WORK PRODUCTIVITY LOSS IN YOUNG WORKERS

Report

July 2015

The views and conclusions expressed in this report do not necessarily represent the views of Safe Work Australia Members.

SAFE WORK AUSTRALIA

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Acknowledgements

This report was a collaborative work between Curtin University and Safe Work Australia. It was prepared by Anne Smith, Darren Beales and Professor Leon Straker of Curtin University together with Su Mon Kyaw-Myint and Jenny Job from Safe Work Australia.

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Disclaimer

Preface

‘Healthy, safe and productive working lives’ is the vision of the Australian Work Health and Safety Strategy 2012–2022. To date, there is very limited information on work productivity loss among young workers and the impact of health conditions on young workers’ productivity at work.

This report examines data from the 23 year follow-up of the Raine Study, a Western Australian birth cohort. Participants were approximately 23 years of age. The aim of the study is to provide estimates of work productivity loss among young workers and to examine the impact of musculoskeletal pain on work productivity. Musculoskeletal pain is a focus for this study because musculoskeletal disorders are a national priority disorder for prevention under the Australian Strategy.

This research report has been written to inform the development of work health and safety policies. The views and the conclusions expressed in this report do not necessarily represent the views of Safe Work Australia Members.

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Executive Summary

Context

Young worker productivity is very important for individual, organisational and national well-being. However, the magnitude of Australian young worker lost productivity is not well documented. Worker productivity loss is due to both absenteeism (absence of the individual from work) and presenteeism (reduced productivity while the individual remains at work). Data on absenteeism among young Australian workers are extremely limited. The only national data source containing some information of relevance is the National Dataset for Compensation-based Statistics (NDS). These data are themselves limited to only those periods of absence associated with accepted workers' compensation claims. No presenteeism data on young Australian workers has been reported though its impact on productivity is expected to be larger than absenteeism. Given the growing importance of younger workers to national productivity in the face of an aging population, understanding young worker productivity loss is essential.

Musculoskeletal pain, especially spinal pain such as back pain or neck pain, and psychological conditions, such as depression and anxiety, are health problems experienced by many young workers. The impact of musculoskeletal pain (either on its own or when it is present together with depression/anxiety) on the work productivity of young workers is not well documented.

The aim of this study was to provide the first detailed estimates of work productivity loss related to absenteeism and presenteeism in young Australians and the impact of musculoskeletal pain on work productivity loss. We used data from the longitudinal Raine Study in Western Australia which collected information on work productivity, musculoskeletal pain and psychological health of participants at 23 years of age (n=1146). The Raine Study is a community based longitudinal study where participants have been followed since birth.

Main findings

Absenteeism and presenteeism in the Raine Study

There were three productivity loss measures in this study: productivity loss from absenteeism due to health reasons (due to workers' own ill health), absenteeism due to any other reason (this includes absenteeism other than for health reasons and vacation) and presenteeism.

Raine participants reported a mean loss of 53 hours per year due to work absenteeism for health reasons. This includes absenteeism from all health related causes, not just those limited to musculoskeletal pain. There were no significant differences in mean hours lost due to absenteeism for health reasons by sex. There were significant differences by occupation and industry.

In addition, Raine participants reported a loss of 175 hours per year from absenteeism due to any other reason (other than their own ill health/ vacation). There were no significant differences in mean hours lost from absenteeism due to any other reason by sex but there were significant differences by occupation and industry.

The mean hours lost per worker from presenteeism was 302 hours per year. As with the findings for absenteeism, there were significant differences in mean hours lost by occupation and industry but not by sex.

For each worker, the costs of productivity loss from absenteeism and presenteeism were estimated using their hourly salary rate. We then estimated the mean annualised cost per worker across the Raine working sample for each type of productivity loss. The mean annualised cost per worker from absenteeism due to health reasons was estimated at $1899 and the mean annualised cost per worker from absenteeism due to any other reason was $6198. The mean annualised cost per worker for presenteeism was the highest at $10 674. The mean annual total cost of work productivity loss per worker from all three types of productivity loss was estimated at $18 836.

The impact of back or neck pain on productivity loss in the Raine Study

Current back or neck pain was reported by 20% of Raine participants; current anxiety or depression was reported by 14%. About one in 20 (4%) reported that they had both back/neck pain and anxiety/depression. These health conditions were health professional diagnosed health conditions reported by young workers. There was no information collected on whether these health conditions were occupational or non-occupational.

Among Raine participants, the rate of absenteeism due to health reasons was 1.8 times greater for those with current back or neck pain. After adjusting for sex and occupation, young workers with diagnosed back or neck pain were estimated to have 73.4 hours of sickness absence per year on average (nearly 10 days if we assume a 7.5 hour work day but the majority of young workers in the Raine Study were working part-time). In contrast, young workers without diagnosed back or neck pain were estimated to have 41.6 hours (about 5.5 days if assuming a 7.5 hour work day) of sickness absence per year on average. The cost to the employer (salary and employer oncost) was $1168 per worker per year more for those with back or neck pain due to extra hours lost from health related absence.

The rate of absenteeism due to health reasons was 3.2 times greater for those who had both back/neck pain and anxiety/depression than those without these health conditions. This is similar to findings in other studies which showed that there was increased productivity loss if musculoskeletal pain was present together with a mental health condition.

Comparison with workers' compensation data

In addition to the questions on health professional diagnosed health conditions (discussed above), the Raine survey contained a second set of questions on whether they have experienced neck/shoulder or low back pain and whether this pain was work-related. Data from this second set of questions on musculoskeletal pain were used for comparison with workers' compensation data as these were the only musculoskeletal pain data for which work-relatedness (perceived) information was available. The limitations of using this data are highlighted on page 22.

The comparison of 23 year old workers with compensated musculoskeletal claims and 23 year old workers with work-related

musculoskeletal pain in Raine Study data showed an opposite sex distribution and different occupation/industry pattern. This suggests the national compensation data may not be useful for estimating productivity loss because they do not capture the full range of workers with musculoskeletal pain. Only 6% of Raine participants with work-related musculoskeletal pain reported their condition to their employer and only 1.2% claimed workers' compensation.

National estimates based on Raine data

National estimates from Raine data showed that the cost of lost productivity of 23 year old Australian workers is approximately $3.8 billion per year. Some 39 000 23 year olds are working with back/neck pain each year. This is costing $45.7 million per year for 23 year olds in health related absenteeism due to back/neck pain alone. This estimate is almost eight times the workers' compensation costs for 23 year olds with accepted musculoskeletal claims.

Conclusions

In young Australian workers absenteeism and presenteeism are significant problems. Back/neck pain and anxiety/depression are experienced by many young workers. Back/neck pain alone and back/neck pain together with anxiety/depression have a significant negative impact on the absenteeism of young workers.

National workers' compensation data may be of limited use for estimating health related productivity loss. This is because it was not designed to measure productivity loss or absenteeism in general but is limited to time lost associated with accepted workers' compensation claims. There are several important differences between self-reported data from Raine and workers' compensation data in terms of distribution by sex, occupation and industry. Such differences are expected because Raine data are self-reported whereas workers' compensation data are administrative data on accepted compensation claims.

The findings of this study suggest that prevention and management of spinal pain and psychological conditions should be a priority for policy and intervention in order to enhance the quality of working life for young Australians and ensure ongoing productivity for the Australian workforce.

Approach

The longitudinal Raine Study collected information on work productivity, musculoskeletal pain and psychological health of participants at 23 years of age. The prevalence and cost of absenteeism and presenteeism and total work productivity loss (combined absenteeism and presenteeism) were estimated. The impact of back pain and neck pain, with or without co-existing depression/anxiety on absenteeism and presenteeism, was calculated from the Raine data. Raine data estimates on work-related musculoskeletal pain were compared with national workers' compensation data. Estimates from the Raine sample were applied to the Australian Bureau of Statistics 2011 Census data to provide national estimates for 23 year old workers.

1. Context

1.1 Overview

Poor health has a major impact on the productivity of an individual. Yet there is little recognition of the importance of health in the national debate on Australia's productivity, particularly in young workers. This project has produced the first detailed estimates of work productivity loss related to absenteeism and presenteeism in young Australians.

These findings inform industry and government of the magnitude of the issue of health impinging upon work productivity in young Australians. This is a key issue given that young workers (20-34 years) currently constitute the largest proportion of the civilian workforce (Australian Bureau of Statistics, 2012) and improving the productivity of young workers has been identified as a way to improve Australia's productivity (Australian Workforce and Productivity Agency, 2012).

Estimations have been taken from the un-biased community sample provided by the Western Australian Pregnancy Cohort (Raine) Study at 23 years of age, with comparisons made to national workers' compensation data.

1.2 Background

Declining productivity growth is a critical issue for Australia

Productivity is a focus for both public and private sectors in Australia (Australian Institute of Company Directors, 2012; Productivity Commission, 2012). Productivity, along with increased supply of capital and labour[1] , drives economic growth. The importance of productivity to the nation goes beyond purely economic terms (Organisation for Economic Co-operation and Development, 2012a) given it is a determinant of social welfare status (House of Representatives & House Standing Committee on Economics, 2010; Subramanian & Kawachi, 2006), contributes to funding of societal institutes, for example law and order (Productivity Commission, 2009), drives long-term prosperity (Taylor et al., 2012) and ensures ongoing improvements in Australia's standard of living. As such productivity is of vital importance for all Australians.

Productivity growth in Australia is shrinking (Eslake, 2011; Green et al., 2012; Organisation for Economic Co-operation and Development, 2012b; Productivity Commission, 2012). 'Multifactor productivity growth' (a construct combining capital and labour factors and the key macroeconomic measure of productivity (Productivity Commission, 2009)) has contributed 40% of Australia's growth in the last 50 years (Green et al., 2012). Although multifactorial productivity growth was sustained at about 1% per annum for the 35 years prior to 2008/9, there has been a subsequent decline in the order of 1% each year since then (Green et al., 2012). This is an issue of utmost national concern (Green et al., 2012).

To date declining productivity growth has largely been offset by favourable terms of trade and population growth (Eslake, 2011; Taylor et al., 2012).

1 Work productivity relates to performance of individuals who are employed, and therefore impacts overall productivity. Work-force participation is a separate construct that relates to labour supply which is an aspect of economic growth rather than productivity.

However, with terms of trade peaking, the detrimental effects of poor productivity growth are expected to become evident as increased inflation, increased unemployment, reduced wage growth and reduced quality of life for Australians (Eslake, 2011; Taylor et al., 2012).

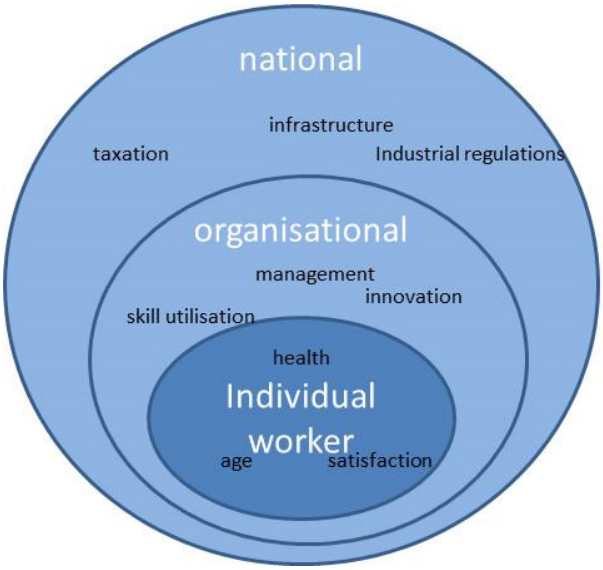
Factors influencing productivity and strategies for promoting productivity

There are many factors influencing workforce productivity (Figure 1). Many recommendations have been made to stimulate increased productivity growth in Australia as it has been estimated that improved productivity growth could add over $20 billion per year to the Australian economy in the next four years (Taylor et al., 2012). At the national level there has been a call for a specific government policy to facilitate productivity growth (House of Representatives & House Standing Committee on Economics, 2010). National level recommendations for specific strategies include regulatory reform including red tape, taxation reform, skill upgrading, innovation including investment in research and development and better infrastructure (Eslake & Walsh, 2011; Green et al., 2012; House of Representatives & House Standing Committee on Economics, 2010; Organisation for Economic Co-operation and Development, 2012b; Productivity Commission, 2009; Taylor et al., 2012).

Many of these national level strategies are focused on facilitating positive change in productivity growth at an organisational level. For example regulatory reform can enhance workplace relations and drive competition which will both lead directly to improved productivity (Productivity Commission, 2009). Other strategies at the organisational level which can stimulate productivity growth are improved management capabilities, improved labour skill utilisation, improved design of work, work processes and systems of work and organisational level innovation (Australian Workforce and Productivity Agency, 2012; Green et al., 2012; Productivity Commission, 2009; Safe Work Australia, 2012a; Taylor et al., 2012).

A number of factors are also known to be determinants of productivity at an individual level including age, education, experience, satisfaction and motivation (Ernst & Young, 2012; Psacharopoulos & Patrinos, 2004; Quinones et al., 1995; Skirbekk, 2004). These determinates relate directly to the quality of labour (Australian Workforce and Productivity Agency, 2012).

Figure 1: Factors influencing work productivity



Health aspects of work productivity loss: absenteeism and presenteeism

Health has been recognised as a key contributor to productivity (D. E. Bloom & Canning, 2000; House of Representatives & House Standing Committee on Economics, 2010; Medibank Private, 2005).

Absenteeism is the absence of an individual from work. It is the commonly used measure of the quantity of productive time lost. Health related productivity is typically captured as sickness absence or work-related injury absence data (Tompa, 2002). While there is no regular national set of sickness absence data, National Health Survey data from 2004-5 show that 13.4% of workers reported health related absenteeism during the two week survey period, with the average absence being two days in duration[2] (Australian Bureau of Statistics, 2006). Workers' compensation related absenteeism is routinely collected nationally (Safe Work Australia, 2012b) and this shows that each year there are 2.6 million days lost to production in Australia as a result of ~130 000 workers' compensation serious claims — claims for a death, permanent incapacity or a temporary incapacity requiring an absence of one working week or more. Published national workers' compensation data are generally limited to serious claims. By design, they also do not capture absenteeism related to health disorders not caused by injury at work. Over a quarter of injured workers who took five or more days off work did not even apply for compensation, and therefore do not show in compensation records (Safe Work Australia, 2011).

Presenteeism is the reduction in productivity while an individual remains at work. It is increasingly being recognised as a critical component in productivity loss as it deals with the quality of productive time. Presenteeism is estimated to result in three to seven times the productivity loss of absenteeism (Johns, 2010) and health conditions typically have a much greater impact on presenteeism than absenteeism (Holden et al., 2011b; Safe Work Australia, 2012c; Stewart et al., 2003). It is essential that presenteeism is included in modelling health related work productivity loss. Very little is known about presenteeism in the Australian context.

Work productivity, in macroeconomics, is defined as the ratio of production output per labour hours (Beaton et al., 2009; McEachern, 2014). However, there was ambiguity in how best to measure health-related productivity loss as a cost to employers. To address this issue, in 2003, an expert panel convened by the American College of Occupational and Environmental Medicine examined productivity measurement. The panel concluded that presenteeism, absenteeism and employee replacement costs are the key measures of health related productivity loss (Loeppke et al., 2003). This was based on the human capital approach. The large majority of studies conducted since 2003 in the field of work health on health-related productivity loss have measured productivity loss as the cost of absenteeism and/or presenteeism (e.g. Leijten et al., 2014; Lerner et al., 2004; Van den Heuvel et al., 2007). This definition of productivity loss is primarily used throughout this report.

National data on the impact of health on work productivity loss is limited

Australian modelling using Household, Income and Labour Dynamics survey data has shown that chronic illness, specifically cardiovascular disease, diabetes, cancer, arthritis, poor mental health and major injury, is associated with lower wages (Forbes et al., 2010). For example poor

2 No definition of how many hours in a work day in this study.

mental health was associated with a 3% (female) to 5% (male) reduction in wages. The authors acknowledged that this approach was limited by the use of average wages as an indirect measure of productivity and that this may have resulted in an underestimate of the negative effects of ill health on productivity.

KPMG has modelled the impact of presenteeism related to 12 chronic disorders on the Australian economy using USA estimates of work productivity loss and Australian disorder prevalences (Medibank Private & KPMG Econtech, 2007). A recent update of this report found the 2009–10 cost of presenteeism was estimated to be $34.1 billion, equating to 6.5 working days annually[3] per worker (Medibank Private & KPMG Econtech, 2011). Major contributors to presenteeism were depression (21%), allergies (17%), hypertension (13%), diabetes (12%), spinal pain (7%) and asthma (7%) (Medibank Private & KPMG Econtech, 2011). No estimates were given for workers at different ages and the US data may not accurately reflect Australian presenteeism due to different cultural and workplace influences.

The most comprehensive Australian data is provided by Holden et al. (2011b) who estimated the impact of health on productivity using data from the Work Outcomes Research Cost-benefit project (WORC). This project collected self-reported health status (conditions for which treatment has been sought from a health professional) for 28 conditions as well as self-reported absenteeism and presenteeism at a single recall time in 18-70 year old employees at 58 companies in Australia. They found a wide range of health conditions increased the risk of absenteeism and presenteeism. As an example, back/neck pain increased the risk of absenteeism by 25% and presenteeism by 32%. However key factors including actual time lost and estimated cost impact on productivity were not reported. While young workers (18-29 years) were 17% of the sample, no age-specific analysis was reported.

Research into the impact of health on work productivity loss is a new and rapidly expanding field, with the majority of studies less than a decade old. The challenge for the field now is to obtain robust contemporary estimates of health related work productivity loss across the broad spectrum of health conditions and for specific age groups.

Young workers are a key labour productivity resource

The aging population, both globally and in Australia, is and will continue to place more burden on workers (Johansson et al., 2012; Skill Australia, 2010). For example it is projected that by 2056 there will be a 3:1 ratio of working adults for every older person rather than the present level of 5:1 (Australian Bureau of Statistics, 2009). While governments have focused on increasing workforce participation in target groups (the aged, mothers, non-working males of working age) and through immigration (Skill Australia, 2010), there will be growing pressure on workers to increase their productivity to support Australia's standard of living. The importance of young workers will continue to increase into the future, particularly as the (positive or negative) attributes of young worker productivity are likely to be multiplied by a lifetime of workforce participation.

Young Australians (20-34 years) currently constitute the largest proportion of the civilian labour force (22%) (Australian Bureau of Statistics, 2012). Thus young workers are a key productivity resource now and into the

3 No definition of how many hours in a work day in this study.

future. To date strategies to increase younger worker productivity have focused on education, training and transition into the workforce (Australian Workforce and Productivity Agency, 2012; Eslake & Walsh, 2011). There is a common perception that health may not be a major problem for young workers compared to older workers. However young Australian adults have a high prevalence of conditions such as spinal pain (15%) (Australian Institute of Health and Welfare, 2010) and mental health disorders (26%) (Australian Institute of Health and Welfare, 2010; Buysse et al., 2008) as well as poor health behaviours such as alcohol misuse (27-32%) (Australian Institute of Health and Welfare, 2011). These common health problems affecting young adults are all known to negatively impact on work productivity (Bergström et al., 2007; Holden et al., 2011b; Salo et al., 2010). For example recently reported data from the Raine cohort at 17 years of age showed that already 20% of them had taken time off work or school due to spinal pain alone (O'Sullivan et al., 2012). Furthermore young workers (25-34 years) have the highest rate of absenteeism for their own health (not carer reasons) of any age group (Australian Bureau of Statistics, 2006). Although research shows that the impact of health on productivity is similar to the impact of education on productivity (D.E. Bloom & Canning, 2005; Weil, 2001), health related productivity loss of younger workers has not received much attention from government, industry and researchers.

The magnitude of health related work productivity loss in young workers is unknown

Given the importance of young worker productivity to Australia, a robust estimate of the magnitude of health related work productivity loss in young Australian workers is critical. The only national data source, the National Dataset for Compensation-based Statistics (NDS) does not capture all health related productivity loss as its purpose is to compile data on workers' compensation claims and absenteeism associated with these claims. A recent report by Safe Work Australia examined work related injuries in young people and found that 63% of young workers (< 25 years) did not apply for workers' compensation for their work-related injury or disease (Safe Work Australia, 2013). The most common reason cited for not claiming workers' compensation among young workers was that they felt their injury was too minor (43% among those with a work-related injury) and a further 10% were not aware or did not think they were eligible for workers' compensation. The report also found that young female workers were less likely to apply for workers' compensation following their injury or disease compared to their male counter parts and two thirds of young workers who did not apply for compensation were females. Using community-based data could address some of these limitations of workers' compensation data in estimating productivity loss. Thus the Raine cohort provides an unbiased sample where data on health related productivity loss can be collected in a robust prospective manner.

1.3 The Raine Study

The Western Australian Pregnancy Cohort (Raine) Study (Raine Study website) is an ongoing community-based, longitudinal study following children who turn 23 years of age between 2012 and 2014. The Raine Study began as a pregnancy cohort of women enrolled around the 18th week of gestation from the public antenatal clinic at the principal obstetric hospital in Perth, Western Australia, and nearby private practices. Mothers of participants were enrolled from August 1989 to April 1992. A total of 2868 children born to 2804 mothers formed the initial cohort for the Raine Study and 1475 subjects remained involved in the 17 year follow-up (O'Sullivan et al., 2012). Similar participation was expected in the 23 year follow-up.

Comparative analysis at 17 years showed that the cohort provided a good representation of the Western Australian population (O'Sullivan et al., 2012). In comparison to the Western Australian population of families with 15 to 17 year olds, it was found that the Raine sample had a lower proportion of rural dwelling families (18.4% versus 33.9%, $p < 0.001$). Also the Raine sample had a slightly higher proportion of urban dwelling families in high socioeconomic status neighbourhoods (23.6% versus 20.6%), and a slightly lower proportion of families with a combined family income of less than A$25 000 (7.9% versus 10.8%).

Similar participation rates and representativeness was expected at the 23 year follow-up.

2. Objectives and Approach

The aim of this project was to produce the first detailed estimates of work productivity loss related to absenteeism and presenteeism in young Australians. In addition, we estimated productivity loss associated with musculoskeletal pain as musculoskeletal disorders are a priority occupational disorder for the Australian Work Health and Safety Strategy 2012–22. Fulfilling this aim will help inform industry and government of the magnitude of the issue of health impinging upon productivity in young workers. As the presence of mental health conditions together with musculoskeletal disorders have been shown to increase productivity loss, mental health conditions (depression, anxiety) were also examined for some of the analyses in this report. The specific objectives were as follows.[4]

Objective 1: Describe young workers in the Raine sample

Descriptive statistics were used to indicate work participation, income, occupation and industry of employment. Data were assessed for sex differences.

Objective 2: Describe the prevalence of diagnosed back/neck pain and anxiety/depression in the Raine sample

The prevalence of these common health conditions were based on self-reported health professional diagnoses. Please note that there was no information available on whether these health conditions were occupational or non-occupational. From the prevalence data, the co-occurrence of musculoskeletal and mental health conditions has been determined.

Objective 3: Determine the annualised rate and cost of absenteeism and presenteeism in the Raine sample

Work productivity loss was determined from the World Health Organisation's recommended Health and Productivity Questionnaire (HPQ). Data from 1146 Raine Study participants, collected from April 2012 to June 2013 as part of the 23-year follow-up, was utilised for this study. Analysis included comparisons by sex, occupation and industry.

Objective 4: Estimate the impact of diagnosed back/neck pain on absenteeism and presenteeism in the Raine sample

Using negative binomial regression models, incidence rate ratios and estimated marginal means were used to estimate the impact of back/neck pain. Subsequent cost estimates were calculated.

Objective 5: Compare young workers reporting work-related neck/ shoulder/ low back pain in the Raine sample and young workers with body-stressing claims in the National Dataset for Compensation-based Statistics (NDS)

In addition to the questions on health professional diagnosed health conditions (objectives 2 and 4), the Raine survey contained a second set of questions on whether they have experienced neck/shoulder or low back pain and whether this pain was work-related. Data from this second set of questions on musculoskeletal pain were used for comparison with

4 Full method details are provided in Appendix 1.

workers' compensation data as these were the only musculoskeletal pain data for which work-relatedness (perceived) information was available. The limitations of using this data are highlighted on page 22.

A profile of 23-year-old workers with accepted workers' compensation claims due to body stressing for back and neck for 2012 was determined from the National Data Set for Compensation-based Statistics (NDS). Comparison data from the Raine sample was formed from self-reported experience of work-related neck and back pain. Group comparisons were performed. We note that these two data sources are not directly comparable (self-reported data versus accepted claims data) but the comparison is made as the NDS is the only data source available for comparison. Also note that this self-reported pain data from the Raine sample is different from Raine diagnosed health conditions data presented in Objectives 2 and 4.

Objective 6: National estimates for the cost of lost productivity based on Raine data

Estimates from the Raine sample were applied to the Australian Bureau of Statistics 2011 Census data to provide national estimates for 23 year old Australian workers.

Objective 7: National estimates for the cost of diagnosed back/neck pain related productivity loss based on Raine data

National estimates were formulated by amalgamating the Raine sample findings on work productivity loss related to back/neck pain with 2011 Census profiles of 23 year olds.

Results are presented in the next section with each of the seven sub-sections representing the results for the seven objectives of the study. The full method in Appendix 1 describes the methods for each of the seven objectives. Appendix 2 contains additional tables that support the results presented in the main report.

3. Results

3.1 A description of young workers in the Raine sample

General demographics

The majority of the Raine sample (83%) was working at the time of the survey (Table 1). Another 8% were actively looking for work. There were no statistically significant differences by sex in terms of the rate of labour force participation. Of the 940 working participants, 73 had data missing for the expected hours worked in a typical week and were excluded leaving 867 for further analysis in this report.

The majority of 23 year olds in the Raine Study were working.

Table 1: Raine sample work status by sex (n=1139)

Do you currently have a full-time or part-time job of any kind?	Females n	Females %	Males n	Males %	Total n	Total %
No, do not have a job - not seeking work	47	7.8	48	9.0	95	8.3
No, do not have a job - actively seeking work	49	8.1	55	10.3	104	8.1
Yes, do work for payment or profit	501	82.9	431	80.6	932	81.8
Yes, do other unpaid work	7	1.2	1	0.2	8	0.7

Note: excludes 7 respondents with missing data on this variable.

Comparison by sex, occupation and industry

The mean hours of work participation per week was 30 hours.

Table 2 presents expected working hours, usual net income per week and occupation of young workers[5] in the Raine Study. The mean number of hours participants were expected to work in a typical week was 30 hours with a range of zero to 100 hours. Overall, just under 30% of working participants were working 19 hours or less in a typical 7 day week and 42% were working 19 to 38 hours per week. There were statistically significant differences in expected working hours per week by sex[6] with the general finding being males having higher expected work hours. The proportion of females working 19 hours or less was 32% compared to 26% among males. Only 4% of females reported expected work hours of 45 hours or more compared to 14% among males.

The most common net income band for young workers was $116-$604 per week with approximately 44% of workers reporting this income band (Table 2). There were statistically significant differences in net income by sex with more females reporting income in the lower ranges.[7] The proportions of male and female workers in the $116-$604 income band were 49% for females and 39% for males. In contrast, only 6% of females reported that their net income band was $1077-$2180 per week compared to 16% among males.

5 The term 'young workers' is used to refer to 23 year old Raine sample workers in this study.
6 Chi-square = 32.46, p < .01
7 Chi-square = 46.12, p <.01

The most common net income range for young workers was $116-604 per week and males reported higher earnings than females.

The most common occupation among males was Technicians & trades workers.

Table 2: Raine sample characteristics of those who were employed (n = 867)

	Females n	Females %	Males n	Males %	Total n	Total %
Expected work hours per week						
19 hours or less	153	32.1	101	25.9	254	29.3
>19 to 38 hours	220	46.1	145	37.2	365	42.1
>38 to 45 hours	83	17.4	90	23.1	173	20.0
>45 hours	21	4.4	54	13.8	75	8.7
Net income per week						
<$116	29	6.1	12	3.1	41	4.8
$116-$604	231	48.5	150	38.9	381	44.2
$605 - $1076	185	38.9	143	37.0	328	38.1
$1077 - $2180	29	6.1	63	16.3	92	10.7
>$2180	2	0.4	18	4.7	20	2.3
Occupation						
Managers	16	3.4	13	3.3	29	3.4
Professionals	71	15.0	50	12.9	121	14.0
Technicians & trades workers	27	5.7	105	27.0	132	15.3
Community & personal service workers	103	21.7	56	14.4	159	18.4
Clerical & administrative workers	123	25.9	29	7.5	152	17.6
Sales workers	102	21.5	55	14.1	157	18.2
Machinery operators & drivers	6	1.3	24	6.2	30	3.5
Labourers	26	5.5	57	14.7	83	9.6
Industry						
Agriculture, forestry & fishing	4	0.8	0	0.0	4	0.5
Mining	20	4.2	35	9.0	55	6.4
Manufacturing	5	1.1	18	4.6	23	2.7
Electricity, gas, water & waste services	4	0.8	7	1.8	11	1.3
Construction	10	2.1	53	13.7	63	7.3
Wholesale trade	5	1.1	2	0.5	7	0.8
Retail trade	103	21.7	77	19.8	180	20.9
Accommodation & food services	74	15.6	50	12.9	124	14.4
Transport, postal & warehousing	6	1.3	18	4.6	24	2.8
Information, media & telecommunications	7	1.5	9	2.3	16	1.9
Finance & insurance services	16	3.4	6	1.5	22	2.6
Rental, hiring & real estate services	3	0.6	1	0.3	4	0.5
Professional, scientific & technical services	15	3.2	17	4.4	32	3.7

	Females n	Females %	Males n	Males %	Total n	Total %
Administrative & support services	14	3.0	3	0.8	17	2.0
Public administration & safety	16	3.4	12	3.1	28	3.2
Education & training	43	9.1	14	3.6	57	6.6
Health care & social assistance	79	16.7	23	5.9	102	11.8
Arts & recreation services	23	4.9	17	4.4	40	4.6
Other services	27	5.7	26	6.7	53	6.1

Community & personal service workers, Clerical & administrative workers and Sales workers were the most common occupations among young workers. There were significant occupational differences by sex.[8] The most common occupation for females was Clerical & administrative workers (26%) whereas only 8% of males were working as Clerical & administrative workers. The most common occupation among males was Technicians & trades workers (27%).

The most common industry of employment for both sexes was Retail trade.

The most common industry of employment for both sexes was Retail trade which employed about 21% of these young workers, followed by Accommodation & food services (14%) and Health care and social assistance (12%). A higher proportion of females reported working in Education & training (9%) and Health care (17%) compared to males (Education & training 4% and Health care 6%). In contrast, a higher proportion of male workers reported working in Construction (14%) compared to females (2%).

3.2 The prevalence of diagnosed back/neck pain and anxiety/ depression in the Raine employed sample

In addition to estimating general productivity loss in this report, we will also be estimating productivity loss associated with musculoskeletal pain as musculoskeletal disorders are a priority disorder for the Australian Work Health and Safety Strategy 2012–2022. The prevalence of depression and anxiety is also presented as the literature shows that there is increased productivity loss if musculoskeletal pain is present together with a mental health condition (Bair et al., 2008; Haukka et al., 2014; Holden et al., 2011a; Munce et al., 2007).

About 17% and 9% of young workers reported having current diagnosed back pain and neck pain respectively.

Table 3 shows the prevalence of diagnosed health conditions. About 17% (n = 149) of young workers reported having current diagnosed back pain. Seventy-eight young workers (9.0%) reported having current diagnosed neck pain. Approximately one in five (19.5%) reported current back or neck pain (back pain alone, or neck pain alone or back pain and neck pain together). About one in 11 (8.8%) young workers reported having diagnosed depression. Over one in ten (11.2%) young workers reported having diagnosed anxiety and 14.1% reported current depression or anxiety (depression alone or anxiety alone or depression and anxiety together).

8 Chi-square = 151.62, p <.001

Table 3: The prevalence of diagnosed health conditions among employed workers in the Raine Study

Diagnosed health condition	Females n	Females %	Males n	Males %	Total n	Total %
Current back pain*	100	21.1	49	12.6	149	17.3
Current neck pain*	57	12.0	21	5.4	78	9.0
Current back or neck pain*	114	24.1	54	13.9	168	19.5
Current depression	53	11.2	23	5.9	76	8.8
Current anxiety*	72	15.3	24	6.2	96	11.2
Current depression or anxiety*	83	17.6	38	9.8	121	14.1

Notes: percentages exclude respondents with missing data; * significant differences in proportions with health condition by sex.

About 9% of young workers reported they had current diagnosed depression and 11% reported having current diagnosed anxiety.

Table 4 shows diagnosed back/neck pain and anxiety/depression and the proportion that had both musculoskeletal pain and mental health conditions (comorbidity). About 71% of workers did not have either back/neck pain or anxiety/depression. About 15% of young workers had back/neck pain but no comorbid anxiety/depression. A small proportion (4.3%) had both back/neck pain and depression/anxiety.

Table 4: The presence of one or more current diagnosed health conditions among employed workers in the Raine Study

Co-occurring health conditions*	Females n	Females %	Males n	Males %	Total n	Total %
No back/neck pain OR anxiety/depression	302	64.1	305	79.0	607	70.8
Has back/neck pain BUT no anxiety/depression	86	18.3	43	11.1	129	15.1
No back/neck pain BUT has anxiety/depression	55	11.7	29	7.5	84	9.8
Has back/neck pain AND anxiety/depression	28	5.9	9	2.3	37	4.3

Notes: percentages exclude missing responses; * significant differences by sex.

About 4% reported that had current diagnosed back/neck pain and anxiety/depression.

3.3 Annualised rate and cost of absenteeism and presenteeism in the Raine employed sample

This section presents the rate and cost of productivity loss in the Raine sample. Three types of productivity loss are presented:

1. Absenteeism due to health reasons represents absenteeism from work due to own health reasons. This includes absenteeism for the health conditions presented in the previous section as well as for any other health condition. The annualised estimate for this productivity loss is based on 48 weeks a year (excluding four weeks of annual leave a year), rather than 52 weeks a year to avoid overestimation.
2. Absenteeism due to any other reason represents any absenteeism from work other than due to own ill health. To avoid overestimation, the annualised estimate for absenteeism due to any other reason is for 48 weeks a year so that it does not include four weeks of annual leave. Therefore this presents absenteeism due to reasons other than own ill health or vacation.
3. Presenteeism is the reduction in productivity while an individual remains at work. The annualised estimate for presenteeism is also estimated based on 48 weeks a year.

Please note that the productivity loss estimates presented in this section are not attributed to a particular health condition. Productivity loss associated with musculoskeletal pain will be presented in Section 3.4.

Rates of absenteeism

The mean annualised hours lost per worker due to absenteeism for health reasons was 53 hours per year. For absenteeism due to any other reason, it was 175 hours per year.

Absenteeism within the past four weeks for health reasons was reported by 31% (261 out of 834) of young workers. The mean and median annualised hours lost per worker due to absenteeism for health reasons was 53 hours and zero hours respectively (range = 0 to 1392 hours).

Absenteeism for any other reason within the past four weeks was reported by 60% (501 of 840) of young workers. The mean and median annualised hours lost per worker due to absenteeism for any other reason was 175 hours and 65 hours per year respectively (range = 0 to 2109 hours).

Rate of presenteeism

The mean hours lost from presenteeism was 302 hours per worker per year.

Presenteeism over the past four weeks was reported by 92% (738 of 800) of young workers. Sixty-seven workers had missing responses. Forty-three (1%) workers reported high presenteeism with ratings of work performance ≤5/10 where 10 is the top work performance. The estimated mean and median annualised number of hours lost per worker due to presenteeism was 302 hours and 230 hours respectively (range = 0 to 1488 hours).

Cost of absenteeism and presenteeism

The mean annualised cost of absenteeism due to health reasons was $1899 per worker (range = $0 to $53 626). The mean annualised cost of absenteeism per worker due to any other reason was $6198 per worker (range = $0 to $114 912). The mean annualised cost due to presenteeism was $10 674 per worker (range = $0 to $101 409). The combined mean annualised cost of lost productivity (presenteeism + absenteeism due to health reasons + absenteeism due to any other reason) was $18 836 per worker (see Table 5).

Table 5: Raine sample cost of lost productivity (all causes)

Lost productivity per worker per year (all cause, not attributed to a particular health condition)	Mean	Median (25th percentile, 75th percentile)
Annual cost for absenteeism due to health reasons	$1899	0 (0,1738)
Annual cost for any other absenteeism	$6198	1998 (0, 6082)
Annual cost for any presenteeism	$10 674	6573 (4003,13 087)
Annual cost for lost productivity†	$18 836	11 452 (5916, 21 197)

Note: † excludes those with missing data on any of the three variables above.

The combined mean cost of productivity loss was $18 836 per worker per year (from both types of absenteeism and presenteeism).

Comparison of productivity loss by selected characteristics

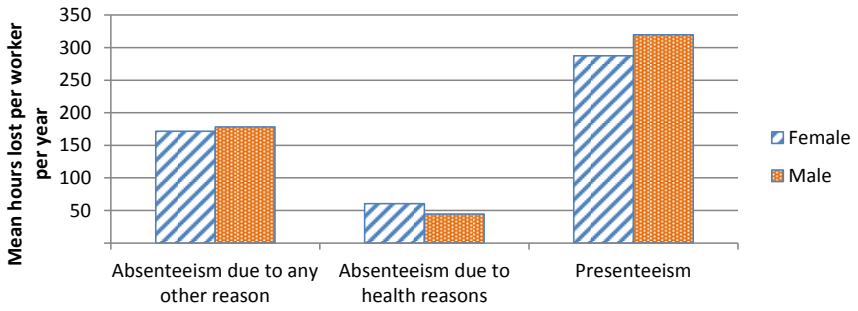
The following paragraphs present productivity loss by specific characteristics. Tables relevant to the figures presented in this section are included in Appendix 2 (Table 20 to Table 25).

Sex

There were no significant differences in mean hours lost due to absenteeism and presenteeism by sex.

Females had higher mean annualised hours lost from absenteeism due to health reasons than males but this difference was not statistically significant (Figure 2). Males had higher mean annualised hours lost due to absenteeism due to any other reason and presenteeism. These differences were not statistically significant.

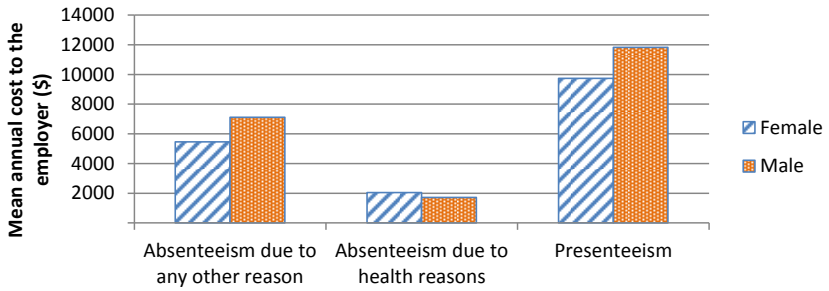
Figure 2: Mean annualised hours lost per worker due to loss in productivity by sex



There were no significant differences in mean annualised cost due to absenteeism and presenteeism by sex.

As shown in Figure 3, for absenteeism due to health reasons, females had a higher mean cost ($2042) than males ($1723) but this difference was not statistically significant. The mean annualised cost to the employer per worker due to absenteeism for any other reason was higher for males ($7110) compared to females ($5458). This difference was also not statistically significant. A similar finding was observed for annual cost from presenteeism by sex.

Figure 3: Mean annualised cost per worker to the employer ($) due to loss in productivity by sex

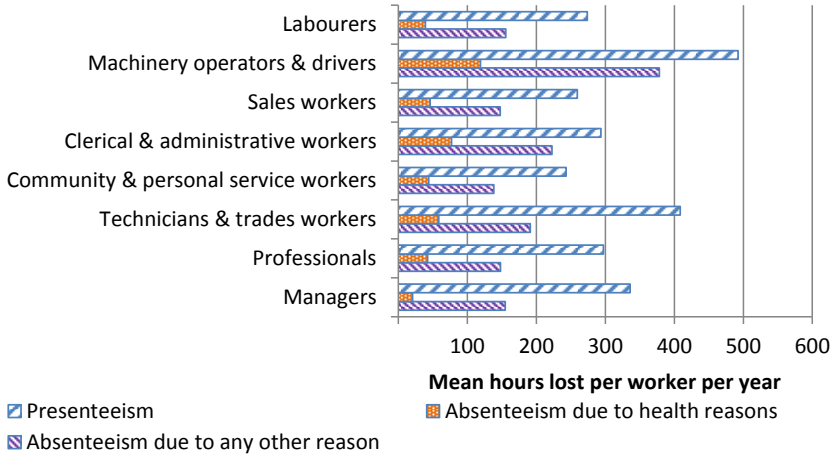


Occupation

There were significant differences in mean hours lost due to absenteeism and presenteeism by occupation.

Figure 4 presents mean annualised hours lost per worker due to loss in productivity by occupation. There were statistically significant differences in mean hours lost due to any other absenteeism[9] and mean hours lost due to health reasons[10] by occupation. There were also statistically significant differences in mean hours lost due to presenteeism[11] by occupation.

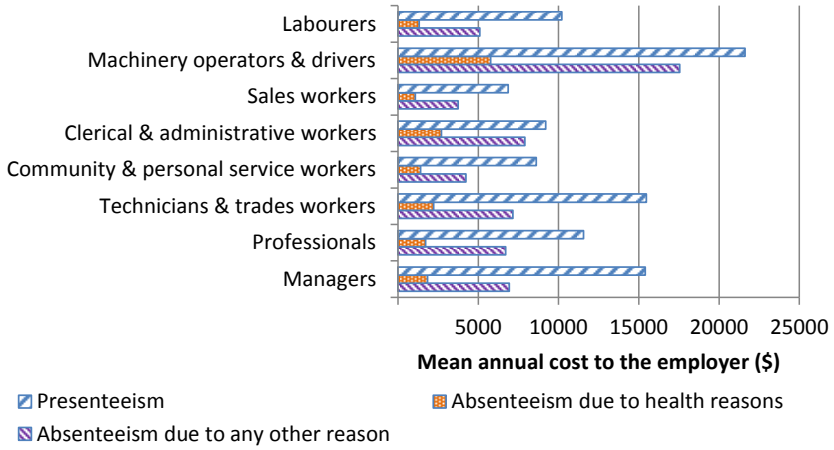
Figure 4: Mean annualised hours lost per worker due to loss in productivity by occupation



Post-hoc comparisons showed that Machinery operators & drivers had significantly higher mean hours lost due to absenteeism for any other reason than Professionals, Community & personal service workers, Sales workers and Labourers (see Table 22, Appendix 2). For absenteeism due to health reasons, there were no significant differences observed in post-hoc comparison. For presenteeism, post-hoc comparisons indicated that Technicians & trades workers had significantly higher mean hours lost from presenteeism compared to Professionals, Community & personal service workers, Clerical & administrative workers, Sales workers and Labourers. Machinery operators & drivers had significantly higher mean hours lost from presenteeism compared to Professionals, Community & personal service workers, Clerical & administrative workers, Sales workers and Labourers.

9 $F(7, 764) = 3.24, p < .005$
10 $F(7, 757) = 2.45, p < .05$
11 $F(7, 788) = 8.19, p < .001$

Figure 5: Mean annualised cost per worker to the employer ($) due to loss in productivity by occupation



There were significant differences in mean annualised cost due to absenteeism and presenteeism by occupation.

Figure 5 presents mean annualised cost due to loss in productivity by occupation. There were significant differences by occupation for all three productivity loss measures.[12] Post-hoc comparisons showed that Machinery operators & drivers had significantly higher mean annual cost from absenteeism due to any other reason than any other occupation (see Table 23 in Appendix 2). Machinery operators & drivers also had significantly higher mean annual cost from absenteeism due to health reasons than Professionals, Community & personal service workers, Sales workers and Labourers. Technicians & trades workers had a significantly higher mean annualised cost due to presenteeism compared to Sales workers, Clerical & administrative workers and Community & personal service workers. Managers had a significantly higher mean annualised cost due to presenteeism compared to Sales workers. Machinery operators & drivers had a significantly higher mean cost due to presenteeism than Professionals, Community & personal service workers, Clerical & administrative workers, Sales workers and Labourers.

Industry

Industry analysis is restricted to industries with n ≥ 25 which means eight industries (total n = 133) were excluded. The excluded industries were Agriculture, forestry & fishing, Manufacturing, Electricity, gas & water supply, Wholesale trade, Transport, postal & warehousing, Information, media & telecommunications, Finance & insurance services, Rental, hiring & real estate services and Administrative & support services.

There were no significant differences in mean hours lost due to absenteeism due to health reasons by industry.

There were no significant differences by industry for mean annualised hours lost from absenteeism due to health reasons.

There were significant differences in hours lost due to absenteeism for any other reason by industry.[13] As shown in Figure 6, the largest mean annualised hours lost due to absenteeism for any other reason was reported by young workers in the Construction industry. The lowest mean annualised hours lost due to absenteeism for any other reason was reported by young workers in Arts & recreation services. Post-hoc

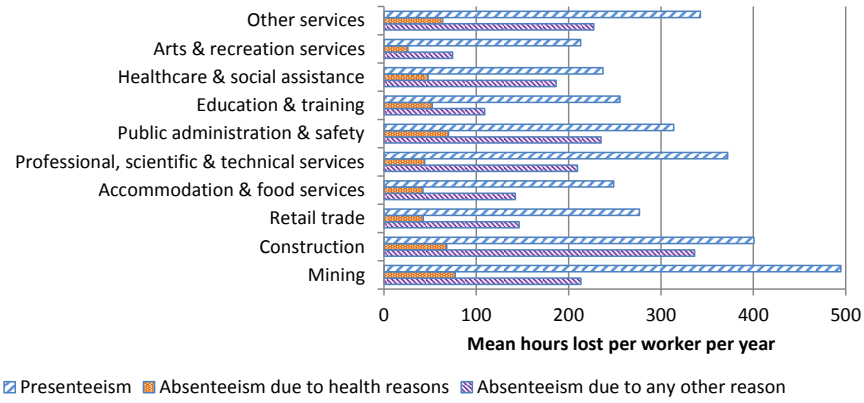
12 Any absenteeism: F (7, 763) = 5.38, p < .001; Absenteeism due to health reasons: F (7, 756) = 3.42. p < .005; Presenteeism: F (7, 781) = 10.02, p < .001

13 F (9, 642) = 3.40, p < .001

comparisons showed that Construction workers had significantly higher mean annualised hours lost from absenteeism due to any other reason compared to workers in the Retail trade, Accommodation & food services, Education & training and Arts & recreation services industries (see Table 24 in Appendix 2).

Figure 6: Mean annualised hours lost per worker due to loss in productivity by industry

Construction and Mining workers had higher mean hours lost from absenteeism due to any other reason and presenteeism than workers in other industries.



There were significant differences by industry for mean annualised hours lost due to presenteeism.[14] Workers in Mining reported the highest mean annualised hours lost due to presenteeism, followed by workers in Construction. Workers in Arts & recreation services reported the lowest annualised mean hours lost. Post-hoc analyses showed that the mean hours lost for Mining workers was significantly higher than the mean hours lost among workers in the Retail trade, Accommodation & food services, Education & training, Healthcare & social assistance and Arts & recreation services industries (Table 24, Appendix 2). Construction workers also had significantly higher mean annual hours lost due to presenteeism compared to workers in Retail trade, Accommodation & food services, Healthcare & social assistance and Arts & recreation services industries.

There were significant differences in mean annualised cost due to absenteeism due to health reason and absenteeism due to any other reason by industry.

There were statistically significant differences by industry for mean annualised cost to the employer per worker for both absenteeism measures.[15] Workers in Mining had the highest mean annual cost from absenteeism due to health reasons compared to workers in other industries. For absenteeism due to any other reason, the mean cost per worker was the highest for Construction workers compared to workers in other industries (Figure 7).

Post-hoc analyses showed that workers in Mining also had a significantly higher mean annual cost due to health reasons than workers in Retail trade. Construction had significantly higher mean cost for absenteeism due to any other reason compared to workers in the Retail trade, Accommodation & food services, Education & training and Arts and recreation services industries (see Table 25, Appendix 2).

There were significant differences in mean annualised cost due to presenteeism by industry.

There were also statistically significant differences by industry for annualised mean cost per worker due to presenteeism.[16] The mean annual cost due to presenteeism was the highest for workers in Mining. Workers in

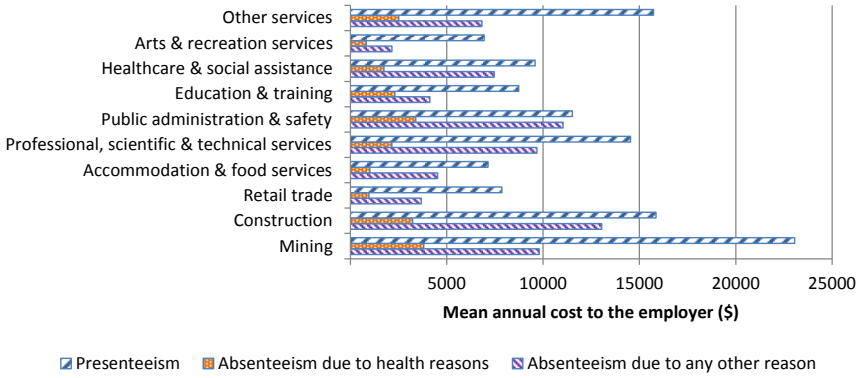
14 F (9, 665) = 7.81, p < .001

15 Absenteeism due to any other reason, F (9, 642) = 4.66, p < .001; Absenteeism due to health reasons, F (9, 639) = 2.65, p < .05

16 F (9, 660) = 11.36, p < .001

Mining had a significantly higher mean cost for presenteeism than workers in all other industries examined except Construction, Professional, scientific & technical services and Other services. Construction workers had a significant higher mean cost from presenteeism than workers from Retail trade, Accommodation & food services and Arts & recreation services. Workers in the Other services industry had significantly higher mean annual cost due to presenteeism than workers in the Retail trade and Arts & recreation services.

Figure 7: Mean annualised cost per worker to the employer ($) due to loss in productivity by industry



3.4 The impact of diagnosed back/neck pain on absenteeism and presenteeism in the Raine sample

This section focuses on health professional diagnosed musculoskeletal pain and its effect on productivity loss. For each type of productivity loss (e.g. absenteeism due to health reasons), we present a comparison of mean annualised hours lost for young workers with and without musculoskeletal pain. Then, we examine the impact of diagnosed musculoskeletal pain on the rate of productivity loss in adjusted regression models. As musculoskeletal pain in combination with depression or anxiety has been shown to increase productivity loss, we also examined whether this is true for young workers in this study. In addition, we estimate additional costs for productivity loss in people with specific musculoskeletal conditions.

Absenteeism due to health reasons

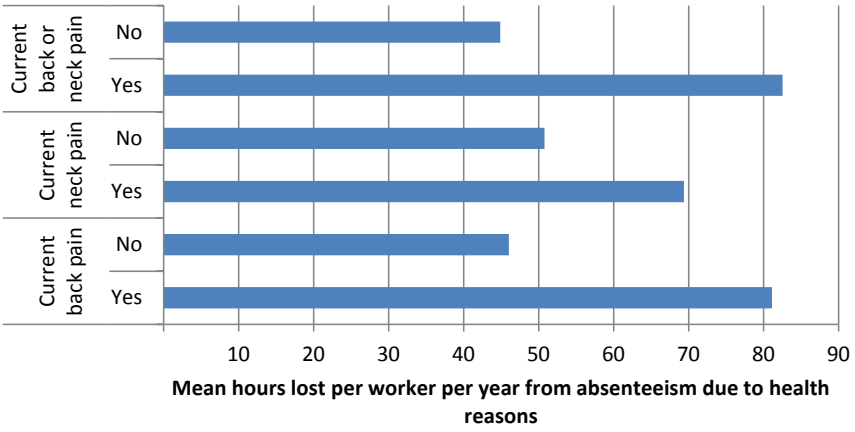
Workers with current diagnosed back pain had higher mean hours lost due to health reasons than those without back pain.

Figure 8 shows the mean annual hours lost from absenteeism due to health reasons by those with and without diagnosed musculoskeletal pain. Those with back pain had 81 mean hours lost per year from absenteeism due to health reasons compared to the mean loss of 41 hours per year among those without back pain. This difference by back pain status was statistically significant.[17] Young workers with neck pain had higher mean annualised hours lost from absenteeism due to health reasons than those without neck pain, 69 hours and 51 hours respectively. This difference was not significantly different. Workers with back or neck pain had significantly higher mean hours lost than workers without back or neck pain (83 hours

17 $t(762) = -2.59.\ p < .05$

and 45 hours respectively).[18]

Figure 8: Mean annualised hours lost per worker from absenteeism due to health reason by the presence or absence of health professional diagnosed musculoskeletal pain



Workers with current diagnosed back pain had 1.7 times the rate of absenteeism due to health reasons accounting for sex and occupation. This equates to an extra 30 hours lost per year.

All health conditions except neck pain were associated with significantly greater rates of absenteeism from health reasons in adjusted negative binomial regression models that included sex and occupation (for details, see Table 28, Appendix 2). Workers with current back pain were estimated to have 1.7 times the rate of absenteeism due to health reasons than those without current back pain. Those with both musculoskeletal pain and depression or anxiety had the highest rate of absenteeism due to health reasons (3.2 times) compared to those without musculoskeletal pain or depression/anxiety.[19]

From these adjusted models, young workers with current back pain compared to those without current back pain had 30 more hours lost per year due to absenteeism due to health reasons. Those with back/neck pain and depression/anxiety had 87 more hours lost due to absenteeism due to health reasons than workers without any of these health conditions. For more details on estimated mean hours lost due to health reasons, see Table 29 in Appendix 2.

Absenteeism due to any other reason

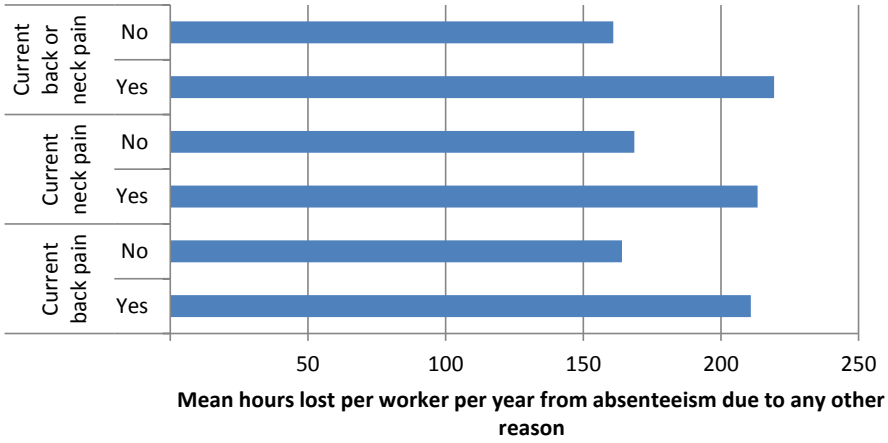
Figure 9 shows that young workers with back pain had 210 mean hours lost per year from absenteeism due to any other reason and those without back pain had 164 mean hours lost per year. This difference was not statistically significant. Young workers with neck pain had higher mean hours lost per year from absenteeism due to any other reason but this was also not statistically significant. However, young workers with current back or neck pain had significantly higher mean hours lost from absenteeism due to any other reason than those without back or neck pain, 219 and 161 hours respectively.[20]

18 $t(202) = -2.96, p < .05$

19 Additional results using those with back/neck pain AND depression/anxiety as a reference group are presented in Appendix 2, Table 32.

20 $t(769) = -2.32, p < .05$

Figure 9: Mean annualised hours lost per worker from absenteeism due to any other reason



Those with current diagnosed back pain had 1.3 times the rate of absenteeism due to any other reason accounting for sex and occupation. This equates to an extra 55 hours lost per year.

When sex and occupation were included as covariates in negative binomial regression models, two of the three diagnosed musculoskeletal conditions (current back pain and current back/neck pain) were associated with significantly greater hours lost from absenteeism due to any other reason. Workers with current back pain were estimated to have 1.3 times the rate of absenteeism due to any other reason than those without current back pain, adjusting for sex and occupation. Workers with current back or neck pain were associated with 1.4 times the rate of absenteeism due to any other reason compared to those without current back or neck pain. Those with back or neck pain combined with depression or anxiety did not have significant greater hours lost from absenteeism due to any other reason compared to those without any of the health conditions. A summary of results from regression models for absenteeism due to any other reason is included in Appendix 2, Table 26.

From these regression models, it was also possible to calculate the mean hours lost per year for people with and without a particular musculoskeletal condition, adjusting for sex and occupation. Those with current back pain had, on average, an extra 55 hours lost per year from absenteeism due to any other reason than those without current back pain after adjusting for sex and occupation. Those with current back or neck pain were estimated to have an extra 65 hours lost per year than those without back or neck pain from absenteeism due to any other reason. For more details, see Table 27, Appendix 2.

Presenteeism

The mean hours lost due to presenteeism was similar between those with back pain and those without back pain (302 hours). There were also no significant differences in mean hours lost per year due to presenteeism by the presence or absence of neck pain or back or neck pain.

There were no significance differences in the rate of productivity loss by musculoskeletal pain.

For all conditions evaluated, having the health condition was not associated with a significantly increased rate of presenteeism compared to the reference category (not having a particular health condition) (Table 30, Appendix 2). Musculoskeletal pain combined with depression or anxiety was also not associated with an increased risk of presenteeism.

The cost of productivity loss associated with diagnosed musculoskeletal pain in the Raine sample

Where there was a significant difference in the rate of absenteeism between those with and those without a particular musculoskeletal condition in adjusted models, the additional cost of productivity loss from these conditions was calculated.

Those with current diagnosed back pain were estimated to result in an additional cost of $1098 per year from extra hours lost due to absenteeism due to health reasons.

Table 6 provides cost estimates for absenteeism due to health reasons. Those with current diagnosed back pain were estimated to result in an additional cost of $1098 per year from sickness absence than those without diagnosed back pain. Young workers with back/neck pain were estimated to result in an additional cost of $1168 per year from sickness absence compared to those without back/neck pain.

Table 6: Estimated additional cost in productivity loss due to extra hours lost for sickness absence for diagnosed musculoskeletal pain

	Current diagnosed back pain	Current diagnosed back OR neck pain
Estimated marginal means in annualised hours lost for those with health condition (hours)	72.3	73.4
Estimated marginal means in annualised hours lost for those without health condition (hours)	42.3	41.6
Difference in annualised hours lost due to absenteeism due to health reasons between those with and without health condition (hours)	30.0	31.9
Mean hourly cost to the employer ($)‡	36.6	36.6
Mean extra cost per year per worker due to health condition ($)	1098.0	1167.5

Note: ‡ hourly cost to the employer per worker was estimated based on net income plus 20% on cost to cover superannuation and other employer expenses (more details in the Methods in Appendix 1).

Having current diagnosed back pain was estimated to result in an additional cost of $2017 per year from extra hours lost due to absenteeism due to any other reason.

Cost estimates from absenteeism due to any other reason are provided in Table 7 for two diagnosed conditions: back pain and back/neck pain. Having diagnosed back pain was estimated to result in an additional cost of $2017 to the employer per worker per year due to an increase of 55 hours in absenteeism due to any other reason. When those with back and/or neck pain were analysed as a single group, the estimated cost per year from extra hours lost due to absenteeism for any other reason was $2386 compared to those without back/neck pain. This was estimated from an increase of 65 hours in absenteeism due to any other reason.

Table 7: Estimated additional cost in productivity loss due to extra hours lost for absenteeism due to any other reason for diagnosed musculoskeletal pain

	Current diagnosed back pain	Current diagnosed back OR neck pain
Estimated marginal means in annualised hours lost for those with health condition (hours)	223.9	231.5
Estimated marginal means in annualised hours lost for those without health condition (hours)	168.8	166.3
Difference in annualised hours lost due to absenteeism due to any other reason between those with and without health condition (hours)	55.1	65.2
Mean hourly cost to the employer ($)‡	36.6	36.6
Mean extra cost per year per worker due to health condition ($)	2016.7	2386.3

Note: ‡ hourly cost to the employer per worker was estimated based on net income plus 20% on cost to cover superannuation and other employer expenses (more details in the Methods in Appendix 1).

3.5 Comparing workers with self-reported pain in the Raine sample with workers with body-stressing workers' compensation claims

This section presents the profile of young workers in the Raine sample with self-reported work-related neck/shoulder or low back pain. This self-reported work-related pain data is derived from a different set of questions in the Raine 23-year follow-up survey than the diagnosed health conditions presented in earlier sections. This is because no work-related questions were asked in relation to diagnosed health conditions.

The profile of 23-year-old workers with accepted workers' compensation claims due to body stressing for neck and back for 2012 from the NDS is then presented for comparison.

Limitation regarding comparison between the two samples

As the Raine sample is based on self-reported work-related pain, the information from this sample is not directly comparable to workers' compensation data where a doctor's opinion is required to identify an injury or disease as work-related and the claims have been accepted as compensable claims. Nevertheless, this comparison is still useful to highlight how well the workers' compensation data represents the work-related pain experience of young workers in the community.

Self-reported neck/shoulder/low back pain in the Raine employed sample

About 78% reported ever having neck/ shoulder or low back pain.

The prevalence of self-reported musculoskeletal pain was high among young workers (see Table 8). About 56% reported having ever had neck/ shoulder pain and two thirds reported having ever had low back pain. Overall, 78% of young workers reported having ever had neck/shoulder pain or low back pain.

Table 8: The prevalence of self-reported pain among workers in the Raine Study (n=855)

Self-reported pain	Females n	Females %	Males n	Males %	Total n	Total %
Ever neck/shoulder pain*	301	63.9	174	45.3	475	55.6
Ever low back pain*	327	69.3	237	61.9	564	66.0
Ever neck/shoulder or low back pain*	388	82.2	281	73.2	669	78.2

Notes: percentages exclude 12 missing responses; * significant differences by sex.

Work-related self-reported neck/ shoulder/low back pain in the Raine employed sample

Overall, 19%[21] of employed young workers in the Raine Study reported that their neck/shoulder or low back pain was work-related (Table 9). Pain was considered work-related if the workers perceived the pain to be caused by work or exacerbated by work. The rate of reporting to the employer was just under 6%. Only eight reported that they claimed workers' compensation for their musculoskeletal pain.

Table 9: Work-related pain estimates among workers in the Raine Study (n = 867)

Work-related self-reported neck/shoulder or low back pain	n	%
Has work-related self-reported neck/shoulder or low back pain	163	18.8
Reported to employer	49	5.7
Claimed workers' compensation	8	0.9

If restricted to the 669 participants with ever self-reported neck/shoulder or low back pain, one in four workers reported that their pain was either caused by work or made worse by work (Table 10). Only 7% of young workers reported this pain to their employer.

Table 10: Work related pain among workers with self-reported ever neck/ shoulder or low back pain (n=669)

Among those with ever self-reported neck/shoulder/low back pain, 24% reported their pain was work-related.

	Females n	Females %	Males n	Males %	Total n	Total %
Has work-related pain	111	28.6	52	18.5	163	24.4
Reported to employer	30	7.7	19	6.8	49	7.3
Claimed workers compensation	3	0.8	5	1.8	8	1.2

Two-thirds of workers with ever self-reported neck/ shoulder/low back pain were female.

Approximately two-thirds (68%) of young workers with work-related neck/ shoulder or low back pain were female (Table 11). The most common occupation among workers with work-related pain in the Raine Study was Sales workers (23%). About 18% were Clerical & administrative workers and 17% were Technicians & trades workers. The largest industry of

21 Due to the sequencing of questions in the survey, many workers with self-reported neck/shoulder or low back pain did not answer the work-relatedness questions. So the whole employed sample size is used as a denominator for these analyses and the rates presented may be underestimates.

employment for these workers was Retail trade (24%). Approximately 15% worked in the Accommodation & food services industry and a further 13% worked in the Health care & social assistance industry.

Time lost and cost of lost productivity for self-reported work-related neck/ shoulder/ low back pain

Among those with ever self-reported neck/ shoulder/ low back pain, the mean hours lost from absenteeism due to health reasons was 71 hours.

For the 163 working Raine participants who reported work-related pain, the mean annualised hours lost due to absenteeism for any other reason was 166 hours with a median of 94 hours (range 0–1152 hours). The mean annualised cost for absenteeism due to any other reason was $6042 and the median cost was $2647. The mean annualised hours lost due to absenteeism from health reasons was 71 hours with a median of zero hours (range 0–864 hours). The mean annualised cost from absenteeism due to health reasons was $2753 with a median of zero. The mean annualised hours lost from presenteeism were 317 hours with a median of 247 hours (range 0–1109 hours). The mean annualised cost from presenteeism was $10 471 and the median cost was $6683.

Profile of young workers with body stressing workers' compensation claims in Australia

The workers' compensation sample is limited to 23 year-old workers with accepted body stressing claims, limited to bodily location of injury of back or neck in 2012. The age of the worker is the age at the time of claim. Commuting and journey claims are excluded as these data are inconsistent across jurisdictions.

Among young workers with body stressing workers' compensation claim, two-thirds were male.

There were a total of 965 workers' compensation claims in 2012 that met the sample criteria. Among this sample, approximately two-thirds (68%, n = 655) were male. This was in contrast to the gender distribution observed for the Raine sample with work-related pain in 2012 where 68% were female (Table 11). The most common occupation among young workers with body stressing claims was Labourers (27%), followed by Technicians & trades workers (21%). Just over 3% were Managers and a similar proportion were Clerical & administrative workers. Although Labourers was the most common occupation among those with workers' compensation claims, Labourers only made up 5% of workers with work-related neck/shoulder or low back pain.

Workers' compensation statistics generally report on the industry of employer as this is the variable traditionally collected. The most common industry of employer was Retail trade (16%). Other common industries were Health care & social assistance (14%), Manufacturing (14%) and Construction (12%).

The most common occupations among the Raine workers with work-related pain were Sales workers and Clerical & administrative workers. Technicians & trades workers and Labourers were the most common occupation among the workers' compensation sample.

Table 11: Characteristics of young workers with accepted workers' compensation claims for body stressing and working Raine participants reporting work-related neck/shoulder/low back pain

	Body stressing claims n	Body stressing claims % ‡	Raine work-related pain n	Raine work-related pain % ‡
Gender				
Female	310	32.1	111	68.1
Male	655	67.9	52	31.9
Occupation				
Managers	31	3.2	5	3.1
Professionals	62	6.4	21	12.9
Technicians & trades workers	199	20.6	28	17.2
Community & personal service workers	142	14.7	26	16.0
Clerical & administrative workers	34	3.5	29	17.8
Sales workers	108	11.2	37	22.7
Machinery operators & drivers	127	13.2	6	3.7
Labourers	261	27.1	11	6.7
Industry				
Agriculture, forestry & fishing	20	2.1	0	0.0
Mining	34	3.6	11	6.8
Manufacturing	132	13.8	6	3.7
Electricity, gas, water & waste services	8	0.8	1	0.6
Construction	118	12.3	9	5.6
Wholesale Trade	48	5.0	2	1.2
Retail Trade	150	15.7	38	23.5
Accommodation & food services	63	6.6	25	15.4
Transport, Postal & warehousing	59	6.2	5	3.1
Information media & telecommunications	1	0.1	1	0.6
Financial & insurance services	6	0.6	6	3.7
Rental, hiring & real estate services	10	1.0	0	0.0
Professional, scientific & technical services	25	2.6	3	1.9
Administrative & support services	59	6.2	5	3.1
Public administration & safety	18	1.9	5	3.1
Education & training	12	1.3	7	4.3
Health care & social assistance	136	14.2	21	13.0
Arts & recreation services	14	1.5	5	3.1
Other services	43	4.5	12	7.4

Notes: ‡ exclude persons with missing data; for workers' compensation data, workers who had labour hire arrangements where they may have worked in a workplace with a different industry were coded under labour hire services which is under the ANZSIC 2006 Division, Administrative & support services.

Time lost and compensation cost for body stressing workers' compensation claims

Among those with workers' compensation claims, the mean working hours lost was 147 hours.

Among young workers with neck/back body stressing claims in 2012, 36% had no time lost and a further 21% had less than one week of lost time from work (Table 12). The mean working weeks lost was 4.2 weeks and the median working weeks lost was 0.6 week (range = 0 to 127 weeks). The mean working hours lost for these workers was 147 hours and median hours lost was 21 hours (range = 0 to 3032 hours).

Table 12: Duration of time lost in working weeks for young workers with body stressing claims

Working weeks lost	n	%
no time lost	351	36.4
< 1 week	204	21.1
1 to < 6 weeks	259	26.8
6 to < 12 weeks	60	6.2
12 to < 26 weeks	46	4.8
26 to < 52 weeks	33	3.4
52 or more weeks	12	1.2
Total	965	100.0

The combined total cost for all 2012 body stressing workers' compensation claims by 23 year old workers was $5.7 million.

Total compensation costs include compensation payments to the worker, payments for goods and services (e.g. medical and rehabilitation costs) and non-compensation payments such as legal costs. For 55 (6%) workers, there was no compensation cost (Table 13). The majority (73%) of claims cost up to $4999. Only five workers had claims costing $100 000 or more. The mean total compensation cost was $5998 and the median cost was $1183. The range was from $0 to $247 559. The combined total cost for all 965 claims was $5 787 898.

Table 13: Total compensation costs for young workers with body stressing claims

Total compensation costs	n	%
No cost	55	5.7
Up to $4999	708	73.4
$5000-$9999	80	8.3
$10 000-$99 999	117	12.1
$100 000 or more	5	0.5
Total	965	100.0

Information on type and cause of claim

Table 14 presents the distribution of the four types of mechanisms of injury or disease for body stressing claims. Over half (55%) of the claims were due to muscular stress while lifting, carrying or putting down objects. About a third (32%) was due to muscular stress while handling objects other than lifting, carrying or putting down. Repetitive movements with low muscle loading accounted for only 3% of body stressing claims among these young workers.

Table 14: Mechanism of injury or disease for body stressing claims among young workers

Mechanism of injury or disease	n	%
Muscular stress while lifting, carrying or putting down objects	529	54.8
Muscular stress while handling objects other than lifting, carrying or putting down	309	32.0
Muscular stress with no objects being handled	99	10.3
Repetitive movement, low muscle loading	28	2.9
Total	965	100.0

Although the sample was limited to 23 year old workers with body stressing claims, the nature of injury and disease for the claim varied (Table 15). The majority of claims were due to sprains and strains of joints and adjacent muscles (78%) followed by dorsopathies (19%). Nineteen workers (2%) had disorders of muscles, tendons and connective tissues.

Table 15: Nature of injury or disease for body stressing claims among young workers

Nature of injury or disease	n	%
Dislocation	1	0.1
Sprains and strains of joints and adjacent muscles	748	77.5
Contusion with intact surface and crushing injury excluding those with fracture	1	0.1
Injuries to nerves and spinal cord without evidence of spinal bone injury	2	0.2
Other and unspecified injuries	4	0.4
Disorders of nerve roots, plexuses, and single nerves	3	0.3
Dorsopathies - disorders of the spinal, vertebrae and intervertebral disc	184	19.1
Disorders of muscle, tendons and other soft tissues	19	2.0
Other diseases of the respiratory system	3	0.3
Total	965	100.0

Comparison between the workers' compensation sample and the Raine sample

There were sex , occupational and industry differences between the workers' compensation sample and the Raine sample with work-related pain.

There were differences in sex distribution between workers with work-related pain from the Raine sample and the workers' compensation sample. More females reported work-related neck/shoulder/low back pain compared to males in the Raine sample. Males comprised two thirds of young workers with body stressing workers' compensation claims.

There were also some differences for occupation and industry distribution. The most common occupations for those with work-related pain in the Raine sample were Sales workers, Clerical & administrative workers and Technicians & trades workers. Among those with workers' compensation claims, Labourers and Technicians & trades workers were the most common. Manufacturing was the third most common industry for workers with compensated claims even though it was not among the top five industries of employment for Raine participants with work-related pain. The Accommodation & food services industry was the second most common industry of employment among Raine participants with work-related pain while this industry was only the fifth most common industry for body stressing workers' compensation claims.

3.6 National estimates for the cost of lost productivity based on Raine data

Earlier on page 13, we provided an estimate of the cost due to loss in productivity per worker per year in Raine working participants which was $18 836. This section provides national estimates of the total cost of lost productivity based on these Raine estimates and the number of 23 year old workers from Census 2011.[22] Given that there were 200 167 employed 23 year-olds according to the 2011 Census, the total cost of lost productivity for all 23 year old workers in Australia was estimated to be about $3.8 billion a year (Table 16).

The total cost of lost work productivity for all 23-year-old workers in Australia was about $3.8 billion per year.

Table 16: National estimate for the cost of lost productivity per year for 23 year old workers

Cost of lost productivity per year among 23 year old workers	
Mean annual cost per worker for lost productivity (Raine estimate)	$18 836
Number of employed 23 year olds in Australia (2011 Census)	200 617
Total cost for all employed 23 year olds in Australia	$3 778 821 812

The national cost of back pain from absenteeism due to any other reason for 23 year old workers was approximately $70 million per year.

3.7National cost of diagnosed back/neck pain related productivity loss based on Raine data

Based on Raine prevalence rates of diagnosed musculoskeletal pain (as presented in Table 4), the national estimates of the number of young workers with a particular health condition are provided in Table 17. Over 34 000 employed 23 year olds in Australia were estimated to have diagnosed back pain. More than 39 000 employed 23 year olds were estimated to have back/neck pain.

Over 34 000 23 year olds in Australia were estimated to have diagnosed back pain.

Table 17: National estimates of the number of young workers with musculoskeletal pain

Condition	Raine prevalence rate %	Number of employed 23 year olds in Australia	Number of 23 year old workers with health condition in Australia
Diagnosed current back pain	17.3	200 617	34 707
Diagnosed current neck pain	9.0	200 617	18 056
Diagnosed current back or neck pain	19.5	200 617	39 120
Self-reported work-related neck/ shoulder or low back pain	24.3	200 617	48 750

22 A comparison of the 2011 Census profile of 23 year olds in Australia and the Raine sample is presented in Appendix 2 (Table 33). From this simple comparison, more Raine participants were employed and more were studying compared to the Census profile of 23 year olds in Australia.

Table 18 provides national estimates of the cost of productivity loss due to the extra hours lost for absenteeism from any other reason and absenteeism from health reasons for the two diagnosed musculoskeletal conditions. The national cost of back pain from absenteeism due to any other reason for 23 year old workers was estimated as $69.9 million per year. The national cost of back pain from absenteeism due to health reasons for 23 year old workers was estimated as $38.1 million per year.

The national cost of back pain from absenteeism due to health reasons for 23 years old workers was estimated as $38.1 million per year.

The national cost for back or neck pain (workers who either had back pain alone, neck pain alone or had both conditions was $93.3 million per year. The national cost of back or neck pain from absenteeism due to health reasons was estimated as $45.7 million per year.

Table 18: Estimated additional cost of productivity loss due to extra hours lost for the two types of absenteeism for diagnosed musculoskeletal pain

	Current diagnosed back pain	Current diagnosed back or neck pain
Absenteeism due to any other reason		
Mean extra cost per year per worker due to health condition based on Raine data ($)	2016.7	2386.3
Estimate of the number of 23 years old with health condition in Australia based on Raine prevalence rate	34 707	39 120
Total extra cost to employers per year due to extra hours lost in sickness absence from health condition ($)	69 991 696	93 353 590
Absenteeism due to health reasons		
Mean extra cost per year per worker due to health condition based on Raine data ($)	1098.0	1167.5
Estimate of the number of 23 years old with health condition in Australia based on Raine prevalence rate	34 707	39 120
Total extra cost to employers per year due to extra hours lost in sickness absence from health condition ($)	38 108 002	45 674 533

Based on workers' compensation data presented in a previous section, the proportion of accepted musculoskeletal claims for 23 year old employees in Australia was 0.51% or 5.1 claims per 1000 employees (Table 19). Since workers' compensation claims exclude self-employed workers, this proportion was calculated based on the number of 23-year-old employees from Census 2011 (not self-employed). The Census 2011 data was used as a denominator for 23 years olds because the denominators used for the national workers' compensation data are only available in age groups (e.g. 20–24 years). This meant that about half a percent of 23 year-old employees had an accepted workers' compensation claim for musculoskeletal disorders in 2012.

This proportion of accepted claims was similar to the proportion of workers in the Raine Study reporting that they claimed workers' compensation for work-related neck/shoulder or low back pain (0.9%, presented earlier in Table 9). It is not known how many of the claims lodged by workers in the Raine Study were accepted.

Table 19: Rate of accepted musculoskeletal workers' compensation claims for 23 year olds

NDS data	
Number of accepted musculoskeletal claims	965
Number of employed 23 year olds from 2011 Census	200 617
Number of 23 year old employees from 2011 Census (presumably covered by workers' compensation)	189 717
% accepted claim for 23 year-old employees in Australia (denominator is all 23-year-old employees)	0.51%

Note: Workers' compensation data are financial year based and contain claims that are lodged from 1 July 2011 to 30 June 2012.

4. Discussion

The results of this investigation showed that young workers are not immune to significant levels of health-related work productivity loss. Back and neck pain and mental health disorders (anxiety and depression) were significant contributors to health related work productivity loss, particularly when they are present at the same time.

This study confirms international studies demonstrating that health has a significant effect on work productivity (Goetzel et al., 2004; Loeppke et al., 2009; Stewart et al., 2003). However, it is difficult to make a detailed comparison across studies due to differences in measures of productivity loss and inclusion of covariates. Australian data on the impact of health on productivity are limited. KPMG's modelling of the cost of presenteeism in Australia was based on presenteeism data from the US on 12 chronic disorders (Medibank Private & KPMG Econtech, 2011). It estimated that 6.5 days[23] annually per worker were lost due to presenteeism for these disorders based on the estimated labour productivity loss due to each medical condition multiplied by 240 working days a year. The largest Australian study, the WORC project, showed that back or neck pain and mental health disorders had a significant impact on absenteeism and presenteeism (Holden et al., 2011b). However, no estimates for time lost and cost per year were available from the WORC study for comparison with the current study. None of these studies provided estimates stratified by age. This Raine Study provides the first estimates of time loss and cost associated with productivity loss among young workers.

In this study, the presence of particular health conditions was associated with increased rates of absenteeism due to health reasons but not increased rates of presenteeism. Other studies found that health conditions had a larger effect on presenteeism than absenteeism (Collins et al., 2005; Holden et al., 2011b; Stewart et al., 2003). This may be a characteristic specific to young workers. As mentioned above, differences in methodology between studies mean it is difficult to make direct comparisons between studies.

Our findings suggest that workers' compensation data may not be useful to estimate the prevalence of young workers who have reduced work productivity secondary to their health. The workers' compensation dataset is not designed to capture the prevalence of health related productivity loss and only contains absenteeism associated with accepted workers' compensation claims. There was also higher representation of males and trades workers in workers' compensation data compared to Raine self-report data on work-related pain. This suggests that using workers' compensation data as a measure of health related productivity loss may underrepresent the magnitude of the problem and may also present a different sex/occupation/ industry pattern compared to the working population with musculoskeletal pain.

The estimate for the total cost of work productivity loss in 23 year olds was substantial at $3.8 billion per annum, with a significant impact from spinal pain and comorbidity. Individual cost is likely to be amplified over a working life. There is some evidence that workplace health promotion programs and interventions targeting work factors can reduce productivity loss (Baicker

23 This study did not provide a definition of a work day (i.e. how many hours in a work day).

et al., 2010; Cancelliere et al., 2011; Kuoppala et al., 2008). While a full cost comparison is required, investment in addressing health related work productivity loss is highly likely to result in large dollar savings over a young worker's working-life. Estimates suggest for every dollar spent nearly three are saved on absenteeism alone (Baicker et al., 2010).

National estimates were based on Raine data. At 17 year follow-up the Raine sample was shown to have good representativeness of the general population (O'Sullivan et al., 2012). A comparison of the Raine sample at 23 years of age with Census 2011 shows that a higher proportion of Raine participants were employed or studying full time compared to 23 year olds in the Census data. This suggests that Raine participants were more likely to be participating in society and may be better off in terms of their socioeconomic status. This is expected to have little bias in estimating the effects of musculoskeletal pain on productivity loss as studies suggest that the impact of pain may be more severe or disabling for people of a lower socioeconomic background (Brekke et al., 2002; Webb et al., 2003).

We used self-reported diagnosed conditions to examine the impact of health conditions on productivity. Although health conditions are self-reported, these questions are likely to capture people with severe symptoms compared to people with mild symptoms as people with severe symptoms are more likely to see a health professional (Kessler et al., 2003). Studies have also shown that self-reported data on health conditions that required consultation with a health professional have good validity compared to medical records (Heliövaara et al., 1993; Metzger et al., 2002; Robinson et al., 1997). Work productivity loss is also self-reported rather than an objective assessment; but, HPQ absenteeism and presenteeism measures were shown to have good validity and were significantly correlated with employer administrative records and supervisor ratings of job performance (further details in Appendix 1, pages 37-38) (Kessler et al., 2004; Kessler et al., 2003). Moreover, self-report assessment is the only feasible method of obtaining work productivity loss data from a community sample, particularly for presenteeism.

Conclusions

The findings are that absenteeism and presenteeism are common experiences for young workers. This issue needs to be a major focus for policy and intervention to enhance the quality of working life for young Australians and ensure ongoing productivity for the Australian workforce.

This study found that musculoskeletal pain (specifically back and neck pain) is a common experience for young workers and thus needs to be a priority prevention and management target.

The study showed that musculoskeletal pain is linked with a substantial increase in absenteeism rates and costs. Understanding the link between musculoskeletal pain and work productivity is important and provides the foundation for policy and intervention actions to reduce the individual, organisational and national burden.

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Appendix 1: Full Method Details

The methods section is presented as follows:

1. the Raine sample and associated measures
2. workers' compensation sample and associated measures, and
3. method details for each objective.

Raine Study sample

The Western Australian Pregnancy Cohort (Raine) Study (www.rainestudy.org.au) is an ongoing community-based, longitudinal study following children who turn 23 years of age between 2012–14. The Raine Study began as a pregnancy cohort of women enrolled around the 18th week of gestation from the public antenatal clinic at the principal obstetric hospital in Perth, Western Australia, and nearby private practices. Mothers of participants were enrolled from August 1989 to April 1992. Comparative analysis at 17 years showed that the cohort remained representative of the Western Australian population.

Data from the 23 year follow-up was utilised for this study.

Raine Study sample measures

Work productivity

Work productivity loss at 23 years of age was measured using the World Health Organisation's recommended Health and Work Performance Questionnaire (HPQ). The HPQ provides separate estimates of both absenteeism and presenteeism over the previous 4 weeks. Three measures of productivity loss were obtained from the HPQ scale: absenteeism due to any other reason; absenteeism due to health reasons (sickness absence); and presenteeism.

A number of scales have been developed in recent years to capture absenteeism and presenteeism. Reviews of these scales have highlighted that many scales have limited evidence of reliability and validity (Brown et al., 2011; Lack, 2011; Roy et al., 2011) and suffer conceptual weaknesses related to theoretical underpinnings based in either medical research or organisational research paradigms (Johns, 2011). The HPQ developed by the World Health Organisation addresses the main methodological and conceptual issues and is now widely used and recommended (Kessler et al., 2003). The scale has been used in over 28 countries and has an international master database of benchmark data. HPQ begins with a number of priming questions to help responders review their work then collects absenteeism data by reports of days and hours absent from work for any other reason and presenteeism data by ratings of job performance. Absenteeism is presented as hours lost per year for each worker from which an annualised estimate can be made. Presenteeism is

also presented in hours lost per year for each worker. The common metric allows not only a consolidated total work productivity loss measure, but also facilitates cost modelling (Johns, 2011). Cost estimates are often based on salary conversion methods using a human capital approach which expresses productivity loss as the product of lost work time multiplied by salary (Mattke et al., 2007).

Validation studies have shown HPQ self-report of absenteeism to be surprisingly accurate. Kessler (Kessler et al., 2004) reported good concordance was found between HPQ 28 day absenteeism recall and payroll records (r ~0.7). They also identified a small but consistent bias for self-report to underestimate absence and they now account for this by using a correction factor in calculations. Thus self-report of absenteeism is preferable to attempting to collate organisational records in samples covering a large number of organisations with varying quality of absenteeism data.

Presenteeism has been assessed using work audits, supervisor ratings, peer ratings and self-report. As with absenteeism, self-report is the preferred method to enable consistent estimates across multiple organisations. Validation studies have shown HPQ self-reports of presenteeism to correlate well with independent assessments across a broad range of industries and occupations (Kessler et al., 2004). The HPQ has also demonstrated good one week test-retest reliability (r=0.89) (Kessler et al., 2004). There is some concern about the change of work productivity over time (Johns, 2011) suggesting a single recall may not be a sufficiently robust estimate but this is yet to be examined.

Absenteeism was calculated as hours lost per year per worker. Presenteeism was calculated in terms of hours lost per year per worker by combining hours worked with job performance rating. The common metric allowed a consolidated total work productivity loss measure (absenteeism + presenteeism). Cost modelling was based on salary conversion methods using a human capital approach which expresses productivity loss as the product of lost work time and salary.

Health conditions

Information on both diagnosed and self-reported health conditions was collected in the Raine Study. Diagnosed health conditions were outcome variables for the majority of analyses presented in this report (Box 1). The following conditions were used in this report: back pain, neck pain, anxiety problems and depression. Response categories were combined to produce a binary variable with those who reported that they had the condition now or both now and in the past coded as having the condition (current diagnosed condition).

For each model of work productivity loss, four separate health condition combinations were examined. These were back pain, neck pain, and neck OR back pain, and a combined variable representing spinal pain (neck or back pain; back pain alone, or neck pain alone or back pain and neck pain together) and psychological comorbidity. For this, a four category variable was created: 1 neither spinal pain nor psychological conditions; 2 spinal pain but no psychological conditions; 3 psychological condition but no spinal pain; 4 comorbid spinal pain and psychological condition.

Box 1: Questionnaire items for diagnosed health conditions

Box 1: Questionnaire items for diagnosed health conditions

1. *Do you have now, or have you had in the past, any of the following health professional diagnosed medical conditions or health problems?*

(please mark one response for each item)	No	Yes, in the past	Yes, now	Yes, now and in the past
Back pain	☐	☐	☐	☐
Neck pain	☐	☐	☐	☐
Depression	☐	☐	☐	☐
Anxiety problems	☐	☐	☐	☐

Workers' compensation sample

The National Data Set for Compensation-based Statistics (NDS) contains workers' compensation claims made under the state, territory and Australian Government's workers' compensation Acts. The NDS is compiled annually and the data presented in this report are for accepted claims lodged between 1 July 2011 and 30 June 2012.

Workers' compensation statistics do not cover all occurrences of occupational injury and disease for the following reasons:

- Temporary disability occupational injuries and diseases that result in absences from work of less than one working week are not always claimed as workers' compensation.
- Occupational injuries and diseases occurring on a journey to or from work (commuting claims) are not covered by all state and territory workers' compensation schemes.
- While the majority of employees are covered for workers' compensation under general Commonwealth, state and territory workers' compensation legislation, some specific groups of workers are covered under separate legislation. Every effort has been made to compile data from all groups of employees but it is known that currently, claims lodged by police in Western Australia and military personnel within the Defence Forces are excluded.
- Most occupational injuries to the self-employed are excluded because such workers generally are not covered for workers' compensation.
- Not all cases of occupational disease are reported in workers' compensation statistics. This is because many diseases result from long-term exposure to agents or have a long latency period, making the link between the occupational disease and work more difficult to identify.

The workers' compensation sample for this report is limited to 23 year old workers with accepted body stressing claims, limited to bodily location of injury of back or neck. The age of the worker is the age at the time of claim. Commuting and journey claims are excluded as these data are inconsistent across jurisdictions.

Workers' compensation sample measures

The following measures were used from the NDS.

Industry of employer relates to the main activity of the establishment at which the worker was employed at the time of reporting the occupational injury or disease. Industry codes presented in this report are Australian and New Zealand Standard Industry Classification (ANZISC) 2006 industry codes. It is noted that workers in labour hire arrangements are coded as labour hire services which is under the ANZSIC 2006 Division, Administrative and Support Services.

Occupation is the worker's occupation at the time of injury or reporting of the occupational disease as coded to the Australian and New Zealand Standard Classification of Occupations (ANZSCO), First edition.

Time lost is the number of hours and minutes lost for which compensation was paid by any party (e.g. employer, insurer, workers' compensation authority). Time lost is not necessarily continuous and may occur over a number of separate periods. Where a worker returns to work on a part-time basis, they may continue to receive pro-rata payments and the total number of hours for which compensation has been paid is included in calculating time lost. Time lost figures exclude estimates of future absences.

Hours usually worked is the number of hours the worker usually works in a week, whether full-time or part-time as defined by the jurisdiction for compensation purposes.

Working weeks lost is the time lost for which compensation was paid divided by the worker' typical working hours per week. Therefore, it takes into account part-time work status.

Total compensation costs include compensation payments to a worker or the worker's surviving dependents, outlays for goods and services such as medical treatment, funeral expenses and rehabilitation services and non-compensation payments such as legal costs, transport and interpreter services.

Nature of injury or disease is the most serious injury or disease sustained or suffered by the worker. The classification for nature of injury or disease was developed as an aggregated version of the International Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification.

Bodily location of injury or disease is the part of the body affected by the most serious injury or disease.

The mechanism of injury or disease is the action, exposure or event that was the direct cause of the most serious injury or disease. There are nine divisions which include body stressing. Each of these divisions are divided into a number of groups. Body stressing is the mechanism of injury or disease for injuries or disorders that result from stress placed on muscles, tendons, ligaments and bones. Body stressing includes:

- muscular stress while lifting, carrying or putting down objects (includes single or multiple events; activities where lifting, carrying or putting down objects is clearly identified; lifting or carrying resulting in stress fractures; repetitive movement; high muscle loading)
- muscular stress while handling objects other than lifting, carrying or

putting down (includes single or multiple events; activities where lifting, carrying or putting down is not clearly identified; pushing or pulling objects; handling objects where muscle power is required; stress fractures from handling objects; continually shovelling; climbing ladders causing upper and lower limb injuries)

• muscular stress with no objects being handled (includes bending down, reaching, turning and twisting movements where no objects are being handled; stress fractures without objects being handled; working in cramped or unchanging positions; prolonged standing causing varicose veins; continually twisting neck with no object being handled), and

• repetitive movement, low muscle loading (includes repetitive movements with low muscle loading; occupational overuse or repetitive movement occurrences; voice strain).

Describe young workers in the Raine sample

Descriptive statistics of the Raine sample were used to indicate the following variables:

- work participation in hours per week
- income as net income per week
- occupation, and
- industry employed in.

Data were assessed for sex differences using Pearson's chi-square test.

Describe the prevalence of back/neck pain and anxiety/depression comorbidity in Raine sample

The prevalence of these common health conditions has been described based on the prevalence of health professional diagnosed presence of these conditions. From the prevalence data, comorbidity of musculoskeletal and mental health conditions has been determined. Please note that no information was collected on the cause of these conditions. Therefore we cannot determine whether these conditions are occupational or non-occupational.

Determine the annualised rate and cost of absenteeism and presenteeism in Raine sample

Estimation of work productivity loss

Four estimates of annualised work productivity loss were calculated: absenteeism due to any other reason, absenteeism due to health reasons, presenteeism, and a combined measure of comprising of absenteeism due to health reasons, absenteeism due to any other reason and presenteeism. Productivity questionnaire items are provided in Box 2. Additional questions captured work hours for each individual (Box 2).

Absenteeism estimates were calculated by combining full days and part days self-reported absences over four weeks prior to the survey. Part days were treated as 0.5 days. Absenteeism estimates collected as days lost in the past 4 weeks were expressed as hours lost per year by:

- Step 1) calculating average hours per day that they were at work, which was derived from dividing the estimated hours worked over the past 7 days by the number of days at work over the past 7 days
- Step 2) multiplying the days lost over the last 4 weeks by the average hours per day they were expected to work on the absent days to get hours lost over 4 weeks, and
- Step 3) multiplying hours lost over last 4 weeks by 12 to obtain an estimate for 48 working weeks a year.

Presenteeism was calculated as the reverse score of participants' rating of their work performance over the past four weeks where 1 was the worst performance and 10 was the top performance. Presenteeism in annualised hours lost was calculated by multiplying respondents' presenteeism scores with 48 times the average work hours per week.

All annual estimates were based on 48 working weeks per year to account for 4 weeks of annual leave a year. As such these estimates do not include vacation time.

Box 2: Work productivity and work hours questionnaire items

Work productivity

Now please think of your work experiences over the past 4 weeks (28 days). In the spaces provided below, write the number of days spent in each of the following work situations.

2. *In the past 4 weeks (28 days), how many days did you:*
   a. *miss an entire day at work because of problems with your physical or mental health? (please include only days missed for your own health, not someone else's health)*
   b. *miss an entire work day for any other reason (including vacation)?*
   c. *miss part of a work day because of problems with your physical or mental health? (please include only days missed for your own health, not someone else's health)*
   d. *miss part of a work day for any other reason (including vacation)?*
3. *On a scale from 0 to 10 where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate your overall job performance for the days you worked during the past 4 weeks (28 days)?*

Work hours

4. *About how many hours altogether did you work in the last 7 days?*
5. *How many hours does your employer expect you to work in a typical 7-day week?*
6. *During the last 7 days, how many days were you at work?*

Estimation of work productivity costs

Participants reported their after tax weekly income via a 5 category response question:

4. < $116 per week
5. $116 to $604 per week
6. $605 to $1076 per week
7. $1077 to $2180 per week
8. > $2180 per week.

Participant's pre-tax weekly income estimate was based on the midpoint of their reported after tax income (except for two end bands where $60 was used for the lowest income band and $2500 was used for the highest income band). Income tax on their estimated income was calculated based on 2013 taxation brackets.

Weekly total employment cost to the employer was estimated by adding

employer on-costs of 20% to pre-tax weekly income estimate as a conservative estimate of additional employment costs covering mandatory employer superannuation contributions. This was then converted to hourly total employment cost by dividing with expected work hours per week.

Annualised cost estimates for the four work productivity loss estimates were calculated by multiplying the estimated annual hours lost by estimated hourly total employment cost.

Differences in mean hours lost and mean cost to the employer by sex, occupation, industry and the presence or absence of particular health conditions were assessed using the T-test and analysis of variance.

Estimate the impact of back/neck pain on the rate and cost of absenteeism and presenteeism in Raine sample

Attribution of work productivity loss to health conditions

Indirect attribution was used to quantify the association between health conditions and three different measures of work productivity loss. This approach is recommended over direct attribution of absenteeism or presenteeism by the worker due to potential bias in worker estimates of the impact of health conditions (Kessler, 2004).

Separate regression models for each work productivity loss outcome variable were estimated for absenteeism due to any other reason, absenteeism due to health reasons and presenteeism. For each outcome, the four health condition variables were used as predictor variables in separate models (i.e. total of 12 models). All three of these outcome variables were measured as annualised mean hours lost per worker. Negative binomial regression was used for all regression analyses. Incidence rate ratios for productivity loss with corresponding 95% confidence intervals for each health condition are reported both unadjusted and adjusted for covariates sex and occupation.

For those models in which health condition showed a statistically significant association with productivity loss, an estimate of the magnitude of the difference in hours lost that could be attributed to the health condition was estimated by calculating the difference in the predicted means for annual hours lost between those with and without the health condition from the adjusted model.

The additional cost of productivity loss from a particular health condition was estimated using the mean hourly cost to the employer across the Raine working sample and the additional hours lost in people with a particular health condition compared to those without a health condition (based on EM means). An equation to calculate the additional cost of back pain is provided below for illustrative purposes.

Additional cost of productivity loss from back pain = mean hourly cost to the employer across the Raine working sample × (EM means in hours for those with back pain - EM means in hours for those without back pain)

Compare workers with self-reported pain in Raine sample with workers with body-stressing workers' compensation claims

Raine comparison sample (self-reported spinal pain symptoms)

For comparison with workers' compensation data, we used self-reported musculoskeletal pain Raine data, as work-relatedness questions were asked in relation to self-reported pain in the Raine Study. Participants were asked if they had ever experienced low back pain or neck/shoulder pain (self-reported musculoskeletal pain), with reference to a body diagram with the area of interest shaded (see Box 3, body diagrams not shown in this report). These self-reported pain variables were combined into a single variable representing the presence of neck/shoulder OR low back pain. Follow-up questions to self-reported pain items in the questionnaire provided information on work-relatedness of self-reported pain. Specifically, participants were asked if their pain was caused by or made worse by work, if they had reported their pain to their employer and if they had claimed workers' compensation for their pain.

Please note that these self-reported pain questions are derived from a different set of questions to the health professional diagnosed conditions that were presented earlier in the report.

Box 3: Raine self-reported musculoskeletal pain and work relatedness items

Response categories: Yes or No

7. *Have you ever had low back pain (anywhere in the shaded area in this picture)?*
8. *Have you ever had neck/shoulder pain (anywhere in the shaded area in this picture)?*
9. *Do you have current body pain?*

If Yes to Q9 and Yes to either Q7 or Q8:

10. *Is your pain work-related in that it was caused by work?*
11. *Is your pain work-related in that your pain developed outside of work but is made worse by work?*

If Yes to either Q10 or Q11:

12. *Have you reported your pain to your employer?*
13. *Have you claimed workers' compensation for your pain?*

Workers' compensation sample analysis

The workers' compensation figures presented in this report are descriptive and are limited to proportions, mean and median figures.

The exception is the calculation of the proportion of employees with accepted claims. This was derived by using the number of 23 year old employees from Census 2011 as a denominator.

Please note that this proportion is different from incidence rates presented in workers' compensation reports published by Safe Work Australia. Calculations of incidence rates in these reports are based on ABS supplied estimates from the Labour Force Survey and are limited to age groups (e.g. 20-24 years). Therefore, these ABS supplied estimates could not be used as denominators for 23 year olds, the focus of this report.

National estimates for the cost of lost productivity based on Raine data

Raine estimates of the costs of lost productivity were extrapolated as national estimates using Census 2011 data. The total cost of lost productivity for all 23 year old workers in Australia was obtained by multiplying the number of 23 year-old workers in Australia from Census 2011 with the cost per worker due to lost productivity from Raine sample.

The cost of diagnosed back/neck pain related productivity loss based on Raine data

The national estimate of the number of 23 year-old workers with a particular diagnosed health condition was obtained by multiplying the number of 23 year-old workers in Australia from Census 2011 with Raine prevalence rates for diagnosed health conditions.

The total extra cost due to specific diagnosed health conditions for all 23 year old workers in Australia was obtained by multiplying the number of 23 year-old workers with particular health conditions with the extra cost per worker due to absenteeism due to health reasons from the Raine sample for people with particular diagnosed health conditions.

Appendix 2: Additional Results

Table 20. Mean annualised hours lost per young worker (and 95% confidence intervals) among Raine employed workers by key characteristics

	Absenteeism due to any other reason	Absenteeism due to health reasons	Presenteeism
Sex			
Female	171.7 (146.9–196.5)	60.5 (47.8–73.2)	287.6 (265.5–309.7)
Male	178.3 (145.0–211.6)	44.5 (32.2–56.8)	319.9 (293.6–346.2)
Occupation			
Managers	154.9 (31.7–278.2)	20.8 (4.6–37.0)	336.2 (222.4–450.0)
Professionals	148.1 (101.9¬–194.3)	42.4 (26.0–58.7)	297.2 (252.7–341.6)
Technicians & trades workers	191.1 (135.3–246.9)	58.8 (35.1–82.5)	408.8 (360.5–457.2)
Community & personal service workers	138.4 (100.8–175.9)	44.0 (24.8–63.3)	243.4 (210.0–276.7)
Clerical & administrative workers	222.9 (165.8–280.0)	77.3 (48.8–105.9)	293.7 (255.7–331.8)
Sales workers	147.8 (113.4–182.2)	46.0 (29.1–62.8)	259.3 (226.4–292.2)
Machinery operators & drivers	378.5 (148.0–608.9)	119.3 (26.5–212.0)	492.4 (328.9–656.0)
Labourers	156.0 (94.2–217.8)	39.5 (15.2–63.8)	273.8 (222.2–325.4)
Total	175.0 (154.7–195.3)	53.6 (44.7–62.6)	302.3 (285.2–319.3)
Industry			
Mining	213.2 (84.6–341.8)	77.2 (22.4–131.9)	494.8 (381.0–608.6)
Construction	336.3 (215.1–457.4)	68.1 (31.7–104.5)	400.6 (344.0–457.1)
Retail trade	146.4 (115.4–177.4)	42.5 (28.1–57.0)	276.7 (243.9–309.4)
Accommodation & food services	142.1 (91.1–193.0)	42.3 (22.0–62.6)	248.7 (207.1–290.2)
Professional, scientific & technical services	209.5 (98.6–320.3)	44.2 (5.6–82.9)	372.2 (280.7–463.5)
Public administration & safety	235.0 (106.3–363.7)	69.9 (26.9–113.0)	313.9 (237.8–390.1)
Education & training	109.1 (60.2–158.0)	52.2 (17.0–87.5)	255.6 (191.6–319.5)
Healthcare & social assistance	186.5 (133.3–239.8)	47.7 (25.2–70.2)	237.1 (198.6–275.6)
Arts & recreation services	74.3 (18.5–130.1)	25.8 (3.9–47.7)	213.1 (151.0–275.3)
Other services	227.2 (115.2–339.1)	63.5 (32.0–95.0)	342.8 (271.1–414.5)
Total	177.7 (155.0–200.3)	50.3 (41.6–59.0)	298.7 (280.3–317.1)
Diagnosed health conditions			
Current back pain (Yes)	210.8 (164.1–257.6)	81.1 (56.0–106.2)	302.2 (261.3–343.1)
Current back pain (No)	164.0 (142.3–185.8)	46.0 (36.8–55.2)	301.9 (283.1–320.6)
Current neck pain (Yes)	213.3 (151.6–275.0)	69.4 (48.6–90.2)	305.1 (250.8–359.4)
Current neck pain (No)	168.5 (147.7–189.3)	50.8 (41.3–60.2)	301.2 (283.3–319.1)
Current back or neck pain (Yes)	219.3 (173.3–265.3)	82.5 (59.2–105.9)	311.0 (271.2–350.8)
Current back or neck pain (No)	160.9 (139.1–182.7)	44.9 (35.6–54.2)	299.7 (280.9–318.6)

Table 21. Mean annualised cost in dollars (and 95% confidence intervals) due to lost productivity per young worker in the Raine Study by key characteristics

	Absenteeism due to any other reason	Absenteeism due to health reasons	Presenteeism
Sex			
Female	5458.0 (4644.6–6271.4)	2042.0 (1581.9–2502.1)	9725.2 (8625.6–10 824.7)
Male	7109.8 (5477.6–8742.1)	1722.6 (1116.1–2329.0)	11 825.9 (10496.8–13 155.0)
Occupation			
Managers	6930.9 (1829.6–12 032.2)	1849.1 (-211.7–3910.0)	15 410.8 (7104.5–23 717.1)
Professionals	6716.9 (4190.5–9243.2)	1733.2 (844.3–2622.1)	11 560.2 (9267.1–13 853.2)
Technicians & trades workers	7160.0 (4704.7–9615.2)	2234.5 (1111.7–3357.2)	15 486.2 (12 905.4–18 067.0)
Community & personal service workers	4229.1 (3011.9–5446.4)	1421.4 (717.1–2125.6)	8613.7 (7075.9–10 151.4)
Clerical & administrative workers	7904.5 (5658.9–10 150.1)	2714.4 (1671.0–3757.7)	9200.2 (7757.6–10 642.8)
Sales workers	3746.5 (2887.0–4606.0)	1082.8 (701.4–1464.2)	6872.5 (5903.7–7841.3)
Machinery operators & drivers	17 564.6 (5402.6–29 726.7)	5773.1 (477.9–11 068.3)	21 624.0 (12 584.9–30 663.2)
Labourers	5106.0 (2882.3–7329.6)	1332.8 (626.0–2039.6)	10 207.5 (6903.9–13 511.2)
Total	6221.8 (5360.1–7083.6)	1909.3 (1536.4–2282.1)	10 685.2 (9829.6–11 540.9)
Industry			
Mining	9797.7 (3459.4–16 136.0)	3807.7 (654.2–6961.3)	23 051.0 (16 861.0–29241.1)
Construction	13 044.7 (7609.8–18 479.7)	3230.9 (1004.9–5456.9)	15 857.6 (12 200.3–19 514.9)
Retail trade	3682.0 (2869.9–4494.1)	962.5 (641.7–1283.3)	7862.8 (6538.2–9187.4)
Accommodation & food services	4531.2 (2682.0–6380.3)	1015.4 (553.5–1477.3)	7149.5 (5735.0–8564.0)
Professional, scientific & technical services	9676.5 (2868.1–16 484.9)	2158.1 (-363.8–4680.1)	14 543.4 (9756.0–19 330.8)
Public administration & safety	11 039.4 (2983.9–19 094.9)	3393.3 (696.7–6090.0)	11 522.4 (7403.4–11 761.2)
Education & training	4119.9 (2484.0–5755.8)	2309.2 (857.3–3761.1)	8737.6 (6659.7–10 815.5)
Healthcare & social assistance	7468.2 (4888.6–10 047.9)	1739.4 (910.6–2568.2)	9582.3 (7403.4–11 761.2)
Arts & recreation services	2150.5 (558.9–3742.0)	825.1 (116.2–1533.9)	6946.7 (4844.6–9048.8)
Other services	6824.1 (3991.1–9657.2)	2505.1 (1046.7–3963.4)	15 727.3 (9865.2–21 589.3)
Total	6330.4 (5359.1–7301.6)	1827.1 (1434.4–2219.8)	10 793.3 (9840.5–11 746.2)
Diagnosed health conditions			
Current back pain (Yes)	6748.7 (4899.6–8597.9)	2767.1 (1778.1–3756.1)	9702.6 (7934.3–11471.0)
Current back pain (No)	5845.8 (4940.2–6751.4)	1595.4 (1219.2–1971.7)	10706.4 (9786.0–11626.7)
Current neck pain (Yes)	5773.9 (4001.3–7546.5)	2132.0 (1354.7–2909.4)	9047.2 (6727.6–11366.7)
Current neck pain (No)	6080.9 (5200.1–6961.7)	1800.9 (1412.8–2189.0)	10655.3 (9786.4–11524.1)
Current back or neck pain (Yes)	6974.1 (5210.2–8737.9)	2780.3 (1869.9–3690.7)	9898.0 (8231.7–11564.4)
Current back or neck pain (No)	5769.4 (4853.4–6685.4)	1565.3 (1182.7–1947.9)	10679.8 (9745.3–11614.3)

Table 22. Statistically significant post hoc comparisons for mean annualised hours lost due absenteeism due to any other reason and presenteeism by occupation

Type of productivity loss	Occupation (I)	Compared with (J)	Mean difference (I-J)	Std. error	Sig.	95% CI lower bound	95% CI upper bound
Absenteeism due to any other reason	Machinery operators & drivers	Professionals	230.4	62.0	.006	35.9	424.8
Absenteeism due to any other reason	Machinery operators & drivers	Community & personal service workers	240.1	60.8	.002	49.5	430.8
Absenteeism due to any other reason	Machinery operators & drivers	Sales workers	230.7	60.7	.004	40.4	421.0
Absenteeism due to any other reason	Machinery operators & drivers	Labourers	222.5	64.6	.017	19.9	425.1
Presenteeism	Technicians & trades workers	Professionals	111.7	31.3	.011	13.6	209.8
Presenteeism	Technicians & trades workers	Community & personal service workers	165.5	29.2	.000	74.1	256.9
Presenteeism	Technicians & trades workers	Clerical & administrative workers	115.1	29.4	.003	23.0	207.2
Presenteeism	Technicians & trades workers	Sales workers	149.5	29.2	.000	58.0	241.1
Presenteeism	Technicians & trades workers	Labourers	135.0	34.6	.003	26.5	243.6
Presenteeism	Machinery operators & drivers	Professionals	195.3	51.0	.004	35.4	355.2
Presenteeism	Machinery operators & drivers	Community & personal service workers	249.1	49.7	.000	93.2	405.0
Presenteeism	Machinery operators & drivers	Clerical & administrative workers	198.7	49.9	.002	42.4	355.0
Presenteeism	Machinery operators & drivers	Sales workers	233.1	49.8	.000	77.2	389.1
Presenteeism	Machinery operators & drivers	Labourers	218.7	53.1	.001	52.1	385.2

Note: CI = confidence interval.

Table 23. Statistically significant post hoc comparisons for mean annualised cost due to absenteeism and presenteeism by occupation

Type of productivity loss	Occupation (I)	Compared with (J)	Mean difference (I-J)	Std. error	Sig.	95% CI lower bound	95% CI upper bound
Absenteeism due to any other reason	Machinery operators & drivers	Managers	10 633.7	3315.1	.039	241.6	21 025.8
Absenteeism due to any other reason	Machinery operators & drivers	Professionals	10 847.8	2606.5	.001	2677.0	19 018.5
Absenteeism due to any other reason	Machinery operators & drivers	Technicians & trades workers	10 404.7	2593.6	.002	2274.4	18 534.9
Absenteeism due to any other reason	Machinery operators & drivers	Community & personal service workers	13 335.5	2555.4	.000	5324.8	21 346.2
Absenteeism due to any other reason	Machinery operators & drivers	Clerical & administrative workers	9660.1	2555.4	.005	1649.4	17 670.8
Absenteeism due to any other reason	Machinery operators & drivers	Sales workers	13 818.1	2551.1	.000	5821.0	21 815.3
Absenteeism due to any other reason	Machinery operators & drivers	Labourers	12 458.6	2715.7	.000	3945.7	20 971.6
Absenteeism due to health reasons	Machinery operators & drivers	Professionals	4039.86	1133.3	.011	487.2	7592.5
Absenteeism due to health reasons	Machinery operators & drivers	Community & personal service workers	4351.72	1108.8	.003	871.7	7831.7
Absenteeism due to health reasons	Machinery operators & drivers	Sales workers	4690.28	1108.8	.001	1214.2	8166.4
Absenteeism due to health reasons	Machinery operators & drivers	Labourers	4440.31	1181.7	.005	735.8	8144.8
Presenteeism	Managers	Sales workers	8538.4	2508.9	.020	674.2	16402.5
Presenteeism	Professionals	Sales workers	4687.7	1489.5	.048	18.8	9356.6
Presenteeism	Professionals	Machinery operators & drivers	-100 63.9	2530.1	.002	-17 994.5	-2133.3
Presenteeism	Technicians & trades workers	Community & personal service workers	6872.6	1452.8	.000	2318.7	11 426.4
Presenteeism	Technicians & trades workers	Clerical & administrative workers	6286.0	1462.2	.001	1702.6	10 869.5
Presenteeism	Technicians & trades workers	Sales workers	8613.8	1450.5	.000	4067.1	13 160.4

Type of productivity loss	Occupation (I)	Compared with (J)	Mean difference (I-J)	Std. error	Sig.	95% CI lower bound	95% CI upper bound
Presenteeism	Machinery operators & drivers	Professionals	10 063.9	2530.1	.002	2133.3	17 994.5
Presenteeism	Machinery operators & drivers	Community & personal service workers	13 010.4	2470.5	.000	5266.4	20 754.3
Presenteeism	Machinery operators & drivers	Clerical & administrative workers	12 423.8	2476.1	.000	4662.5	20 185.2
Presenteeism	Machinery operators & drivers	Sales workers	14 751.6	2469.2	.000	7011.9	22 491.3
Presenteeism	Machinery operators & drivers	Labourers	11 416.5	2639.3	.000	3143.7	19 689.4

Note: CI = confidence interval.

Table 24. Statistically significant post hoc comparisons for mean annualised hours lost due to absenteeism for any other reason and presenteeism by industry

Type of productivity loss	Occupation (I)	Compared with (J)	Mean difference (I-J)	Std. error	Sig.	95% CI lower bound	95% CI upper bound
Absenteeism due to any other reason	Construction	Retail trade	189.8	45.2	.001	41.8	337.9
Absenteeism due to any other reason	Construction	Accommodation & food services	194.2	47.7	.002	37.8	350.5
Absenteeism due to any other reason	Construction	Education & training	227.1	56.3	.003	42.8	411.4
Absenteeism due to any other reason	Construction	Arts & recreation services	262.0	63.7	.002	53.2	470.7
Presenteeism	Mining	Retail trade	218.1	38.1	.000	93.3	343.0
Presenteeism	Mining	Accommodation & food services	246.1	40.0	.000	115.0	377.2
Presenteeism	Mining	Education & training	239.2	47.1	.000	85.1	393.4
Presenteeism	Mining	Healthcare & social assistance	257.7	41.3	.000	122.3	393.1
Presenteeism	Mining	Arts & recreation services	281.7	51.8	.000	112.1	451.3
Presenteeism	Construction	Retail trade	123.9	35.0	.020	9.1	238.7
Presenteeism	Construction	Accommodation & food services	151.9	37.1	.002	30.4	273.4
Presenteeism	Construction	Healthcare & social assistance	163.5	38.5	.001	37.4	289.6
Presenteeism	Construction	Arts & recreation services	187.4	49.6	.008	25.1	349.7

Note: CI = confidence interval.

Table 25. Statistically significant post hoc comparisons for mean annualised cost due to due to absenteeism for any other reason, absenteeism for health reasons and presenteeism by industry

Type of productivity loss	Occupation (I)	Compared with (J)	Mean difference (I-J)	Std. error	Sig.	95% CI lower bound	95% CI upper bound
Absenteeism due to any other reason	Construction	Retail trade	9362.8	1924.5	.000	3058.9	15 666.6
Absenteeism due to any other reason	Construction	Accommodation & food services	8513.6	2031.9	.001	1858.0	15 169.1
Absenteeism due to any other reason	Construction	Education & training	8924.9	2395.4	.010	1078.7	16 771.1
Absenteeism due to any other reason	Construction	Arts & recreation services	10 894.3	2713.2	.003	2006.9	19 781.7
Absenteeism due to health reasons	Mining	Retail trade	2845.3	850.0	.039	61.0	5629.6
Presenteeism	Mining	Retail trade	15 188.2	1927.2	.000	8876.2	21 500.3
Presenteeism	Mining	Accommodation & food services	15 901.5	2022.2	.000	9278.6	22 524.5
Presenteeism	Mining	Public administration & safety	11 528.6	2902.4	.004	2022.6	21 034.7
Presenteeism	Mining	Education and training	14 313.4	2377.9	.000	6525.3	22 101.6
Presenteeism	Mining	Healthcare and social assistance	13 468.7	2095.3	.000	6606.3	20 331.2
Presenteeism	Mining	Arts & recreation services	16 104.3	2615.6	.000	7537.6	24 671.0
Presenteeism	Construction	Retail trade	7994.8	1782.2	.000	2157.7	13 831.9
Presenteeism	Construction	Accommodation & food services	8708.1	1884.5	.000	2536.1	14 880.2
Presenteeism	Construction	Arts & recreation services	8910.9	2510.7	.019	687.8	17 133.9
Presenteeism	Other services	Retail trade	7864.5	1943.1	.003	1500.5	14 228.4
Presenteeism	Other services	Arts & recreation services	8780.5	2627.3	.040	175.5	17 385.6

Note: CI = confidence interval.

Table 26. Unadjusted and adjusted risk of absenteeism for any other reason (measured as hours lost per year) by diagnosed health condition, using negative binomial regression, reporting Incidence Rate Ratios (IRR)

Diagnosed health condition	**Unadjusted** Model n	**Unadjusted** IRR (95% CIs)	**Adjusted** Model n	**Adjusted‡** IRR (95% CIs)
Current back pain	771	1.29** (1.07–1.55)	767	1.33** (1.10–1.60)
Current neck pain	772	1.27 (0.99–1.62)	768	1.21 (0.95–1.56)
Current back or neck pain	771	1.36** (1.14–1.63)	767	1.39** (1.16–1.67)
Current depression	772	1.00 (0.78–1.29)	768	1.03 (0.80–1.33)
Current anxiety	768	0.99 (0.79–1.24)	764	0.96 (0.76–1.21)
Current depression or anxiety	768	0.90 (0.73–1.11)	764	0.91 (0.74–1.12)
Current comorbidity	767		763	
Back/neck pain & depression/ anxiety		1.24 (0.88–1.76)		1.27 (0.90–1.81)
Depression/anxiety BUT no back/neck pain		0.81 (0.63–1.04)		0.82 (0.63–1.05)
Back/neck pain BUT no depression/ anxiety		1.31** (1.07–1.60)		1.33** (1.09–1.64)

Notes: ‡ adjusted for sex and occupation; ** significant at p < .05 level; CI = confidence interval.

Table 27. Estimated marginal (EM) means (and 95% CI) of annualised hours lost due to absenteeism due to any other reason by diagnosed health condition, adjusted for sex and occupation

	Has condition	**Does not have condition**	**Difference**
Current back pain	223.9 (183.6–264.2)	168.8 (152.8–184.7)	55.1** (14.7–95.6)
Current neck pain	212.4 (160.0–264.8)	174.9 (158.9–190.9)	37.5 (-14.7–89.8)
Current back or neck pain	231.5 (191.4–271.6)	166.3 (150.5–182.1)	65.2** (25.2–105.2)
Current depression	183.3 (137.1–229.5)	177.3 (161.1–193.5)	6.0 (-40.6–52.6)
Current anxiety	170.0 (131.6–208.5)	177.1 (160.8–193.5)	-7.1 (-46.3–32.1)
Current depression or anxiety	161.6 (128.4–194.7)	178.4 (161.8–195.0)	-16.9 (-51.1–17.4)
Current Comorbidity	Has condition	No back/neck pain AND depression/anxiety	Difference
Back/neck pain AND depression/anxiety	215.9 (141.3–290.5)	169.4 (152.7–186.1)	46.5 (-54.2–147.1)
Depression/anxiety BUT no back/neck pain	138.2 (104.3–172.1)	169.4 (152.7–186.1)	-31.2 (-79.5–17.0)
Back/neck pain BUT no depression/anxiety	226.0 (182.1–270.0)	169.4 (152.7–186.1)	56.6 (-3.3–116.6)

Notes: ‡ adjusted for sex and occupation; ** significant at p < .05 level; CI = confidence interval.

Table 28. Unadjusted and adjusted risk of absenteeism for health reasons (hours lost per year) by diagnosed health condition, using negative binomial regression, reporting Incidence Rate Ratios (IRR)

Diagnosed health condition	**Unadjusted** Model n	**Unadjusted** IRR (95% CIs)	**Adjusted** Model n	**Adjusted‡** IRR (95% CIs)
Current back pain	764	1.76** (1.46–2.12)	760	1.71** (1.42–2.06)
Current neck pain	765	1.37** (1.07–1.75)	761	1.27 (0.99–1.63)
Current back OR neck pain	764	1.84** (1.54–2.20)	760	1.77** (1.47–2.12)
Current depression	765	2.18** (1.69–2.80)	761	2.40** (1.85–3.10)
Current anxiety	761	2.00** (1.59–2.50)	757	2.03** (1.60–2.57)
Current depression OR anxiety	761	1.82** (1.48–2.23)	757	1.91** (1.55–2.36)
Current comorbidity	760		756	
Back/neck pain AND depression/anxiety		3.09** (2.18–4.37)		3.20** (2.25–4.54)
Depression/anxiety BUT no back/neck pain		1.49** (1.16–1.91)		1.50** (1.16–1.94)
Back/neck pain BUT no depression/anxiety		1.56** (1.28–1.91)		1.41** (1.15–1.74)

Notes: ‡ adjusted for sex and occupation; ** significant at p < .05 level; CI = confidence interval.

Table 29. Estimated marginal (EM) means (and 95% CI) of annualised hours lost due to absenteeism due to health reasons by diagnosed health condition, adjusted for sex and occupation

	Has condition	**Does not have condition**	**Difference**
Current back pain	72.3 (59.3–85.3)	42.3 (38.2–46.4)	30.0**(17.1–42.9)
Current neck pain	59.1 (44.5–73.8)	46.7 (42.3–51.0)	12.5 (-2.1–27.0)
Current back or neck pain	73.4 (60.7–86.2)	41.6 (37.5–45.6)	31.9** (19.3–44.5)
Current depression	103.0 (76.9–129.1)	43.0 (39.0–47.0)	60.0** (34.2–85.9)
Current anxiety	87.4 (67.2–107.6)	43.1 (39.1–47.2)	44.3** (24.3–64.3)
Current depression or anxiety	81.6 (64.7–98.5)	42.7 (38.6–46.7)	38.9** (22.2–55.6)
Current Comorbidity	Has condition	No back/neck pain AND depression/anxiety	Difference
Back/neck pain AND depression/anxiety	127.0 (83.3–170.7)	39.8 (35.8–43.7)	87.3** (28.6–145.9)
Depression/anxiety BUT no back/neck pain	59.5 (44.4–74.5)	39.8 (35.8–43.7)	19.7 (-0.5–39.9)
Back/neck pain BUT no depression/anxiety	56.1 (44.9–67.3)	39.8 (35.8–43.7)	16.4** (1.2–31.6)

Notes: ‡ adjusted for sex and occupation; ** significant at p < .05 level; CI = confidence interval.

Table 30. Unadjusted and adjusted risk of presenteeism (hours lost per year) by diagnosed health condition, using negative binomial regression, reporting Incidence Rate Ratios (IRR)

Diagnosed health condition	Unadjusted Model n	Unadjusted IRR (95% CIs)	Adjusted Model n	Adjusted‡ IRR (95% CIs)
Current back pain	794	1.00 (0.84–1.20)	790	1.02 (0.85–1.23)
Current neck pain	795	1.01 (0.79–1.29)	791	1.01 (0.80–1.30)
Current back OR neck pain	794	1.04 (0.87–1.24)	790	1.06 (0.88–1.26)
Current depression	795	0.94 (0.73–1.20)	791	0.96 (0.75–1.24)
Current anxiety	791	0.96 (0.77–1.20)	787	0.99 (0.79–1.24)
Current depression OR anxiety	791	0.96 (0.78–1.17)	787	0.99 (0.80–1.22)
Current comorbidity	790		786	
Back/neck pain AND depression/anxiety		0.96 (0.68–1.37)		1.04 (0.73–1.48)
Depression/anxiety BUT no back/neck pain		0.96 (0.75–1.23)		0.98 (0.77–1.25)
Back/neck pain BUT no depression/ anxiety		1.04 (0.85–1.26)		1.05 (0.86–1.28)

Notes: ‡ adjusted for sex and occupation; ** significant at p < .05 level; CI = confidence interval.

Table 31. Estimated marginal (EM) means (and 95% CI) of annualised hours lost due to presenteeism by diagnosed health condition, adjusted for sex and occupation

	Has condition	Does not have condition	Difference
Current back pain	321.6 (265.1–378.1)	314.7 (285.2–344.3)	6.8 (-52.0–65.7)
Current neck pain	318.8 (240.0–397.6)	315.4 (287.0–343.8)	3.4 (-75.7–82.4)
Current back or neck pain	330.0 (274.2–385.7)	312.7 (283.2–342.2)	17.2 (-40.6–75.0)
Current depression	304.5 (288.6–380.5)	316.6 (287.9–345.4)	-12.1 (-89.6–65.5)
Current anxiety	311.6 (241.4–381.9)	315.6 (286.8–344.4)	-3.9 (-75.6–67.7)
Current depression or anxiety	312.2 (249.0–375.4)	315.6 (286.6–344.6)	-3.4 (-68.1–61.3)
Current Comorbidity	Has condition	No back/neck pain AND depression/anxiety	Difference
Back/neck pain AND depression/anxiety	325.1 (211.1–439.0)	313.3 (282.5–344.0)	11.8 (-143.1–166.6)
Depression/anxiety BUT no back/neck pain	306.4 (233.2–379.5)	313.3 (282.5–344.0)	-6.9 (-108.6–94.8)
Back/neck pain BUT no depression/anxiety	329.1 (267.1–391.2)	313.3 (282.5–344.0)	15.9 (–71.4–103.2)

Notes: ‡ adjusted for sex and occupation; ** significant at p < .05 level; CI = confidence interval.

Table 32. Unadjusted and adjusted risk of absenteeism for health reasons (measured as hours lost per year) by the comorbidity variable using people with back/neck pain AND depression/ anxiety as a reference group, using negative binomial regression, reporting Incidence Rate Ratios (IRR)

Current comorbidity	Unadjusted (n=767) IRR (95% CIs)	Adjusted† (n=763) IRR (95% CIs)
No back/neck pain AND no depression or anxiety	0.81 (0.57–1.14)	0.79 (0.55–1.11)
Back/neck pain BUT no depression/anxiety	1.05 (0.72–1.54)	1.05 (0.71–1.54)
Depression/anxiety BUT no back/neck pain	0.65** (0.40–0.98)	0.64** (0.42–0.97)
Back/neck pain AND depression/anxiety (reference group)		

Notes: ‡ adjusted for sex and occupation; ** significant at p < .05 level; CI = confidence interval

Table 33. Raine 23-year-old cohort (n=1146) and the Australian 23 year olds based on Census 2011 data by employment status, study status and occupation

Characteristic	Raine Female %	Census Female %	Raine Males %	Census Males %
Employment status				
Employed (full time or part time)	84.1	66.9	80.7	70.9
Unemployed	8.1	5.8	10.3	7.1
Not in the labour force	7.8	22.2	9.0	15.1
Undertaking current study				
Studying full time	34.9	21.3	31.4	18.9
Studying part-time	10.0	9.2	7.4	7.6
Occupation				
Managers	3.1	6.2	3.0	5.9
Professionals	14.4	23.4	12.8	14.4
Technicians & trades workers	6.1	6.0	26.8	30.8
Community & personal service workers	22.8	18.8	14.0	8.9
Clerical & administrative workers	25.2	23.2	7.6	7.1
Sales workers	21.9	16.2	14.0	9.7
Machinery operators & drivers	1.2	1.1	6.2	9.0
Labourers	5.3	5.1	15.6	14.3

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