

# *Final Report*

## **Project 1/07: Incidence of Work Related Injury – Migrants, Youth and Mature Age Workers**

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Final report prepared for the Australian Government Department of Education, Employment and Workplace Relations under the Social Policy Research Services Agreement

May 2008

### **Acknowledgements**

*This research was commissioned by the Australian Government (Department of Education, Employment and Workplace Relations (DEEWR)) under the Social Policy Research Services Agreement (2005-09) with the Melbourne Institute of Applied Economic and Social Research. The views expressed in this report are those of the authors alone and do not represent of DEEWR*



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## **Executive summary**

- This report analyses the factors associated with workplace injury among Migrants, Mature Age workers and Youth. Workers belonging to each of these groups are in their own way both different and more vulnerable than the representative member of the Australian working population. The main motivation for this analysis is to further our understanding of health and safety issues in the workplace to help enhance labour force participation and retention of these groups of workers.
- The nature of workplace injuries and their main preventive mechanism (OHS Training) is highly self-limiting, in that we can expect workers in riskier jobs to show more willingness to take up OHS training and to be more careful and capable of handling physical risk in an attempt to protect themselves and limit the probability of a workplace injury. At the same time we can expect employers to be keen to eliminate hotspots of risky activity in their workplace where the risks have been identified as unacceptably high. One of the ways to do this is by making the workplace safer and another is by offering OHS training more widely and more rigorously. Employers, motivated by pure profit-making incentives, will act this way, as a reasonably safe workplace will help them recruit better employees at more reasonable wages. Thus we can expect self-interested behaviour from both sides of the employment relationship to provide incentives to intervene and reduce the risk of workplace injuries. This self-limiting nature of workplace injuries implies that we cannot expect to find in our data many striking systematic and persistent differences in workplace injury rates.
- This report contains the first in depth analysis of a newly released ABS data set, the 2006 Workplace Related Injuries Survey (WRIS). This report identified a number of serious shortcomings in the design of the data set which seriously limit its use for in depth economic and econometric analysis. For example, the OHS training information was only asked of those who reported a workplace injury. Hence, comparisons with the wider working population were not feasible. The report makes

the strong recommendation that more piloting be carried out during the data design phase, jointly involving the research and the policy communities, in order to maximize the scope and usefulness of national data sets. Given that such data sets are a unique national asset in their contribution towards the design of evidence-based policy, every effort must be made to target the evidence collected towards the policy relevant issues and the questions that may be feasibly addressed. This report also identifies that access to the data via the RADL system limits the type of statistical analysis that can be performed. This could be addressed through the use of safe rooms in full compliance with the confidentiality requirements of the Commonwealth.

- The analysis defined Migrants as those who reported a Country of Birth other than Australia, Youth as those aged between 15 and 24 years and Mature Age as those aged 45 years and over, making the further distinction of those aged 45 to 54, 55 to 64 and 65 and over where pertinent. Workplace injuries and illnesses were categorized into: Fracture and crushing injury / internal organ damage; Chronic joint or muscle condition; Cut or open wound and superficial injury; Stress or other mental condition and other injuries; Sprain or strain.
- With the exception of the length of absence from work following a workplace injury, the data does not contain any other information by which we can judge the severity of the workplace injury. Multivariate regressions have shown that the following categories of length of absence are empirically relevant. *Low severity*, which contains all injuries that resulted in an absence of up to four working days (including the cases with no absence at all); *Medium severity*, which contains absences from five to ten days; *High severity* which contains absences of eleven days or more but workers had returned to work by the time of interview; *Very High severity* which contains a small percentage of workers who had not returned to work by the time of their interview. Clearly the last category is closely related to the issue of labour force retention following a workplace injury.

- A number of factors related to workplace injuries and outcomes following a workplace injury were examined. These included the length of absence from work, whether there have been changes in full time and part time status for those who return to work, whether they received any financial assistance for the work absence (and the source of this assistance), the relationship between OHS training and workplace injuries, whether Workers' Compensation was applied for or not (and the reasons why it was not applied for).
- The descriptive analysis of the three groups of interest highlighted a number of similarities and differences between them and the representative member of the Australian working population. On average Migrants are more educated and more likely to be residing in major cities. Youth workers are more likely to be in casual employment with fewer than average work hours and entitlements. Participation in OHS training was higher for Youth compared to either Mature Age workers or Migrants. Workplace injuries are more common amongst those in the lower two socio-economic advantage deciles and less common amongst those in the higher two deciles. The rate of applications for Workers' Compensation by workers who experienced a workplace injury is different between Migrants, Mature Age workers and Youth. However, there is no discernible pattern that arises from the regression results.
- The core of the econometric analysis is based on multivariate analysis using a number of LOGIT and PROBIT estimations. The econometric analysis generated a number of informative results which include the following:
  - *OHS Training*: A weak suggestion that higher prevalence of OHS training is associated with shorter absences from work following a workplace injury. Statistically, this result is very weak. We explained that this weakness in the estimated relationship could well be the case of two-way causalities being present and working in opposite directions: high risk jobs may be more likely to generate more/better OHS training (a positive relationship between workplace injury

prevalence and OHS training prevalence, resulting from higher demand for training by employers and employees where they perceive the job risk to be higher) and more/better OHS training being able to generate lower rates of workplace injury (a negative relationship between workplace injury prevalence and OHS training prevalence, resulting from effective training). The evidence we have suggests that the positive (causal) effect of OHS training on workplace injury rates is stronger than the negative (causal) effect of job riskiness on the take up rate of OHS training. This implies that OHS training makes a useful contribution to prevention of workplace injury in Australia, but a number of data caveats that are examined in the data section of the report do not allow a statistically precise quantification of this effect.

- *Severity of workplace injuries:* Once the socio-demographic and employment characteristics of Migrants, Mature Age workers and the Youth are considered, there are no differences in the severity of workplace injuries between these groups. In the absence of a direct measure in the data set, severity has been approximated by the length of stay off work and is found to be associated only with the employment variables in the estimation.
- *Return to work after a workplace injury:* Around 97 percent of all workers who reported having experienced a workplace injury in the last 12 months were at work at the time of interview. Workplace injuries do not appear to be a major cause of leaving the labour market altogether. However, they appear to be associated with changes in work circumstances. Between one in five and one in six of those who returned to work after a workplace injury returned to another job. The reason for the job change for one third of them was because they were either retrenched or laid off. The reason for the job change for the other two thirds was not related to their workplace injury. Most of the negative effect of the workplace injury seems to have been confined to a reduction in the hours worked for those who returned to work after a workplace injury. Between 35 and 40 percent decreased their work hours. It is noteworthy that between 17 and 21 percent increased their work hours after a workplace injury,

supporting the view that we are also looking at normal job turnover changes, many of which would have happened without the workplace injury.

- *Migrants, origin and length of stay in Australia:* Although raw data appear to suggest that more recently arrived Migrants experienced fewer workplace injuries than their more assimilated (older arrivals) counterparts, this relationship is primarily driven by the occupation and sector choices of newer migrant arrivals. Migrants who have been in Australia for less than five years experience fewer workplace injuries because of their choice of industry and occupation. The distinction between Migrants originating from English speaking and non-English speaking countries appears to be empirically relevant in that Migrants from non-English speaking countries are less likely to experience a workplace injury. The margin of only one percent, however, is too small to be of any practical significance.
- *Applications for Workers' Compensation following a workplace injury:* Not everyone who experienced a workplace injury applied for Workers' Compensation. In most of these cases the injury was considered too minor to make such an application. However, a sizeable minority of workers who experienced a workplace injury did not apply for compensation for reasons that could give rise to concerns. These include 'not covered or not aware of workers' compensation', 'did not think eligible', 'inconvenient/required too much effort' and last but not least, due to fears of 'negative impact on current or future employment'. This last category, particularly prevalent amongst the Youth, may be the result of higher job insecurity in this part of the labour force.

## **1. Introduction**

The primary aim of this report is to investigate the financial and employment outcomes of work related injury (WRI) and illness in the Australian labour market for a number of specific groups of workers. These groups are Migrants, Mature Age persons and young persons. The report concentrates on the most recent evidence available using data that has only recently been released by the Australian Bureau of Statistics (ABS) in the form of the Work Related Injuries, Australia, 2005-2006 survey which forms a one-off part of the ABS Multi Purpose Household Survey 2005-06. The report describes the demographics of those who suffer WRIs and illnesses and relates this information to financial and employment circumstances of the individuals with WRI with the objective of understanding the personal and social implications of having a WRI in these groups of people. The degree to which WRIs may prevent individual labour market participants from realizing their full employment potential will be examined by this research. Further, this research investigates the possible role played by Occupational and Health Safety (OHS) training, by asking the question of whether OHS influences the probability of encountering WRIs. The main outcome of this project will be the generation of information that will enable the development of evidence-based policy approaches to increase the labour market participation of Migrants, Mature Age and Youth by understanding the nature of and reasons for WRIs in these groups.

### *The importance of WRIs and Illnesses*

Before we introduce a plan for the analysis that follows, we will discuss briefly the motivation that underlies this research. WRIs can be thought of as the opposite of skill building activities such as education and training. WRIs damage human capital, whereas skill building develops human capital. There are many similarities regarding the benefits and the costs involved in these two processes. Therefore, it makes sense, for policy purposes, to treat a WRI with the same, if not more, urgency as that given to improving the labour market skills of the working population. The loss of human capital has an added unwelcome dimension to it for those who experience a WRI, in that, on some occasions, WRIs cause permanent loss of human capital which results in a long-term



absence and some times permanent exit of the injured/ill person from the labour force. As some simple calculations presented in the next paragraph suggest, the proportion of cases of severe WRIs may be small, but the consequences for those unfortunate enough to belong to this category can be very serious.

The level of damage to human capital caused by a WRI can be variable. It will depend on the severity of the WRI and the duration of its effects. As we show below, the immediate effect of reported WRIs on human capital utilisation can be anything from zero days of work lost to not having returned to work since the WRI occurred. The data used in this report contains information on WRIs that happened to the interviewees up to 12 months prior to their interview. WRIs that occurred 12 months or more ago, or after the interview date are therefore, not reported in the data. Consequently, there is little evidence in the data we use here for the sustained long-term human capital damage caused by WRIs. We can use our data to build an example of what happens in the first 12 months after a WRI. Simple population-wide projections using the ABS Work Related Injuries, Australia, 2005-06 (ABS cat. No. 6324.0) part of the Multi Purpose Household Survey 2005-06 show that out of 10,838,600 employed people in Australia in 2005-06 (the number of persons who worked at some point in time in the last 12 months), 6.4 percent experienced a WRI in the 12 months prior to being interviewed, which corresponds to 689,500 persons.

The severity of the consequences of a WRI in terms of lost workdays were

- low for about 70 percent of the total WRIs (lost no more than 4 days of work due to the WRI),
- moderate for about 12 percent (lost between 5 and 11 days of work),
- high for 15.6 percent (who lost 11 days of work or more, but had returned to work by the interview day) and
- very high for 2.5 percent, who had not returned to work by the interview day. Considering that a proportion of this 2.5 percent will either take a long time to return to work, or may stay permanently out of the labour force because of their WRI, we

can see that this apparently small annual percentage can have a serious cumulative effect on labour force participation.<sup>1</sup>

The consequences of WRIs are not only borne by the individuals who have suffered the destruction of their personal human capital. WRIs also harm employers in terms of immediate productivity losses caused by absenteeism, losing present employees and all the costs of re-hiring, as well as indirect productivity losses through possible skill shortages. WRIs also influence the macroeconomic performance of the labour market in the form of lost tax revenue and increased welfare payments, as well as the long-term caring burden they generate in terms of increased resources dedicated to formal or informal care of the severely injured. As with most such calculations, using foregone income (in terms of lost hours and pay) as a measure of the true cost to society is a limited calculation that underestimates the true costs of WRIs.

#### *Migrants, Mature Age and young persons*

These three sub-groups of the labour force have been chosen as the focal point of this research. These groups are of particular policy interest because their labour market participation may be more sensitive than that of the conventional young-to-middle-aged male labour market participant. Migrants form a highly useful part of the labour force, which plays a crucial role in combating skill shortages that may in some cases take a long time to build from scratch within Australia. However, Migrants' labour force participation can be sensitive because of assimilation issues. Unlike other groups in the labour force, the Mature Aged may be more prone to leaving the labour market permanently following a WRI because of their impending retirement, which also reduces the benefits of any investment in rehabilitation. Furthermore, the cost of re-training may be higher at an advanced age. The long term losses involved in the human capital destruction of younger people make the effect of WRIs a particularly important consideration for this group. However, previous research shows that, in general, all

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<sup>1</sup> A very rough calculation of the implications from the 2.5% more severe WRIs, would yield a loss in workdays of about 2 months per annum and, on the assumption of an average 35 year working life, a steady state stock of about 5-6 percent of people out of work due to past severe WRIs. Estimates based on numbers from the ABS technical paper on the Work-Related Injuries Survey (Cat. No. 6324.0).

disabling long term health conditions have a lesser impact the earlier the onset of a disability is in a person's life (Mavromaras et al. 2007). This could be explained by the possibility that re-training and adapting to the worsening human capital due to WRI is easier for younger people. This research will concentrate on the question of whether the consequences of WRIs are different for Migrants, the Mature Aged and young persons than for the average labour market participant.

Section 2 introduces our data source, the ABS 2005-06 Work Related Injuries Survey (WRIS). We briefly discuss the sample design, the advantages and limitations of the data and the difficulties that were encountered in using the data. Section 3 introduces a description of WRIs for the three groups in question. Section 4 uses this evidence in a multivariate context to estimate the probability of WRIs. Section 5 concentrates on Migrants, Section 6 investigates Occupational Health and Safety (OHS) training and its possible relationship with WRI rates. Section 7 investigates the difference in applications for Workers' Compensation following a WRI by jurisdiction. Section 8 looks at the income assistance source following a WRI. Sections 9 and 10 investigate the employment and social circumstances that surround WRIs. Section 11 concludes. Appendices contain further information.

## **2. Data – ABS WRIs Survey**

### *General description of the survey*

The data source used in this project is the ABS 2005-06 Work Related Injuries Survey (WRIS) which is a one-off part of the regularly collected ABS Multi Purpose Household Survey. The information that is presented in WRIS is drawn from the work-related injuries topic included in the Multi-Purpose Household Survey (MPHS), which was conducted throughout Australia between July 2005 and June 2006 as a supplement to the Australian Bureau of Statistics (ABS) monthly Labour Force Survey (LFS). The WRIS data is a product of 29,235 completed interviews. 14,219 of these interviews form the main sample of the survey. This representative sample of Australian working age population contains limited number of individuals with WRI. The remaining 15,061 individuals form the extra WRI sample that is constructed by over-sampling individuals with recent WRI. The extra WRI sample does not contain some of the financial information (i.e. source of income) that is available for the main sample.

The survey records whether an interviewee states that they experienced their most recent work-related injury or illness in the 12 months prior to the interview.

The survey collected a number of details about the interviewees' most recent work-related injury or illness through direct questions. Central to this report are the following questions:

#### ***Box 1: WRI Information***

Whether the subject suffered the injury or illness in their current job or a previous job

How the injury or illness occurred

The number of days/shifts absent from work due to the injury or illness

Sources of financial assistance during the WRI

Whether the subject applied for workers' compensation, and, if not, the reason why they did not apply for workers' compensation.

A large number of labour force characteristics and demographics such as occupation, industry, gender and others are also included in WRIS. A full list and description of variables can be found in the Appendix 1.

We restricted our analysis to those aged 15 years and over and who worked at some time in the 12 months prior to the interview. The groups of interest in this study are defined in the survey as follows:

***Box 2: WRIS data set definitions of sub-groups***

<i>Migrants:</i>	Persons that report a Country of Birth other than Australia
<i>Youth:</i>	Persons aged 15 to 24 years
<i>Mature Age:</i>	Persons aged 45 years and over. Where appropriate, the Mature Age category has been split into age groups 45-54, 55-64 and 65+

As this report shows, the WRIS data have been very useful in the attempt to address the research questions in the Project Brief. However, a number of pertinent caveats have come to light during this research. First, from the point of view of data design and scope, the data is not optimal. In particular, given that one of the major motivations for the WRIS data collection was to investigate WRIs and illnesses, some of which can be prevented through the rigorous design and implementation of OHS training, it is a missed opportunity that the OHS training questions were only asked of those who experienced an injury. The lack of OHS training information for individuals without a WRI limits the possibility of analysing the relationship between the presence of OHS training and the prevalence of WRIs. Another example is that information on personal income is available only for a limited sample (i.e. the main sample) of the WRIS data. These are clearly missed opportunities. Our recommendation is that consultation with the research community regarding data scope and design should be undertaken as a matter of course in order to maximize the benefit from national data sets.

Second, from the point of view of data access for research, restriction to RADL access is not helpful, as it limits the computational complexity of the statistical procedures that can be used. For example, the use of up to date extensions to STATA code and the use of GAUSS programs are not open to the research community. The closer investigation of the data is also made a lot harder with remote access. Our recommendation is that the use of secure data rooms, designed and maintained in accordance with Commonwealth confidentiality standards, should be extended to the great benefit of the research outcomes and the full utilisation of a national asset such as the ABS data sets.

### **3. Descriptive analysis of WRI rates**

#### ***3.1 Key demographic characteristics of Migrants, Mature Age and Youth***

Table 1 below lists selected demographic information from the sample that is investigated in this study. The gender distributions of all sub-samples (Migrants, Youth and Mature Age) follow the gender distribution of the general population closely, with about 55 percent men and 45 percent women. Migrants are slightly older (reported average age is 42) than the general population (reported average age is 39). A closer look at the age distribution reveals that most of the people in the Mature Age category in this sample are concentrated between the ages of 45 and 54. Migrants appear to have, on average, higher educational attainments than the other two sub-groups and the general population: 32 percent of Migrants have a bachelor or a higher degree compared to 23 percent of Mature Age individuals and 23.6 percent of the general Australian working population. We also see that the Mature Age group have a higher incidence of individuals without a high school diploma (approximately 36 percent). These differences are clearly the cumulative result of selective in-migration in Australia.

Migrants are more likely to be in a coupled household with or without a dependent.<sup>2</sup> The residence information is very similar across all groups and largely reflects the population

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<sup>2</sup> Note that, since the family type is recorded as a household characteristic this information may be a little misleading when it comes to Youth. For example a young person's family type may appear as 'couple with

of the states. One important observation is that Migrants are *more* likely and the Mature Aged are *less* likely to be living in major cities when compared to the general population.

**Table 1: Demographic characteristics**

	Migrants	Youth	Mature Age	All Persons
<i>Gender (%)</i>				
Male	55.5	51.3	55.8	54.6
Female	44.5	48.7	44.2	45.4
Average age	42.0	20.1	53.7	39.0
<i>Age categories (%)</i>				
15-24 years	9.5	100.0	0.0	18.2
25-34 years	19.6	0.0	0.0	22.0
35-44 years	26.8	0.0	0.0	23.2
45-54 years	25.4	0.0	59.1	21.7
55-64 years	16.5	0.0	34.5	12.6
65 years and above	2.1	0.0	6.5	2.4
<i>Highest educational attainment (%)</i>				
Postgraduate degree	7.3	0.1	4.7	3.9
Graduate diploma/ Graduate certificate	2.3	0.3	3.5	2.7
Bachelor degree	22.4	9.9	15.0	17.0
Advanced diploma/ Diploma	9.1	5.7	9.7	8.9
Certificate III/ IV	13.7	12.0	16.5	16.4
Certificate I/ II	0.0	0.5	0.3	0.4
Certificate not further defined	0.4	0.1	1.1	0.5
Year 12	19.1	37.9	11.7	19.7
Year 11	5.2	12.3	5.7	7.3
Year 10	11.0	15.5	18.7	15.3
Year 9	3.1	4.6	5.5	3.7
Year 8 or below (includes no school attendance)	5.3	0.5	6.2	3.2
Not determined	1.2	0.6	1.6	1.1
<i>Marital status (%)</i>				
Married	72.0	14.4	78.7	63.4
Not married	28.0	85.6	21.4	36.7
<i>Family type (%)</i>				
Couple with dependent/s	40.6	39.7	29.2	39.6
Couple without dependent/s	23.1	9.5	33.5	22.6
Single with dependent/s	2.9	8.2	2.9	4.7
Other family types	17.4	26.4	19.1	17.2
Lone person	8.6	4.1	12.0	9.4
Group household	4.7	8.7	1.3	4.3
Unknown	2.8	3.6	2.1	2.2

dependent' where in fact he/she may be the dependent, not the parent in the family. This may inflate the percentage of people who live in 'couple with dependent' or 'single with dependent' families.

	Migrants	Youth	Mature Age	All Persons
<i>Children aged under 15 years in Household (%)</i>				
HH has at least one	35.3	24.6	19.4	34.6
HH has none	64.7	75.5	80.6	65.4
<i>State or territory of residence (%)</i>				
New South Wales	36.7	32.3	33.0	32.8
Victoria	25.7	22.9	24.3	24.6
Queensland	17.0	21.7	19.5	19.9
South Australia	5.7	6.9	7.8	7.4
Western Australia	11.8	11.1	10.5	10.4
Tasmania	0.9	2.4	2.5	2.3
Northern Territory	0.7	0.8	0.8	0.8
Australian Capital Territory	1.4	1.9	1.7	1.8
<i>Area/ Remoteness of residence (%)</i>				
Major city	84.6	71.5	64.5	68.3
Inner regional	9.7	18.2	21.7	19.7
Other	5.7	10.4	13.9	12.0
Sample size (N)	4,575	2,500	7,127	18,789

Note: Figures are representative of Australian population as (main sample) person weights are applied.

Table 2 provides a summary of the labour force status of individuals in the sample. Migrants and Mature Aged individuals have a similar likelihood of employed; however Migrants are more likely to be in full time employment. Youth are more likely to be found in part time employment. This could be partly because part time work may be the only employment option open to those who pursuing post-school education. Youth also have the highest percentage of persons not in the labour force, at 7.7 percent compared to 5.2 percent for the general population.

**Table 2: Labour force status**

	Migrants	Youth	Mature Age	All Persons
<i>Labour force status (%)</i>				
Employed	92.1	87.6	93.9	92.6
Full-time employed	75.7	56.7	70.7	71.5
Part-time employed	24.3	43.3	29.3	28.5
Unemployed	2.3	4.8	1.3	2.3
Not in labour force	5.7	7.7	4.9	5.2
Sample size (N)	4,575	2,500	7,127	18,789

Note: Figures are representative of Australian population as (main sample) person weights are applied.



A number of employment characteristics for employed individuals are reported in Table 3.

**Table 3: Employment characteristics, for persons employed**

	Migrants	Youth	Mature Age	All Persons
<i>Hours per week usually worked in all jobs (%)</i>				
1 to 15 hours	8.0	26.8	9.9	11.4
16 to 29 hours	11.5	14.9	13.8	13.0
30 to 34 hours	6.0	3.1	6.9	5.4
35 to 39 hours	21.4	20.9	19.9	21.2
40 hours	26.2	22.0	19.9	22.3
41 to 44 hours	3.0	2.2	3.0	3.0
45 to 49 hours	8.4	5.7	7.9	7.9
50 to 59 hours	8.9	2.8	10.1	9.2
60 hours and above	6.6	1.6	8.6	6.6
<i>Number of jobs (%)</i>				
Multiple jobs	4.7	4.6	5.3	5.2
Single job	95.4	95.5	94.7	94.8
<i>Employment type (Main job) – Status (%)</i>				
Employee	87.8	97.3	83.3	87.6
Employer	2.7	0.1	3.9	2.8
Own account worker	9.6	2.6	12.8	9.7
<i>Employment type (Main job) – Leave entitlements (%)</i>				
Employee with paid leave entitlements	63.5	54.0	58.5	62.0
Employee without paid leave entitlements	15.0	43.0	13.8	18.5
Owner manager of incorporated enterprise	9.3	0.3	11.0	7.1
Owner manager of unincorporated enterprise	12.2	2.7	16.7	12.4
<i>Employment type (Main job) – Contract (%)</i>				
Employee on a fixed-term contract	3.9	4.0	3.6	4.1
Employee not on a fixed-term contract	74.6	93.0	68.7	76.4
Owner manager on contract basis	4.8	1.1	6.1	4.8
Owner manager not on contract basis	16.7	1.9	21.6	14.8
<i>Employment type (Main job) – Shift work (%)</i>				
Worked under shift arrangements	17.1	22.8	13.0	15.9
Did not work under shift arrangements	82.9	77.2	87.0	84.1
<i>Duration of employment (Main job) (%)</i>				
Less than 3 months	5.0	11.4	3.4	5.7
Between 3 and 6 months	6.5	14.0	2.9	6.1
Between 6 and 12 months	9.8	17.4	4.5	9.2
Between 1 and 2 years	10.5	21.5	5.3	10.8
Between 2 and 5 years	24.7	29.3	17.1	24.2
Between 5 and 10 years	17.0	6.3	19.0	17.7
10 years and above	26.5	0.1	47.9	26.4
Sample size (N)	4,211	2,175	6,621	17,354

Note: Figures are representative of Australian population as (main sample) person weights are applied.

Young workers are more likely to be in casual employment, which is more flexible but is also without entitlements such as paid leave. The majority of young workers (26.8 percent) also report 1 to 15 hours of weekly working hours and they are more likely to do shift work when compared to migrant and Mature Aged workers. Mature Age workers are more likely to be self-employed or to be an employer when compared to the other groups investigated. The duration of employment categories generally reflects the average age of the groups, where the Mature Aged (young) workers are those most (least) likely to be found in long term employment relationships.

Table 4 shows the differences in the occupational composition (ASCO) between the Mature Aged, the Migrants and the young. The majority of Migrants and Mature Aged are professionals, associate professionals and intermediate clerical workers. By contrast, young workers are most likely to be elementary and intermediate clerical, sales and service workers and tradespersons. Table 4 also shows the breakdown of those in employment by industrial sector (ANZSIC). Retail trade is the most likely industry for young workers. The concentration of more than 34 percent of those below the age of 25 in the retail trade sector could be a cause for concern in terms of national human capital development, although a proportion of those will be in that sector because they are pursuing part time education. Migrants are more likely to be in property and business services, manufacturing, retail trade and health and community services. Mature Age workers are most likely to be in property and business services, health and community services, retail trade and manufacturing.

**Table 4: Occupation and industry classifications, for employed persons**

	Migrants	Youth	Mature Age	All Employed Persons
<i>Occupation classification (ASCO 1-digit) (%)</i>				
Managers and administrators	7.1	1.4	13.5	9.0
Professionals	24.1	10.8	21.1	20.5
Associate professionals	14.3	6.9	13.8	13.0
Tradespersons and related workers	10.6	16.7	9.2	12.0
Advanced clerical and service workers	3.8	3.1	4.4	4.2
Intermediate clerical, sales and service workers	14.2	19.0	14.5	15.8
Intermediate production and transport workers	8.1	6.5	9.0	7.8
Elementary clerical, sales and service workers	7.9	25.4	5.8	9.1
Labourers and related workers	9.9	10.2	8.6	8.5
Inadequately described	<0.1	0.1	<0.1	<0.1
<i>Industry classification (ANZSIC 1-digit) (%)</i>				
Agriculture, forestry and fishing	1.7	1.5	5.4	3.8
Mining	1.0	0.5	1.4	1.3
Manufacturing	13.2	8.0	10.3	10.6
Electricity, gas and water supply	0.6	0.7	0.9	0.8
Construction	7.1	9.8	7.5	8.6
Wholesale trade	5.0	2.1	4.5	3.9
Retail trade	12.3	34.4	9.1	14.4
Accommodation, cafes and restaurants	5.5	6.8	3.0	4.0
Transport and storage	5.6	3.0	6.2	5.0
Communication	2.5	1.5	1.8	2.0
Finance and insurance	4.2	1.8	2.7	3.5
Property and business services	14.9	10.3	12.3	12.5
Government administration and defence	4.6	1.8	6.1	4.9
Education	5.4	3.7	10.1	7.2
Health and community services	11.3	6.2	12.5	10.4
Cultural and recreational services	1.7	3.8	2.4	2.7
Personal and other services	3.5	4.1	3.8	4.4
Inadequately described	0.1	0.1	0.1	0.1
Sample size (N)	4,211	2,175	6,621	17,354

Note: Figures are representative of Australian population as (main sample) person weights are applied.

### 3.2 Financial and employment circumstances surrounding occurrence of WRI

The remainder of this section provides descriptive statistics on the employment circumstances that surround the occurrence of WRIs for the three groups of interest. The data focuses on workers who experienced a WRI in the 12 months prior to the data collection. Table 5 provides a general overview of WRI rates for the young, Mature Aged and Migrants. The prevalence of WRIs amongst the Australian working population is 6.4 percent, with Migrants being the least likely (at 5.5 percent) and Youth the most likely (at 7.6 percent) group to experience a work related injury/illness. The Mature Aged are just under the Australian mean. Although these percentages look very similar in their aggregate form, they conceal differences between the groups investigated in this report.

**Table 5: Incidence of WRI in previous 12 months**

	Migrants	Youth	Mature Age	All Persons
<i>Experience WRI in previous 12 months (%)</i>				
No WRI	94.5	92.4	94.0	93.6
Did experience WRI	5.5	7.6	6.0	6.4
Sample size (N)	4,575	2,500	7,127	18,789

Note: Figures are representative of Australian population as (WRI sample) person weights are applied.

Table 6 presents more detailed information on the location and type of WRIs, whether they happen to recently hired employees, employees with or without OHS training and finally, how they occur. WRIs occurred in the workplace (as opposed to travelling on business and to and from work) in more than 90 percent of all cases. This proportion is higher for the young. This could be because they carry out more risky jobs in the workplace or because they travel less. Multivariate analysis should separate these two possibilities. The pattern of the length of tenure at the time of the injury follows the general pattern of the length of tenure in the working population and, again, conceals simultaneous factors which can only be distinguished using the disaggregation that multivariate analysis offers. The Youth who have the highest WRI rate also have the highest rate of OHS training. The observation that OHS training is more prevalent amongst those who are in risky jobs and/or have historically suffered above average

injury/illness rates has to be seen in combination with the knowledge that OHS training reduces WRI rates.<sup>3</sup> Hence, what we observe in the data is the net effect of the following two co-existing causal processes:

- (i) Other things equal, OHS training will reduce WRI rates. Although we can safely assume that the effect of OHS training on WRI rates is negative, its strength is unknown and can only be determined in an empirical manner. Note that this formulation allows the possibility of a zero effect.
- (ii) Other things equal, the riskier a job the more willing and likely will be employees to undertake OHS training and employers to offer it. Although we can safely assume that the effect of job riskiness on OHS training rates is positive, its strength is unknown and can only be determined in an empirical manner. Note that this formulation allows the possibility of a zero effect.

These are two co-existing causal effects that work in opposite directions. What we observe in the data is the *net* effect of these two. Our raw data suggests that where there is more OHS training there is also a higher rate of WRIs, which then could imply that the positive effect of job riskiness on OHS training is stronger than the negative effect of OHS training on job riskiness. We do not think that this would be an accurate account of what we can learn from this data for two reasons. First, this data cannot inform us about the individual strength of either of these causal effects. Hence, what the data reveals could be anything between two very strong effects, where the positive direction is only marginally stronger, and a zero negative effect combined with a weak positive effect.<sup>4</sup> For any practical use the strength of these effects is very important. Second, when we use raw data, we do not know whether the ‘effects’ that we are looking at are due to the relationship between two variables or just the common correlation between both variables with a third (unobserved in a two-way tabulation) variable. This problem is addressed below with the use of multivariate estimations.

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<sup>3</sup> Note, however, that Wald tests of the proportions of persons that received formal training in OHS risks in workplace for each group (Migrants, Youth, and Mature Age) reveal that these proportions are not statistically significantly different from the proportion in the all persons group. That is, proportion of Migrants that received OHS training (54.3%) is not statistically significantly different from the proportion of all persons that received OHS training (57.5%), and similarly for the Youth and Mature Age groups.

<sup>4</sup> Put in a simple and abstract way, the number 2 can be the result of  $1002-1000=2$  as well as the result of  $2-0=2$ . Two very different situations.

There are differences across the groups according to the type of injury suffered. Migrants are most likely to suffer from sprain and strain (27.2 percent of all injuries) or chronic joint or muscle conditions (24.6 percent of all injuries), with the Mature Aged showing similar rates. These differences reflect a number of influences including the occupational and industry sector composition of these groups.

Table 6 also suggests that most of the recorded injuries occurred while lifting, pushing or pulling objects (Youth: 25.4 percent, Migrants: 31.8 percent, Mature Aged: 32.2 percent) or by hitting or being hit or cut by an object (Youth: 39.9 percent, Migrants: 25 percent, Mature Aged: 21.3 percent).

Table 7 provides further information on the type of employment relationship of those who suffered a WRI. Both full time/part time status and the working hours reflect the employment characteristics we have observed in Tables 2 and 3.

The majority of those who suffered WRIs reported that they worked full time, less so amongst the young (as the incidence of full time work is lower for them). The full-time versus part-time patterns are shown in more detail by splitting the percentages by the usual hours worked.

**Table 6: Occurrence of WRI, for persons who experienced a WRI in the previous 12 months**

	Migrants	Youth	Mature Age	All Persons with WRI
<i>Location where WRI occurred (%)</i>				
Workplace	90.5	94.8	90.5	91.1
Travelling on business / Travelling to or from work	9.5	5.2	9.5	8.9
<i>WRI occurred within first 6 months of starting job (%)</i>				
Yes	15.3	35.4	8.2	16.4
No	84.7	64.6	91.8	83.7
<i>Received formal training in OH&amp;S risks in workplace prior to WRI (%)</i>				
Yes	54.3	61.8	58.1	57.5
No	45.8	38.2	41.9	42.5
<i>Type of WRI (%)</i>				
Fracture	7.0	3.1	8.8	6.4
Chronic joint or muscle condition	24.6	10.1	21.8	18.6
Sprain / strain	27.2	23.9	28.6	30.1
Cut / open wound	17.9	38.0	14.5	19.2
Crushing injury / internal organ damage	4.4	5.3	3.4	4.0
Superficial injury	7.8	6.5	8.5	7.5
Stress or other mental condition	4.2	1.5	6.7	4.5
Other	6.7	11.7	7.7	9.7
<i>How WRI occurred (%)</i>				
Lifting, pushing or pulling object	31.8	25.4	32.2	31.7
Repetitive movement	9.4	4.9	8.4	8.2
Prolonged standing, working in cramped or unchanging position	4.5	0.3	1.7	1.9
Vehicle accident	3.9	3.1	2.1	3.6
Hitting or being hit or cut by an object	25.0	39.9	21.3	26.6
Fall on same level (including slip or fall)	12.2	5.7	12.7	8.6
Fall from height	2.0	3.9	6.8	4.3
Exposure to mental stress	3.6	1.5	7.9	5.0
Long term exposure to sound	0.9	0.0	0.3	0.6
Contact with chemical or substance	3.0	8.2	2.7	4.6
Other	3.7	7.1	3.8	5.0
Sample size (N)	266	206	446	1,230

Note: Figures are representative of Australian population as (WRI sample) person weights are applied.

**Table 7: Employment characteristics of the job where WRI occurred, for persons who experienced a WRI in the previous 12 months**

	Migrants	Youth	Mature Age	All Persons with WRI
<i>Employment status (%)</i>				
Full-time employed	73.0	63.5	73.8	73.7
Part-time employed	27.0	36.5	26.3	26.3
<i>Hours per week usually worked (%)</i>				
1 to 15 hours	8.6	21.6	6.0	9.0
16 to 29 hours	14.5	12.1	11.6	11.3
30 to 34 hours	3.9	2.7	8.7	6.0
35 to 39 hours	21.1	26.4	18.1	20.7
40 hours	24.0	17.4	26.3	24.3
41 to 44 hours	3.1	4.9	2.2	3.0
45 to 49 hours	7.2	5.7	8.1	9.0
50 to 59 hours	11.5	6.2	10.2	9.5
60 hours and above	6.1	3.0	9.0	7.2
<i>Employment type – Status (%)</i>				
Employee	91.3	97.9	86.0	90.8
Employer / Own account worker	8.7	2.1	14.1	9.2
<i>Employment type – Leave entitlements (%)</i>				
Employee with paid leave entitlements	64.8	59.6	67.3	67.8
Employee without paid leave entitlements	21.1	38.3	11.6	18.3
Owner manager of incorporated enterprise	5.3	0.0	7.1	4.6
Owner manager of unincorporated enterprise	8.7	2.1	14.1	9.2
<i>Employment type – Contract (%)</i>				
Employee on a fixed-term contract	3.2	6.9	1.9	3.1
Employee not on a fixed-term contract	82.8	91.0	77.0	83.1
Owner manager on contract basis	2.9	0.3	6.0	4.3
Owner manager not on contract basis	11.2	1.8	15.1	9.6
<i>Employment type – Shift work (%)</i>				
Worked under shift arrangements	32.5	33.8	21.8	26.6
Did not work under shift arrangements	67.5	66.2	78.2	73.4
Sample size (N)	266	206	446	1,230

Note: Figures are representative of Australian population as (WRI sample) person weights are applied.

Table 8 presents the occupation and industry classifications of those who suffered WRIs. The figures appear similar to the percentages presented in Table 4. Generally, the higher the likelihood of employment in a certain industry or occupation, the higher is the risk of an injury in that specific occupation and industry. However, there are some noteworthy differences. For example, immigrants who work as a clerical/sales and service provider



are the most likely to be injured, even though this occupation is only the third category in terms of migrant employment. Similarly, only 15 percent of injured Migrants are professionals, whereas about a quarter of all migrant workers are professionals. Youth workers are most likely to be injured if they are employed as a tradesperson or related worker. This category is the second most likely occupation for a Youth worker.

Manufacturing is the sector most likely to employ a Migrant worker and the sector where a Migrant runs the highest risk of a WRI (at 17 percent). Recalling employment rates from Table 4, injured Youth workers are most likely to have been working in the Accommodation, Cafes and Restaurant sector at the time of their WRI. Manufacturing, Health Services and Construction are the three sectors that are most likely to employ Mature Age workers. They are also the most dangerous sectors for Mature Age workers.

So far we have presented, in Tables 3 and 4 and Tables 7 and 8, two related types of information. In Tables 3 and 4 we presented the probability of an employment characteristic being observed amongst those who belong to the three groups of interest (for example Table 4 contains the statement “if we only look at Migrants and we observe a person at random, the probability that this migrant will be a professional is 24.1 percent). In Table 8 we presented the probability of an employment characteristic being observed amongst those in each of the three groups, but we restricted the selection to those who have suffered a WRI (in essence, making the statement “if we only look at those Migrants who have suffered a WRI and we observe a person at random, the probability that this migrant will be a professional is 15 percent).

**Table 8: Occupation and industry classifications of the job where WRI occurred, for persons who experienced a WRI in the previous 12 months**

	Migrants	Youth	Mature Age	All Persons with WRI
<i>Occupation classification (ASCO 1-digit) (%)</i>				
Managers and administrators	4.7	1.1	9.7	7.4
Professionals	15.0	5.0	14.3	12.5
Associate professionals	11.3	5.7	10.0	10.1
Tradespersons and related workers	16.9	29.5	13.3	19.3
Advanced clerical and service workers	1.8	1.0	2.0	1.8
Intermediate clerical, sales and service workers	17.2	12.8	14.4	13.8
Intermediate production and transport workers	11.7	10.6	14.2	12.8
Elementary clerical, sales and service workers	11.2	19.7	6.7	9.2
Labourers and related workers	10.2	14.5	15.5	13.0
Inadequately described	0.1	0.0	0.0	0.1
<i>Industry classification (ANZSIC 1-digit) (%)</i>				
Agriculture, forestry and fishing	2.2	1.2	7.4	6.0
Mining	1.6	3.1	1.3	1.7
Manufacturing	17.1	11.3	13.9	13.8
Electricity, gas and water supply	0.8	0.0	1.0	0.7
Construction	10.9	12.1	10.9	11.0
Wholesale trade	1.0	4.0	2.4	3.2
Retail trade	11.7	37.5	9.3	15.8
Accommodation, cafes and restaurants	8.8	9.7	4.7	5.0
Transport and storage	6.0	2.9	6.7	5.8
Communication	1.1	0.5	1.5	1.1
Finance and insurance	1.2	0.2	1.5	1.0
Property and business services	7.8	3.1	5.4	6.3
Government administration and defence	5.8	2.1	8.1	5.1
Education	3.8	1.4	7.8	5.3
Health and community services	15.0	7.9	13.6	11.5
Cultural and recreational services	4.5	2.5	1.1	2.6
Personal and other services	0.8	0.6	3.7	4.2
Inadequately described	0.0	0.0	0.0	0.0
Sample size (N)	266	206	446	1,230

Note: Figures are representative of Australian population as (WRI sample) person weights are applied.

In order to provide a proxy for the conditional risk of a WRI in a given employment characteristic, we combine the information in Tables 3 and 4 together with the information in Tables 7 and 8. The results are provided in Tables 9 and 10. The statistics represent the estimated risk (per 10,000 individuals) of a WRI given that a person belongs to a specific employment characteristics category<sup>5</sup>.

<sup>5</sup>Details on how the conditional probabilities are calculated are provided in the Appendix 4.

**Table 9: Estimated work injury risk by employment characteristics**

	Migrants	Youth	Mature Age	All Persons with WRI
<i>Employment status (%)</i>				
Full-time employed	6.07	10.61	7.01	7.30
Part-time employed	7.02	7.95	6.07	6.52
<i>Hours per week usually worked (%)</i>				
1 to 15 hours	6.83	7.67	4.11	5.60
16 to 29 hours	7.96	7.67	5.66	6.17
30 to 34 hours	4.11	8.24	8.49	7.87
35 to 39 hours	6.26	11.93	6.13	6.95
40 hours	5.81	7.48	8.90	7.73
41 to 44 hours	6.51	21.12	4.92	7.09
45 to 49 hours	5.44	9.47	6.94	8.08
50 to 59 hours	8.15	20.93	6.81	7.30
60 hours and above	5.81	17.80	7.08	7.73
<i>Employment type – Status (%)</i>				
Employee	6.57	9.56	6.94	7.37
Employer / Own account worker	4.49	7.39	5.66	5.25
<i>Employment type – Leave entitlements (%)</i>				
Employee with paid leave entitlements	6.45	10.42	7.75	7.73
Employee without paid leave entitlements	8.91	8.43	5.66	7.02
Owner manager of incorporated enterprise	3.60	0.00	4.38	4.61
Owner manager of unincorporated enterprise	4.49	7.39	5.66	5.25
<i>Employment type – Contract (%)</i>				
Employee on a fixed-term contract	5.18	16.38	3.57	5.39
Employee not on a fixed-term contract	7.02	9.28	7.55	7.73
Owner manager on contract basis	3.79	2.56	6.61	6.38
Owner manager not on contract basis	4.23	9.00	4.72	4.61
<i>Employment type – Shift work (%)</i>				
Worked under shift arrangements	12.01	14.02	11.32	11.84
Did not work under shift arrangements	5.12	8.14	6.07	6.17
Number of injured	266	206	446	1,230
Number of all employed	4,211	2,175	6,621	17,354

Note: Above statistics refer to the estimated risk of a WRI per 10,000 individuals given a specific employment characteristic.

The most striking observation from the Table 9 is the relative riskiness of the shift work. For all groups that we analyse, the risk of a WRI for a shift worker is approximately twice the risk that is estimated for a non-shift worker. For example, looking at all migrants, each migrant working shifts has an estimated risk of work injury of 12 per 10,000, whereas each migrant not working shifts has a much smaller estimated risk of injury of 5 per 10,000.

**Table 10: Estimated work injury risk by occupation and industry**

	Migrants	Youth	Mature Age	All Persons with WRI
<i>Occupation classification (ASCO 1-digit) (%)</i>				
Managers and administrators	4.17	7.48	4.85	5.81
Professionals	3.92	4.36	4.58	4.32
Associate professionals	4.99	7.86	4.85	5.53
Tradespersons and related workers	10.05	16.76	9.77	11.41
Advanced clerical and service workers	2.97	3.03	3.03	3.05
Intermediate clerical, sales and service workers	7.65	6.34	6.67	6.17
Intermediate production and transport workers	9.10	15.44	10.65	11.63
Elementary clerical, sales and service workers	8.97	7.39	7.82	7.16
Labourers and related workers	6.51	13.45	12.13	10.85
Inadequately described				
<i>Industry classification (ANZSIC 1-digit) (%)</i>				
Agriculture, forestry and fishing	8.15	7.58	9.23	11.20
Mining	10.11	58.71	6.27	9.29
Manufacturing	8.22	13.35	9.10	9.22
Electricity, gas and water supply	8.41	0.00	7.48	6.24
Construction	9.73	11.65	9.77	9.08
Wholesale trade	1.26	17.99	3.57	5.81
Retail trade	6.00	10.32	6.87	7.80
Accommodation, cafes and restaurants	10.11	13.54	10.58	8.86
Transport and storage	6.76	9.19	7.28	8.22
Communication	2.78	3.13	5.59	3.90
Finance and insurance	1.83	1.04	3.77	2.06
Property and business services	3.29	2.84	2.97	3.55
Government administration and defence	7.96	11.08	8.96	7.37
Education	4.42	3.60	5.19	5.25
Health and community services	8.41	12.03	7.35	7.87
Cultural and recreational services	16.75	6.25	3.10	6.81
Personal and other services	1.45	1.42	6.54	6.74
Inadequately described	-	-	-	-
Number of Injured Workers	266	206	446	1,230
Number of Employed	4,211	2,175	6,621	17,354

Note: Above statistics refer to the estimated risk of a WRI per 10,000 individuals given a specific employment characteristic.

Similarly, the estimated risks of work injury for Youth and Mature Aged shift workers are 14 and 11.3 (per 10,000) respectively, both higher than the estimated risks of injury of 8 and 6 for Youth and Mature Aged workers who do not work under shift arrangements. In Table 10, the conditional risk of a WRI for a given occupation and an industry are reported. The 'safest' occupation for all groups appears to be the 'Advanced clerical and service workers' occupation (about 3 per 10,000 for all groups). With a 12 per 10,000 likelihood of a WRI, the 'Labourers and related workers' is the riskiest occupation for Mature Aged workers. For Migrants and Youth, the 'Tradespersons and related workers' occupation is associated with the highest risk of a WRI (10 and 16.7 per 10,000 Migrants and Youth respectively). According to Table 10, 'Mining' is undeniably the most risky industry for Youth where 58 out of every 10,000 Youth mine workers report to have a WRI. The highest estimated risk for Migrants is observed given the 'Cultural and recreational services' industry (16.7 per 10,000). The riskiest industry for Mature Aged appears to be 'Accommodation, cafes and restaurants' (10.6 per 10,000).

In this section we presented the demographic and employment characteristics of Migrants, Youth and Mature Aged individuals as well as the characteristics of the Australian working population. There are important differences across these categories. Migrants are shown to be, on average, more educated and more likely to be residing in major cities. Youth workers are associated with casual employment with few hours of work and lower entitlements from employment. The Youth are also shown to be working under shift arrangements and to have a much higher tendency to be in the labourer or related worker category. Participation in OHS training was higher for young workers compared to Migrants and Mature Aged. The evidence presented in this section suggests that observed differences in the frequency of WRIs depend simultaneously on a number of factors. This suggestion highlights the limited usefulness of the simple descriptives presented in this section and makes a clear case for the use of multivariate analysis where conditional associations can be estimated. The conditional associations of a number of characteristics with WRIs and illness are analysed in the next section.

#### 4. Multivariate analysis of WRI rates

The first aim of this section is to identify the factors that are associated with the probability that a WRI occurs. The second aim of this section is to identify different types of WRIs and illnesses and investigate their associations with the socio-demographic characteristics in the sample. In particular, this section focuses on the following questions:

After controlling for occupation and industry,

- i. how do the injury and illness rates for Migrants compare with those of the general population?
- ii. how do the injury and illness rates for older workers and the young compare with those of the general population?<sup>6</sup>
- iii. are certain types of injuries more likely to occur in these groups compared with the general population of those who have had a workplace injury or illness?

In order to make meaningful comparisons between the WRI rates of different groups we have to take into account the degree to which observed differences in WRI rates may be attributable to the underlying riskiness of industries and occupations. This can be done using multivariate analysis which controls for occupation and industry. In essence, the question is whether any observed differences in the WRI rates of any group can be attributed to their occupational and industry choices or to any other characteristics of this group or labour market circumstances surrounding this group.<sup>7</sup> Put very simply, in the context of the present research, one may think that (i) Mature Age workers are less adept at handling physical risk, so independent of where they work, Mature Age people will be

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<sup>6</sup> Where possible, analysis was carried out on the following age groups 45-54 years, 55-64 years and 65+ years (possibly splitting the 55-64 category into 55-60 and 61-64 for women).

<sup>7</sup> Not controlling for the differences in industry WRI rates will lead to false conclusions. For example if certain risky industries tend to hire certain group of individuals more often than others, the unconditional WRI risk of this group can be exaggerated. This section introduces this type of econometric control, so that, when we observe that one of our subgroups appears to have higher WRI rates than another, we know whether this depends on their choices of occupation, industry and/or other factors which may or may not have to do with the subgroups themselves.

more likely to suffer a WRI. Or alternatively, one may think that (ii) some industries are more likely than others to expose their workers to riskier working conditions (as part of the very nature of the job), so independent of who works in that industry, they are more likely to suffer a WRI. Whilst in case (i) prevention should focus on the type of worker (e.g. on Migrants or Youth), in case (ii) it should focus on the type of industry. Multivariate analysis will increase our understanding of the distinction between the influence of different factors on observed WRIs by allowing us to derive estimates of the conditional associations between WRIs and other observed characteristics, including industry and occupation.

#### *4.1 Econometric modelling of WRI rates*

In order to analyse the conditional association between WRI rates and socio-economic and other observable individual characteristics, we employ an econometric modelling approach which assumes that there is an underlying unobserved risk of a WRI which can be expressed by a continuous variable. The higher this (unobserved) probability of having an injury is, the more likely that a worker will be observed to have suffered an (observed) work related injury. Note that the unobserved underlying variable is a continuous probability and the observed outcome is binary variable which conventionally takes the value 1 for those who have suffered an injury and 0 for those who have not. The underlying unobserved model can be written as follows:

$$y_i^* = X_i' \beta + \varepsilon_i \quad (1)$$

The relationship between observed  $y_i$  and unobserved  $y_i^*$  is that

we observe  $y_i = 1$  if  $y_i^* > 0$   
and  $y_i = 0$  otherwise.

This assumption leads to the empirical specification of the probit model as follows:

$$y_i = X_i \beta + \varepsilon_i \quad (2)$$

where  $y_i=1$  (that is,  $y_i^*$  is positive) if the individual suffered a WRI and  $y_i=0$  if not (that is,  $y_i^*$  is zero or negative) and  $X_i$  is a list of appropriate covariates which contains socio-demographic and other characteristics. Estimation results are presented below in the form of marginal effects which can be interpreted as changes in the probability of being observed to have suffered a WRI. We estimate first a number of general models. We then continue with the estimation of separate models for the specific sub-groups of interest in this report. We work on two main types of model specification. The first specification contains only demographic characteristics such as age, education, family and marital status, and characteristics about residence. The second specification introduces additional employment specific information such as occupation, industry, shift work, type of contract and full time/ part time status. In addition to those who are currently working we sourced employment information from those who are out of work using their most recent job.

#### ***4.2 Estimating the probability of a WRI***

Table 11 presents results from the estimation of Equation 2, with the probability of having observed a WRI as the dependent variable. Both model specifications are presented; one excluding and one including employment information. The overall fit of the regression is poor, with a lot of the right hand side variables found to be not statistically significant at conventional significance levels. There is a reason for this. Note that since we are modelling accidental events that result *despite* the considerable preventive efforts of all parties involved (that is, employers, employees and governments), one can expect that the randomness of the data will be very strong. It would be useful to recall at this stage the argument made earlier (regarding Table 6) about the simultaneous presence of a number of causal effects in our observed data outcomes. Indeed, it would be surprising if, despite the considerable efforts and expense dedicated to safety and accident prevention in the workplace, one could trace clear-cut



and persistent factors that raise markedly the probability of injuries and illnesses in employment. The data is describing an environment that is covered by OHS legislation, which aims to induce employers and employees to tackle vigorously any persistent risk at work, so that the randomness in the data is, to a degree, expected and welcome as an estimation result. In Table 11 we present marginal effects and their standard errors. Marginal effects must be interpreted as the percentage difference in WRI rates between two otherwise identical individuals who differ with respect to a certain characteristic. For example, looking at the gender variable in Specification I in Table 11, a man with the average sample characteristics is two percent more likely to suffer a WRI than a woman with the same average sample characteristics.<sup>8</sup> Our results using Specification I suggest that Youth is the most likely age category to have a WRI, while Mature Age workers older than 64 years are the least likely group to have a work injury. This finding could be because either Mature Age workers are safer than very young workers or because of the different type of jobs that these two groups are likely to undertake. For example, a younger worker would be more likely to be employed in a physically demanding job with above average rates of WRIs, such as mining or construction, than an older worker. However, looking at the results from Specification II (where we control for occupation, sector and other employment-related characteristics), we observe very similar age-group marginal effects, which is worth noting. The significance of the age variables persists when we include employment related variables in Specification II on the RHS. Identical age profiles of workers across occupations and industries implies that younger people assume the riskier jobs within each occupation/industry cell. This could be explained on pure economic grounds, as the cost of risk is lower for younger people (they can handle it more easily), which makes them ask for a lower wage for taking a risky job than a mature counterpart worker. However, for the same reason we can expect that younger people would be more likely to be employed in a riskier occupation/industry (for the same economic reasons, through self selection), which implies that the estimated age profile marginal effects are under-estimates of the true effects, as younger people are not only more capable of handling risk, but they are also more likely to be employed in a riskier

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<sup>8</sup> Note that this is a conditional probability (conditioned on the average sample characteristics). This implies that this statement is very different to saying that the average man and the average woman have different probabilities of a WRI.

occupation/industry. Given that the data at hand offers only one observation per individual with no panel element in it, there is little that can be done to investigate empirically such possibilities.

**Table 11: Probit estimation of WRI rates**

<i>Specification:</i>	<i>I</i>		<i>II</i>	
	<i>Marginal Effect</i>	<i>Standard Error</i>	<i>Marginal Effect</i>	<i>Standard Error</i>
Male [Female]	0.019***	0.004	0.007	0.005
Youth: 15-24 years [Prime Age: 25-44 years]	0.016**	0.007	0.014**	0.007
Mature Age: 45-54 years	0.004	0.005	0.001	0.005
Mature Age: 55-64 years	-0.009*	0.005	-0.009	0.006
Mature Age: 65 years and above	-0.034***	0.008	-0.029***	0.009
Australian-born Migrant	-0.003	0.004	-0.003	0.004
Bachelor degree or higher Advanced diploma/ Diploma Certificate (I-IV) Year 12 [Year 11 or below]	-0.018*** -0.011 0.007 -0.015**	0.005 0.008 0.007 0.006	-0.006 -0.006 <0.001 -0.013**	0.007 0.009 0.007 0.006
Married [Not married]	-0.007	0.008	-0.002	0.008
Couple with dependent/s Couple without dependent/s Single with dependent/s Lone person [Group HH, Unknown, and Other family types]	-0.007 0.006 0.007 0.009	0.007 0.008 0.009 0.007	-0.006 0.006 0.017* 0.012*	0.007 0.008 0.011 0.007
HH has a child under 15 years [HH without child under 15 years]	0.005	0.007	0.002	0.007
New South Wales Victoria [Queensland]	0.002 -0.010*	0.006 0.005	0.003 -0.009	0.006 0.006
South Australia Western Australia Tasmania Northern Territory Australian Capital Territory	-0.003 -0.003 -0.010 -0.010 0.011	0.007 0.006 0.007 0.012 0.010	-0.006 -0.004 -0.010 -0.007 0.015	0.007 0.006 0.008 0.013 0.011
Major city [Regional and remote areas]	-0.014***	0.004	-0.005	0.005
Full-time job [Part-time job]			0.004	0.005

<i>Specification:</i>	<i>I</i>		<i>II</i>	
	<i>Marginal Effect</i>	<i>Standard Error</i>	<i>Marginal Effect</i>	<i>Standard Error</i>
Shift work arrangements [Did not work under shift work arrangements]			0.043***	0.006
Employed on contract basis Not employed on contract basis			-0.011	0.006
Managers and administrators [Professionals]			0.006	0.009
Associate professionals			0.010	0.008
Tradespersons and related workers			0.054***	0.012
Advanced clerical and service workers			-0.004	0.012
Intermediate clerical, sales and service workers			0.008	0.008
Intermediate production and transport workers			0.050***	0.013
Elementary clerical, sales and service workers			0.024**	0.011
Labourers and related workers			0.056***	0.012
Agriculture, forestry and fishing			0.050***	0.016
Mining			-0.016	0.013
Manufacturing			0.000	0.008
Electricity, gas and water supply			-0.012	0.019
Construction			0.007	0.009
Wholesale trade [Retail trade]			-0.013	0.010
Accommodation, cafes and restaurants			0.010	0.011
Transport and storage			0.007	0.011
Communication			-0.020	0.012
Finance and insurance			-0.040***	0.008
Property and business services			-0.021***	0.007
Government administration and defence			0.010	0.011
Education			0.015	0.011
Health and community services			0.016*	0.010
Cultural and recreational services			0.003	0.013
Personal and other services			0.014	0.012
Log likelihood	-4,484.20		-4,267.01	
LR test (Joint significance)	115.86***		360.57***	
Pseudo R-squared	0.0128		0.0405	
Sample size (N)	18,789		17,441	

Note: \*, \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% levels, respectively.

This argument should be borne in mind when we compare the effects for the different age groups, as differential selection into specific occupations/industries will conceal some of the group differences regarding the underlying exposure to and capacity of individuals to handle the risk of WRIs and illnesses.

Results suggest that there are no statistically significant differences in WRI rates between migrant (non-Australian born) and Australian born individuals. The results from highest

educational attainment categories suggest that Bachelor and higher degree education is associated with lower injury rates, however after controlling for employment characteristics, the association disappears, suggesting that those with higher degrees work in safer occupations and industries. Similarly, workers with year 12 as their highest educational attainment are significantly less likely to sustain a WRI, however, this effect is not related to the occupation and/or job choice of these workers. Unlike the result for those with higher education degrees, where the inclusion of occupation and industry variables absorbs the WRI rate differences, workers with only year 12 education appear to be doing less dangerous jobs within their occupation and industry subgroups. We cannot offer a clear economic explanation for this result. Marital status does not play a significant role in the propensity of a work related injury. Family composition is in some cases significant at the 10 percent level, and this only after employment characteristics have been controlled for.<sup>9</sup> It is interesting that in this multivariate context, both with and without employment controls in the estimation, jurisdictions do not show any statistically significant differences in the WRI rates. There are, however, regional differences between city and rural regions; with cities appearing to be safer than the regions. As soon as occupation and industry have been controlled for, cities and regions have the same WRI rates.

Employment characteristics play a role in the level of WRIs. No difference is found between full time and part time employment. Shift work appears to be considerably riskier than conventional 9 to 5 job arrangements. Specification II offers some valuable insight into the characteristics of riskier employment circumstances. Workers who do shift work have, on average, a 4.3 percent higher WRI rate compared to those in more standard (no shift) working arrangements. Note that the impact of shift work is over and above the impact of industry and occupation. Therefore, our results imply one or both of the following explanations. Either changing working hours increases occupational risks in itself (no matter what the job is) or the jobs that need to be worked with shift arrangements are inherently riskier in a sufficiently large number of occupation and

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<sup>9</sup> This result suggests that there may be some relationship between employment characteristics and family composition that is revealed in Specification II when both factors enter estimation.

industry pairs to make the estimate statistically significant. Both explanations sound reasonable.

Looking at specific occupation categories, tradespersons and related workers, intermediate production and transport workers, elementary clerical, sales and services workers and labourers and related workers are the occupations that are most likely to experience a work related injury. On average, these occupations are associated with 5.4, 5, 2.4 and 5.6 percent higher WRI rates than professionals who are the reference category in the estimation. The riskiest industry is agriculture, forestry and fishing at 5 percent higher WRI rates and the least risky one is finance and insurance with a 4 percent lower rate.<sup>10</sup>

#### ***4.3 Estimating the probability of WRI, by type of WRI***

This sub-section investigates the differences between types of WRIs. We restrict our analysis to the 1,230 workers who experienced a WRI in the 12 months before their interview and who also answered all the survey questions included in the estimations.

The data set divides WRIs into eight mutually exclusive and collectively exhaustive types. These are: (i) fracture, (ii) chronic joint or muscle condition, (iii) cut or open wound, (iv) crushing injury or internal organ damage, (v) superficial injury, (vi) stress or other mental condition, (vii) sprain and strain, and (viii) other. After following this split of the data, it became apparent that the resulting sample sizes of the injury type sub-groups are not large enough to obtain statistically reliable estimates. A certain amount of experimentation regarding the estimation possibilities offered by the data in terms of the size of possible groupings of injury types and their intuitive cohesion, suggested the following aggregated classification: (a) fracture and crushing injury & internal organ

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<sup>10</sup> It is interesting that there is little variation by industry with most individual industries being statistically indistinguishable from the reference retail industry. Note that mining appears to be safer than most industries, although the difference is rather imprecisely estimated. The nature of mining accidents may be the reason, in that when they happen they can involve a large number of casualties so that they get bunched up in terms of time. As a result, sampling in a bad year will give a very different picture than sampling in a good year.

damage, (b) chronic joint or muscle condition, (c) cut or open wound & superficial injury (d) stress or other mental condition and other injuries, and (e) sprain or strain.

**Box 3: Types of WRI**

Fracture and crushing injury / internal organ damage  
Chronic joint or muscle condition  
Cut or open wound and superficial injury  
Stress or other mental condition and other injuries  
Sprain or strain (*used as the reference category in estimation*)

We estimate the probability of WRI by type of injury and illness using a multinomial logit model. In its simplest form, the multinomial logit model can be defined as the estimation of the odds ratios of a number of distinct specific outcomes against a single base outcome. More precisely, a multinomial logit model estimates how much more or less likely an outcome may be when compared to the base outcome, in the presence, absence or specific level of a certain characteristic. This model can be represented for an individual  $i$  and an injury type  $j$  as follows

$$\log(p_{ij} / p_{i1}) = \beta_1 X_i \tag{3}$$

Where  $\log()$  is the natural logarithm operator,  $p_{ij}$  is the probability of observing individual  $i$  having suffered an injury type  $j$ ,  $X_i$  contains all observed socio-demographic characteristics of individual  $i$  and  $\beta_1$  are the parameters to be estimated.

The estimated marginal effects and the bootstrapped (empirical) standard errors of Equation 3 are presented in Tables 12 and 13 with ‘sprain or strain’ the chosen base (reference) category. Note that the bootstrapped standard errors for the reference category could not be computed due to limitations in estimating through RADL, but a good feel for the significance can be obtained by examining the other standard errors for the same

variable. Table 12 (Specification I) contains a number of key demographic characteristics by themselves and Table 13 (Specification II) adds to them a number of key employment characteristics.

**Table 12: Multinomial logit estimation of type of injury sustained, for persons who experienced a WRI in previous 12 months – Specification I**

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain<sup>(a)</sup></i>		<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>
Male [Female]	0.050**	0.018	-0.072	0.038	0.001		0.060	0.136	-0.040	0.170
Youth: 15-24 [Prime Age: 25-44]	0.013	0.204	-0.096	0.33	-0.086		0.189***	0.000	-0.019	0.565
Mature Age: 45-54	-0.010	0.771	0.015	0.622	-0.009		0.006	0.808	-0.002	0.935
Mature Age: 55-64	0.006	0.314	-0.017	0.483	-0.083		0.088**	0.026	0.006	0.291
Mature Age: 65+	0.076	0.588	-0.054	0.441	0.082		-0.113	0.305	0.009	0.807
[Australian- born]										
Migrant	-0.003	0.627	0.036	0.097	-0.050		0.028	0.175	-0.011	0.698
Bachelor degree or higher	-0.042*	0.072	-0.044	0.094	0.099		-0.104**	0.015	0.092	0.493
Advanced diploma/ Diploma	0.009	0.971	-0.007	0.742	0.036		-0.123	0.114	0.086	0.435
Certificate (I- IV)	0.026	0.483	0.03	0.642	0.006		-0.039	0.491	-0.023	0.604
Year 12 [Year 11 or below]	-0.004	0.828	-0.022	0.952	-0.042		0.039	0.342	0.030	0.377
Married [Not married]	0.060	0.183	-0.001	0.975	0.003		-0.020	0.785	-0.041	0.505
Couple with dep./s	-0.067**	0.036	-0.005	0.718	0.033		0.006	0.801	0.032	0.797

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain<sup>(a)</sup></i>	<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
Couple no dep./s	-0.036	0.352	0.037	0.583	-0.007	-0.039	0.671	0.045	0.478
Single with dep./s	-0.023	0.293	-0.074	0.067	0.119	-0.058	0.110	0.035	0.774
Lone person [Group HH, Unknown, Other]	0.044	0.296	-0.018	0.708	0.007	-0.026	0.646	-0.006	0.852
HH has a child under 15 years [HH without child under 15 years]	0.029	0.385	-0.011	0.97	-0.022	0.038	0.429	-0.033	0.618
New South Wales	0.060*	0.096	-0.005	0.975	-0.005	-0.034	0.598	-0.016	0.743
Victoria [Queensland ]	0.055	0.185	-0.004	0.884	0.006	-0.068	0.221	0.011	0.858
South Australia	-0.002	0.926	0.04	0.414	-0.019	0.017	0.654	-0.036	0.583
Western Australia	0.017	0.641	0.015	0.753	-0.005	0.009	0.850	-0.036	0.471
Tasmania	0.036	0.565	0.008	0.991	0.012	-0.058	0.414	0.003	0.958
Northern Territory	0.197**	0.038	0.103	0.222	-0.093	-0.120	0.650	-0.087	0.587
A.C.T	0.034	0.420	0.005	0.705	-0.040	-0.017	0.875	0.018	0.569
Major city [Regional and remote areas]	0.008	0.841	0.036	0.44	0.012	-0.028	0.405	-0.028	0.306
Log likelihood	-1826.170								
LR test (Joint significance)	144.470								
Pseudo R- squared	0.038								
Sample size (N)	1230.000								

Note: Columns labelled as 'P-Val.' refer to the probability values of the coefficient estimates. Computation of significance levels for the marginal effects failed due to memory restrictions in RADL. (a) The probabilities for the 'Sprain and Strains' outcome can not be calculated since this category is the reference outcome category in the estimations and therefore is omitted by Stata. Statistics in the bottom four rows refer to the actual model not to the estimation of the marginal effects.



The interpretation of the estimates presented in Tables 12 and 13 is explained by way of example. The marginal effect of variable *Male* under type of injury *Chronic joint or muscle* condition is -0.0717 and comes with a P-value of 0.038. The reference category for this variable is being female. The estimate suggests that a male person in the sample is 7.17 percent less likely than a female person to be observed suffering a work related chronic joint or muscle condition. The low P-value suggests that this probability is estimated precisely. Note that, following the rules of multiple regression, all other characteristics are kept at the average sample levels and the only characteristic that is altered to obtain this marginal effect is gender.<sup>11</sup>

In Table 12 we look at the role of demographic characteristics alone. The model is very poor at explaining the observed variation in the dependent variable (that is, the incidence of different types of WRI). This is revealed by the small number of significant variables in the regression, although it should be noted that the sample size is very small for the number of variables included in the specification, so that this lack of significance could be due in part to statistical reasons. Men are more likely to have a fracture or crushing injury or internal organ damage and less likely to have a chronic joint or muscle condition. Only significant age category variables are observed in the Cut or Open Wound & Superficial Injury, where the very young workers (age 15-24) and the Mature Age workers (age 55-64) are more likely to suffer this type of injury. Migrants appear to have higher likelihood of having a Chronic Joint or Muscle Conditions. Those with higher education (a bachelor degree or above) are less likely to suffer any of the physical injuries and illnesses and more likely to suffer from stress or other mental conditions (although this latter effect is not precisely estimated). Other characteristics that measure family status and residence (state as well as the urban-rural division) do not appear to be systematically related with the type of injury and illness sustained. With the exception of the higher education results and the result that suggests that Youth are almost 20 percent

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<sup>11</sup> The choice of reference category (for the injury type) does not play a role in this context. The choice of reference category in a two-way split (as with gender) is not material, if gender had been estimated with males being the reference group, the estimate would have exactly the same standard error/significance and would simply have the opposite sign, thus leading to exactly the same result interpretation.

more likely to suffer a cut or open wound and superficial injury than their 25-44 aged counterparts, there is little that can be understood from Table 12.

In Table 13, we combine the demographic variables in Table 12 with a number of additional key employment variables. The general picture is one of improved model fit, despite the fact that the specification is rather overburdened for a sample size as small as 1,230 observations. The statistical significance of the demographic variables is improved and there are no sign reversals in the new estimation results. The same message, albeit weak, is conveyed by the demographic variables.

The employment variables add a lot to this estimation and can be split into three main categories: general ones, occupation related and industry sector related. We look at them in turn.

There are three general variables representing the type of employment relationship: full time employment, shift work and contract type. It is interesting that the probability of suffering stress or other mental condition is lower for those in full time employment. We cannot know whether this is due to the possibility that people who (are more likely to) suffer from stress or other mental conditions may try to avoid working full time, or because full time work is less stressful than part time work. These are two very distinct possibilities and their differences should be addressed using long panel data.

Similarly, shift workers appear to be less likely to suffer from chronic joint or muscle conditions. Here it makes more sense to think that causality runs from the condition to the employment type choice, in that people with chronic conditions may want to avoid the strenuous time patterns of shift work giving rise to this statistical relationship.

**Table 13: Multinomial logit estimation of type of injury sustained, for persons who experienced a WRI in previous 12 months – Specification II**

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain<sup>(a)</sup></i>		<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>
Male [Female]	0.029	0.305	-0.078*	0.070	0.008		0.043	0.475	-0.002	0.862
Youth: 15-24 [Prime Age : 25-44]	0.028*	0.064	-0.094	0.549	-0.109		0.179***	0.000	-0.004	0.257
Mature Age: 45-54	-0.010	0.763	0.013	0.673	-0.008		0.005	0.834	-0.001	0.944
Mature Age:55-64	0.006	0.392	-0.033	0.834	-0.072		0.084*	0.053	0.016	0.280
Mature Age:65+	0.080	0.603	-0.065	0.369	0.097		-0.117	0.285	0.005	0.758
[Australian-born] Migrant	-0.002	0.553	0.045*	0.062	-0.057		0.028	0.167	-0.014	0.709
B.A. Degree or Higher Advanced diploma/ Diploma	-0.040*	0.096	-0.031	0.168	0.109		-0.093**	0.037	0.055	0.936
Certificate (I-IV)	0.017	0.901	0.017	0.961	0.035		-0.116	0.156	0.047	0.701
Year 12	0.022	0.597	0.027	0.764	0.015		-0.047	0.363	-0.018	0.611
[Year 11 or below]	0.004	0.588	-0.022	0.824	-0.060		0.049	0.220	0.029	0.307
Married [Not married]	0.062	0.178	-0.010	0.836	0.010		-0.021	0.743	-0.041	0.464
Couple with dep./s	-0.068**	0.042	0.009	0.952	0.022		0.008	0.917	0.029	0.760
Couple no dep./s	-0.036	0.386	0.052	0.421	-0.017		-0.042	0.724	0.044	0.431
Single with dep./s	-0.017	0.326	-0.086**	0.037	0.136		-0.060*	0.096	0.027	0.653
Lone person [Group HH, Unknown, Other]	0.049	0.232	-0.015	0.783	0.003		-0.032	0.627	-0.004	0.916
HH has a child under 15 years [HH without child under 15 years]	0.031	0.386	-0.022	0.840	-0.016		0.029	0.556	-0.022	0.753
New South Wales	0.068*	0.064	-0.008	0.931	-0.006		-0.032	0.640	-0.022	0.636
Victoria [Queensland]	0.058	0.157	0.003	0.970	0.001		-0.066	0.273	0.004	0.941
South Australia	-0.006	0.960	0.049	0.389	-0.014		0.005	0.833	-0.033	0.577
Western Australia	0.015	0.695	0.014	0.799	-0.002		0.008	0.899	-0.036	0.451

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain<sup>(a)</sup></i>		<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>
Tasmania	0.038	0.486	0.018	0.809	-0.004		-0.049	0.589	-0.002	0.999
Northern Territory	0.231**	0.025	0.096	0.219	-0.107		-0.128	0.655	-0.092	0.534
A.C.T	0.048	0.321	0.004	0.716	-0.042		-0.003	0.756	-0.008	0.853
Major city [Regional and remote areas]	0.014	0.593	0.030	0.499	0.004		-0.014	0.729	-0.034	0.293
Full-time job [Part-time job]	0.007	0.843	-0.009	0.408	0.045		0.009	0.624	-0.052**	0.049
Shift work [Not shift work]	0.003	0.509	-0.050**	0.020	0.073		-0.019	0.137	-0.007	0.254
Contract basis [Not contract basis]	0.068	0.122	0.003	0.982	0.003		-0.003	0.943	-0.072	0.142
Managers and administrators [Professionals]	0.072**	0.026	0.051*	0.059	-0.159		0.043*	0.083	-0.008	0.213
Associate professionals	0.025	0.589	0.019	0.739	-0.009		-0.041	0.703	0.006	0.847
Tradespersons and related workers	0.000	0.739	-0.038	0.928	-0.053		0.152*	0.063	-0.061	0.454
Advanced clerical and service workers	-0.026	0.638	-0.040	0.523	0.074		0.027	0.880	-0.035	0.463
Intermediate clerical, sales and service workers	0.024	0.453	0.069	0.201	-0.038		0.003	0.700	-0.058	0.359
Intermediate production and transport workers	0.027	0.711	0.070	0.538	0.024		0.004	0.884	-0.125***	0.005
Elementary clerical, sales and service workers	-0.014	0.632	-0.010	0.661	0.047		0.037	0.989	-0.059	0.155
Labourers and related workers	0.000	0.575	0.103*	0.054	-0.083		0.080	0.123	-0.100	0.135
Agriculture, forestry and fishing	0.059	0.347	-0.080	0.330	-0.004		0.059	0.596	-0.034	0.636
Mining	-0.030	0.899	0.229**	0.049	-0.137		0.027	0.365	-0.088	0.764

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain<sup>(a)</sup></i>		<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>	<i>M.E.</i>	<i>P-Val.</i>
Manufacturing [Electricity, gas and water supply]	0.050*	0.072	0.001	0.312	-0.101		0.044	0.112	0.006	0.322
Construction	0.063*	0.096	0.015	0.439	-0.066		-0.012	0.625	0.000	0.599
Wholesale trade [Retail trade]	0.002	0.543	-0.030	0.653	-0.114		0.170*	0.051	-0.029	0.769
Accommodation, cafes and restaurants	0.026	0.152	-0.044	0.435	-0.154		0.179***	0.005	-0.007	0.233
Transport and storage [Communication]	0.013	0.181	-0.012	0.221	-0.150		0.086**	0.031	0.062**	0.047
[Finance and insurance]										
Property and business services	0.022	0.475	0.002	0.646	-0.052		0.008	0.609	0.020	0.469
Government administration and defence	0.023	0.394	0.050	0.254	-0.073		-0.065	0.920	0.064	0.157
Education	-0.009	0.915	-0.058	0.717	-0.052		0.178*	0.097	-0.059	0.519
Health and community services	0.001	0.397	0.021	0.136	-0.118		0.105**	0.030	-0.010	0.351
Cultural and recreational services	0.099	0.133	-0.042	0.996	-0.069		0.080	0.347	-0.068	0.575
Personal and other services	0.007	0.422	0.027	0.204	-0.115		0.084	0.104	-0.004	0.410
Log likelihood										
LR test										
(Joint significance)										
Pseudo R-squared										
Sample size (N)										

Note: Columns labelled as 'P-Val.' refer to the probability values of the coefficient estimates. Computation of significance levels for the marginal effects failed due to memory restrictions in RADL. (a) The probabilities for the 'Sprain and Strains' outcome can not be calculated since this category is the reference outcome category in the estimations and therefore is omitted by Stata. Statistics in the bottom four rows refer to the actual model not to the estimation of the marginal effects. (b) Due to imprecise results several industry categories are combined to form the reference category. The reference category for industry is Electricity, gas and water supply + Retail trade + Communication+ Finance and insurance.

The second set of employment variables focuses on differences by occupation. There are few clear results here. Labourers and related workers appear to be more likely to suffer from a chronic joint or muscle condition. Tradespersons and related workers are more likely to suffer a cut or open wound and superficial injury. We cannot find any intuition for the significant marginal effects for managers and administrators and intermediate production and transport workers.

The third set of employment variables focuses on differences by industry sector. A very strong marginal effect appears for those employed in the mining sector who are about 23 percent more likely to suffer a chronic joint and muscle condition, a result worth further investigation once more specific data becomes available. Construction and manufacturing both have higher fracture and crushing injuries, whilst a large number of sectors (Wholesale trade, Accommodation, cafes and restaurants, Transport and storage and health and community services) have higher probabilities for cuts or open wounds and superficial injuries. Some of these sectors appear to involve a fair amount of physical work, which may be the underlying reason for this result.

## **5. Migrants and WRI**

In this section we focus on issues relating to Migrants. We include in the estimations more detailed information about migrant workers in order to examine the association between the *length of time in Australia* and the *country of origin* and the *incidence and the type of a work injury and illness*. The variable *length of time in Australia* will give an approximation of the degree to which Migrants assimilate in their work environment as their length of stay in Australia increases. It is important that this happens in a well functioning and non-discriminatory labour market. The variable *country of origin* adds a complication to the empirical testing of assimilation in a cross section context. We know that post-1940s immigration patterns have been changing dramatically in Australia. The degree to which cohorts of Migrants into Australia may differ depending on their arrival date and in ways that may not be readily observable and/or quantifiable by the data will make the estimation of assimilation by length of stay impossible, as the length of stay

will be confounded by unobserved compositional differences between successive cohorts of immigrants. To put it simply, if we observe a difference in the WRIs of 1960s immigrants and 1980s immigrants, we will not be able to identify whether these differences are due to the longer stay of the 1960s immigrants or the different countries of origin between the 1960s (principally Mediterranean) and the 1980s (principally Asian) immigrants. This is a problem that was first highlighted in the immigration literature by Borjas (1986) and applies to all studies that use cross sectional data in their analysis. It is a problem to resolve empirically, because, even if we had access to panel data that observes immigrants from different countries of origin as their individual length of stay increases, we would still have the problem that the composition of immigrants from any single origin may well change in itself in a way that is unobservable by the data. This report does what can be best done with the data at hand, namely, it uses as many covariates as possible in order to be able to control for heterogeneity. However, results should be read with some caution. In order to save space we only report a number of key variables in the tables that follow.

**Table 14: Probit estimation of injury and illness rates – Migrants by length of time in Australia**

<i>Specification:</i>	<i>I</i>		<i>II</i>	
	<i>M.E.</i>	<i>S.E</i>	<i>M.E.</i>	<i>S.E</i>
Australian-born				
Migrant – in Australia 5 years or less	-0.016*	0.009	-0.013	0.010
Migrant – in Australia 6-15 years	-0.002	0.008	-0.006	0.008
Migrant – in Australia 16-25 years	-0.001	0.008	-0.001	0.008
Migrant – in Australia 26 years or more	-0.001	0.006	-0.001	0.006
Other Demographic Characteristics	<i>INCLUDED</i>		<i>INCLUDED</i>	
Employment Characteristics	<i>NOT INCLUDED</i>		<i>INCLUDED</i>	
Log likelihood	-4,483.22		-4,266.39	
LR test (Joint significance)	117.81		361.81	
Pseudo R-squared	0.0130		0.0407	
Sample size (N)	18,789		17,441	

Note: \* indicates statistical significance at the 10% level.

Before looking at the results in Table 14, recall that the *Migrant* variable was not significant in any of the models presented in the previous section. This lack of significance is reflected in the estimations that follow, with only few exceptions. Table

14 presents the estimation of the likelihood of a WRI against the length of time Migrants have already spent in Australia. We cannot trace any statistical significance in the coefficients, with the exception of the suggestion that Migrants with a length of stay shorter than 5 years are less likely to suffer a WRI. However, this significance is lost when the employment variables are included in the estimation (specification II), indicating that the difference is principally due to safer occupational destinations of the newly arrived immigrants.

**Table 15: Probit estimation of injury and illness rates – Migrants by country of origin**

<i>Specification:</i>	<i>I</i>		<i>II</i>	
	<i>M.E.</i>	<i>S.E</i>	<i>M.E.</i>	<i>S.E</i>
Australian-born				
Migrant – English speaking country	0.002	0.006	0.002	0.001
Migrant – non-English speaking country	-0.008	0.005	-0.010	0.005*
Other Demographic Characteristics	<i>INCLUDED</i>		<i>INCLUDED</i>	
Employment Characteristics	<i>NOT INCLUDED</i>		<i>INCLUDED</i>	
Log likelihood	-4,483.30		-4,265.63	
LR test (Joint significance)	117.66		363.33	
Pseudo R-squared	0.0130		0.0408	
Sample size (N)	18,789		17,441	

Note: \* indicates statistical significance at the 10% level.

Table 15 suggests that all effects are very small and largely not significant. It is interesting that the marginal effect of the non-English speaking country Migrants gains in statistical significance *after* the employment variables have been included in the estimation.<sup>12</sup> This negative marginal effect suggests that Migrants from non-English speaking countries are less likely to suffer a WRI, but the effect is far too small to have any practical implication.

<sup>12</sup> The implication here is that there is some information that is part of the employment variables and which biased the coefficient towards zero. With the inclusion of the employment information in the estimation this bias was removed. The bias could be due to unobserved personal or job characteristics. It could either be that immigrants are more careful (in a way not observable by the data) and therefore less likely to be injured, or that amongst all the jobs that are included in their recorded job choice, they choose jobs that are safer than the average in the recorded category (in their unobservable characteristics).



## 6. Participation in OHS training on workplace risks and rates of WRI

Given that the survey question regarding OHS training was only asked of persons who suffered a WRI, we have been unable to estimate whether and how participation in OHS training may be related to the rates of injury and illness for Migrants, Youth and Mature Age Workers. The impact of OHS training on the severity of an injury has been investigated as the closest feasible alternative. Since there is not a direct measure of severity in the WRIS data, we employ the information on the duration of absence from work as a proxy for the severity of a WRI. Before we examine the distribution of the severity measure it is worthwhile noting that time lost is an imperfect measure of severity due to differences in the date of injury onset. For example, an individual who has been injured with a minor injury only recently could have been categorised in the highest severity group if the date of onset of their WRI was sufficiently close to the date of the interview. Since this hypothetical worker would not have had enough time to return to work yet, they would be classified in the ‘Not Returned to Work’ category. Moreover, we expect that the time lost from work can be influenced by factors other than the severity of injury, for example leave entitlements. If we consider two workers with identical injuries, the worker who is entitled to take paid sick leave is more likely to be absent from work than the one who does not have such an entitlement. Keeping these caveats in mind, we list the distribution of our severity measure for different groups of injured workers in Table 16 .

**Table 16: Number of days or shifts absent from work in past 12 months due to WRI, for persons who experienced a WRI**

	Migrants	Youth	Mature Age	All Persons
No absence	40.8	43.3	45.4	41.7
Part of a day or shift	5.5	10.0	4.9	7.5
1 – 4 days	25.6	20.3	18.6	20.8
5 – 10 days	10.3	11.3	11.3	12.0
11 days or more	14.2	12.1	16.5	15.6
Had not returned to work since injury or illness	3.5	2.9	3.4	2.5
Sample size (N)	266	206	446	1,230

Note: Figures are representative of Australian population as (WRI sample) person weights have been applied.

According to Table 16, Mature Aged workers are slightly less likely to lose working time due to work injury. Compared to 45.4 percent of the mature aged group, 40.3 percent of the injured Youth and 40.8 percent of the injured migrant workers have no absence from work following an injury. Youth is more likely to lose part of a day or shift due to injury compared to other groups. The matured aged workers are more likely to experience long absences from work compared to Youth and Migrants. Combining the last three absence categories we see that 31.2 percent of injured Mature Aged workers experience a loss of work more than 5 days. The percentages for Youth and Migrants are 26.6 percent and 28 percent, respectively. It is interesting that Youth have a higher percentage for the ‘Part of day or shift’ absence category (at 10 percent) and a lower one for the ‘1 to 4 days’ absence category. Overall, Youth have a lower rate of absence due to WRIs than both other groups, and the average for the Australian working population.

### ***6.1 Multivariate analysis of absence from work***

We model the probability of the prevalence of different severity levels of a work injury (measured as the lengths of absence from work) using an ordered probit model. Ordered probit estimation is an extension of binary probit estimation, used where the dependent categorical variable has a natural ordering and (unlike the binary case) more than two distinct outcomes. The underlying assumption of this model is that, there is a latent process which relates the severity of the injury with all right hand side variables, but that this latent process is unobserved. We only observe outcome changes which occur when the unobserved latent process passes thresholds that are defined by different severity levels. Simply put, although we do not observe the actual magnitude of severity we do identify the discrete levels of severity using information provided by WRI data. The econometric model of severity for an individual who experienced a WRI can be written as follows:

$$S_i^* = \beta X_i + \varepsilon_i \quad (3)$$

where

$$\begin{aligned}
S_i &= 0 \text{ if } S_i^* < c_0 \\
S_i &= 1 \text{ if } c_0 \leq S_i^* < c_1 \\
S_i &= 2 \text{ if } c_1 \leq S_i^* < c_2 \\
&\cdot \\
&\cdot \\
S_i &= m \text{ if } c_{m-1} \leq S_i^* < c_m
\end{aligned}$$

In Equation 3,  $S^*$  denotes the unobserved severity,  $S$  denotes an observed discrete severity level and  $c_m$  are estimates of the unobserved thresholds (usually referred to as cut-off points) that define the observed discrete severity levels. Our preliminary analysis showed that cut-off points for the first three absence duration categories (no loss of work, absence during part of a day, and absence of 1 to 4 days) are imprecisely estimated. That is, the data can not distinguish between these three lowest severity categories once demographic and employment characteristics are controlled for. This could be due to either a small sample size which cannot detect any such differences, or due to the absence of any differences between the lowest absence duration categories. We cannot know which of the two explanations holds. In our final estimations we have combined these groups in a single category. The category has been defined by the duration of absence from work are as follows:

- (i) Low (no loss of work or loss up to four days)
- (ii) Medium (loss of 5 to 10 days)
- (iii) High (11 days or more)
- (iv) Very High (Had not returned to work)

We present in Table 17 the estimated coefficients of Equation 3. As in the previous sections we use two specifications: Specification (I) contains only demographic information of the individual, whereas Specification (II) introduces employment specific information. Equation 3 is estimated using the maximum likelihood method. The ordered probit estimates also estimate the values of the cut-off points that best fit the data.

Specification (I) reveals limited information on the association of the demographic variables with the level of severity. We do not observe any statistically significant explanatory variables. The low explanatory power of our model also implies that demographic characteristics do not play an important role in the severity of an injury. However, this is not surprising. Given that the more severe WRIs are rarely observed events with large costs to individuals, it is unlikely that there will be many characteristics that are persistent and systematically associated with more severe WRIs. WRIs will be self-limiting in that the mere knowing that a characteristic is associated with a potentially very costly loss, implies that the individual who is at risk of incurring the loss would want to spend extra effort to avoid it, hence, decreasing the probability of the WRI and lowering the observed correlation of the characteristic and the loss (the WRI in this case) itself.

We can interpret the estimation results from using Specification II where employment details are included in a similar fashion. Both employers and employees can be expected to work to reduce the likelihood of a severe injury, particularly so for dangerous occupations. However, there are two reasons why their efforts may not remove completely the effect of an employment characteristic on severity. This is principally so because in most industries it may not be economically feasible to render the working environment 100 percent safe. In such industries, some of the risk will be passed on to employees, one would expect with appropriate remunerative compensation and self selection into the riskier jobs by those who can handle risk better.

We now turn to the interpretation of individual results. Specification II includes the employment characteristics and clearly performs better than Specification I which only included socio-demographic information. Occupation and industry variables are significant and the overall fit of the model is also slightly better (at about 2.5 percent). Table 17 suggests that Construction, Property and Business services, and the Health and Community services are associated with significantly more severe WRIs than the Retail

and Trade sector (the reference category). Similarly, there are statistically significant differences between different occupational categories.<sup>13</sup>

The coefficient of the full-time job variable is significant. The fact that it has a positive sign suggests that full time work is associated with more severe WRIs. There may be two reasons why we observe a positive association of full time work with the severity of a WRI. First, it could be true that the time spent at work may be positively correlated with the incidence of a work injury. However, earlier in the report (see Table 11) we established that full-time and part-time workers are equally likely to experience a WRI. It could still be that, once injured, full-time workers are more likely to have experienced a severe WRI because of the increased time spent in the workplace. Another possibility could be due to compensating differentials. One could expect that, in general, full-time employment comes with additional benefits and protection in the event of a WRI, such as more generous paid leave arrangements compared to casual or part-time employment. Therefore, injured full-time workers will be entitled to take more days off work than part-time workers with comparable injuries. The downside of this argument is that, to the extent that it is correct, it will be this economic incentive, rather than actual severity of a WRI, that will drive the results we have obtained regarding the relationship between full-time employment and severity. Finally, the distinction between the different levels of severity as they are presented in the data is done with very good accuracy. This is indicated by the fact that the cut-off points are estimated with considerable accuracy.

## ***6.2 The impact of OHS training***

In the WRIS data only individuals who had a WRI in the last 12 months were asked if they had participated to OHS training. Ideally we would also have liked to have observed OHS participation for workers without a work injury. This information would have allowed a direct assessment of the role of OHS training in the reduction of work injuries.

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<sup>13</sup>Here, we are assuming that individual significance (i.e. individual coefficients being significantly different from zero) implies joint significance (i.e. multiple coefficients being significantly different from each other) Although this assumption may not always hold, it is appropriate for the non-technical reader to use this reasoning to compare the effects of two or more variables that belong to the same category.

In the absence of this information, we have examined the association between OHS training and the severity of WRIs. A question of interest is whether workers with OHS training have a different probability of experiencing a severe WRI. Note that whilst the WRIS data allows us to see how observed occurrences of OHS training and severe WRI may co-vary in the sample, it cannot tell us whether (i) the presence of OHS training may influence the probability of a severe WRI or whether (ii) the higher ex ante risk in a type of job may influence the probability that OHS training will be offered or taken up. To understand these processes we need to decompose the problem into: (i) the effectiveness of OHS training, (ii) the degree to which workers self-select into safe/risky jobs in accordance with their ability to handle risk, (iii) the degree to which workers may be more likely to self-select into OHS training if they perceive their job to be risky, (iv) the degree to which employers are more likely to offer OHS training (both in terms of quantity and quality) if they perceive that the jobs they offer are risky. Factors (i) to (iv) work simultaneously and in an inter-dependent fashion. The single coefficient derived in the ordered probit estimation in Table 17 represents the net effect of all these factors and should be interpreted as such, avoiding the temptation to over-interpret in terms of one factor at the expense of the other ones. The truth of the matter is that the data at hand, being a single cross section survey, cannot distinguish between these simultaneously operating factors. The estimated coefficient of the OHS training variable is negative, very small and imprecisely estimated (that is to say, a reasonable 5 percent confidence interval around the coefficient contains zero in it, so that we cannot reject the hypothesis that there is a zero effect at the 5 percent level). The fact that we have a rather imprecise coefficient could mean two main things. First, it could be that the net effect is non-zero, but is just imprecisely estimated because of the small sample size, the large noise in the data and the simple structure in the model. Second it could be that the net effect is zero and if we were to find a larger sample, we would simply end up with a coefficient that would be closer to zero than in the present estimation. Note that whatever we do, using the present data we cannot infer anything about the individual simultaneous factors that jointly generate the estimated net relationship between presence of OHS training and severe WRI.

**Table 17: Ordered probit estimation of severity of WRI**

Specification	I		II	
	Coefficient	Standard Error	Coefficient	Standard Error
Male <i>[Female]</i>	0.036	0.076	-0.072	0.098
Youth: 15-24 years <i>[Prime Age: 25-44 years]</i>	-0.044	0.118	0.013	0.124
Mature Age: 45-54 years	-0.057	0.097	-0.052	0.098
Mature Age: 55-64 years	0.192	0.118	0.190	0.122
Mature Age: 65 years and above	0.254	0.288	0.346	0.296
<i>[Australian-born]</i>				
Migrant	-0.026	0.093	-0.025	0.096
Bachelor degree or higher	-0.049	0.141	0.036	0.152
Advanced diploma/ Diploma	-0.105	0.201	-0.029	0.208
Certificate (I-IV)	0.109	0.120	0.103	0.123
Year 12 <i>[Year 11 or below]</i>	0.091	0.143	0.079	0.147
Married <i>[Not married]</i>	0.103	0.161	0.046	0.165
Couple with dependent/s	-0.115	0.150	-0.048	0.153
Couple without dependent/s	-0.094	0.158	-0.041	0.162
Single with dependent/s	0.123	0.173	0.144	0.177
Lone person <i>[Group HH, Unknown, and Other family types]</i>	0.130	0.130	0.128	0.132
HH has a child under 15 years <i>[HH without child under 15 years]</i>	0.044	0.132	0.018	0.135
New South Wales	0.151	0.110	0.174	0.111
Victoria	0.023	0.119	0.033	0.122
<i>[Queensland]</i>				
South Australia	-0.078	0.139	-0.087	0.142
Western Australia	-0.081	0.130	-0.075	0.133
Tasmania	0.027	0.168	0.020	0.171
Northern Territory	0.133	0.276	0.178	0.280
Australian Capital Territory	-0.174	0.190	-0.154	0.196
Major city <i>[Regional and remote areas]</i>	-0.075	0.084	-0.084	0.090
<b>OHS Training</b> <i>[Without an OHS Training]</i>	-0.076	0.073	-0.078	0.075
Full-time job <i>[Part-time job]</i>			0.180*	0.098
Shift work arrangements <i>[Did not work under shift work arrangements]</i>			-0.079	0.092

Specification	I		II	
	Coefficient	Standard Error	Coefficient	Standard Error
Employed on contract basis			0.035	0.145
Not employed on contract basis				
<b>Occupation</b>				
Managers and administrators			0.171	0.195
[Professionals]				
Associate professionals			0.283*	0.168
Tradespersons and related workers			0.275	0.169
Advanced clerical and service workers			0.054	0.332
Intermediate clerical, sales and service workers			0.320**	0.155
Intermediate production and transport workers			0.365**	0.180
Elementary clerical, sales and service workers			0.331*	0.195
Labourers and related workers			0.546***	0.165
<b>Industry</b>				
Agriculture, forestry and fishing			0.301	0.205
Mining			0.142	0.336
Manufacturing			0.188	0.163
Electricity, gas and water supply			0.101	0.487
Construction			0.397***	0.171
Wholesale trade			0.203	0.244
[Retail trade]				
Accommodation, cafes and restaurants			-0.031	0.209
Transport and storage			0.130	0.200
Communication			0.492	0.330
Finance and insurance			0.556	0.406
Property and business services			0.395**	0.185
Government administration and defence			0.260	0.200
Education			0.262	0.215
Health and community services			0.458***	0.168
Cultural and recreational services			0.484*	0.248
Personal and other services			0.154	0.210
<b>Cut-Off Points</b>				
Cut Point 1	0.543***	0.162	1.149***	0.247
Cut Point 2	0.880***	0.163	1.494***	0.248
Cut Point 3	1.977***	0.176	2.610***	0.259
Log likelihood				
			-1070.6067	-1054.5476
LR test (Joint significance)			20.97	53.09
Pseudo R-squared			0.0097	0.0246
Sample size (N)			1230	1230

Note: \*, \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% levels, respectively. Reference categories are in square brackets.



## 7. Application for workers' compensation payments by jurisdiction

In this section we examine the distribution by jurisdiction of workers who experienced a WRI and applied for Workers' Compensation. Table 18 presents the percentage of individuals with a WRI who applied for workers' compensation. The percentage of individuals who have received workers' compensation payments is also listed. The rates of application for and receipt of Workers' Compensation vary considerably across states and within different groups.

**Table 18: Application and receipt of workers' compensation payments by jurisdiction of employment, for persons who experienced a WRI in previous 12 months**

	Migrants		Youth		Mature Age		All Persons with WRI	
	Applied	Received	Applied	Received	Applied	Received	Applied	Received
New South Wales	44.5	40.1	36.29	36.29	39.2	32.5	40.3	37.3
Victoria	26.2	22.8	24.74	22.50	28.4	24.7	28.9	25.8
Queensland	19.1	14.1	37.82	29.42	29.4	26.4	31.2	26.6
South Australia	45.3	30.4	41.56	34.64	31.2	20.5	38.6	31.5
Western Australia	34.4	31.2	28.89	28.89	43.1	39.8	33.0	32.0
Tasmania	38.3	13.3	15.29	15.29	37.3	35.5	38.9	32.7
Northern Territory	37.6	37.6	32.39	32.39	42.6	42.6	37.4	37.4
Australian Capital Territory	20.2	20.2	32.59	27.91	41.0	35.3	31.7	27.2
All jurisdictions	34.3	29.6	33.2	30.15	34.3	29.4	34.8	31.3
Sample size (N)	266		206		446		1,230	

Notes: Figures are representative of Australian population as (WRI sample) person weights are applied. Jurisdiction of employment is proxied by persons' current state or territory of residence, and so does not completely depict the set of workers' compensation jurisdictions that exist in Australia (i.e. the Commonwealth jurisdictions 'Comcare' and 'Seacare' are unable to be explicitly identified). Figures for 'Applied' and 'Received' are both proportions of all persons who experienced a WRI within each jurisdiction for each group (i.e. Migrants, Youth, etc).

Table 19 provides a multivariate analysis of the likelihood that a WRI is followed by an application for Workers' Compensation. Given that we have only a limited number of observations we only control for gender and the education level of the individuals in our sample. The model is estimated separately for Migrants, Youth and Mature Age. Table 19 shows that most of the explanatory variables are imprecisely estimated. The strongest

results are observed for the migrant workers. The injured Migrants from New South Wales and South Australia are more likely to be workers' compensation applicants (by 25 percent and 29 percent, respectively) than the injured Migrants from Queensland. Another statistically significant result is that injured Mature Aged workers from Western Australia are 15 percent more likely to apply for workers' compensation payments than their Queensland counterparts.

**Table 19: Probit estimation of application for workers' compensation payments, workers who experienced a WRI in the previous 12 months**

	Migrants		Youth		Mature Age	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error	Marginal Effect	Standard Error
Male [Female]	-0.0098	0.0608	0.1301*	0.0658	-0.0269	0.0464
Migrant			-0.1013	0.1054	0.0422	0.0518
Youth	-0.1489	0.1021				
Mature Age	0.0634	0.0616				
Bachelor degree or higher	0.0306	0.0943	-0.1146	0.1403	-0.1598**	0.0744
New South Wales	0.2564**	0.1044	-0.0898	0.0913	0.1132	0.0706
Victoria [Queensland]	0.0482	0.1080	-0.1635	0.0878	0.0104	0.0733
South Australia	0.2926**	0.1273	0.0840	0.1337	0.0648	0.0920
Western Australia	0.1327	0.1095	-0.0990	0.0965	0.1458*	0.0861
Tasmania	0.2570	0.2075	-0.1957	0.0923	0.1214	0.1124
Northern Territory	0.0913	0.1844	-0.1381	0.1726	0.0751	0.1850
Australian Capital Territory	0.0567	0.1793	-0.0189	0.1272	0.2120	0.1216
Log likelihood		-163.6		-122.4		-283.17
LR test (Joint significance)		14.57		11.96		11.05
Pseudo R-squared		0.0426		0.0465		0.019
Sample size (N)		266		206		446

Notes: \*, \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% levels, respectively. Base categories for comparison are: Female; Aged 26-44 years; Advanced diploma/ Diploma or below education level; Queensland.

In the WRIS data, injured workers who did not apply for Workers' Compensation were asked to state the reason why they did not apply. Table 20 summarises this information for Migrants, Youth and Mature Aged workers. For all groups, the most likely reason for not applying for compensation is the lack of need to do so. 52.3 percent of migrant workers, 62 percent of Youth and 48 percent of Mature Aged injured workers indicate that their WRI was too minor to necessitate an application. Around 20 percent of

Migrants and Mature Age workers reported that they were either unaware of Workers' Compensation or that they were not covered or that they thought they were not eligible (presumably in this injury instance?). This percentage is much lower for Youth at just over 11 percent. The same pattern appears in the category "Other Reasons" which was chosen by around 14 percent of Migrants and Mature Age workers and 7 percent of Youth. Put together, these categories may indicate that current regulations may be permitting a rather sizeable percentage of those who experienced a WRI to remain uncompensated for reasons that are not all that clear.

**Table 20: Main reason did not apply for workers' compensation payments, for persons who experienced a WRI in previous 12 months and did not apply for workers' compensation payments**

	Migrants	Youth	Mature Age	All Persons
Not covered or not aware of workers' compensation	11.0	1.2	10.8	7.7
Did not think eligible	8.4	11.2	10.3	9.6
Minor injury only/ Not considered necessary	52.3	62.0	47.7	51.3
Negative impact on current or future employment	6.3	10.2	5.4	7.4
Inconvenient/ Required too much effort or paperwork	5.6	3.6	8.7	7.5
Employer agreed to pay costs	1.0	2.3	1.6	2.2
Other	13.4	6.6	14.6	12.3
Did not know	2.1	3.0	1.0	2.1
Sample size (N)	175	141	290	801

Note: Figures are representative of Australian population as (WRI sample) person weights are applied.

A very small percentage (between 1 and 2.3 percent) of cases did not apply for Workers' Compensation because their employer agreed to pay the costs. A larger percentage of 5.4 percent of Mature Age workers, 6.3 percent of Migrants and 10.2 percent of Youth did not apply because they thought that their application would influence their current or future employment prospects. Although this is clearly a reason worth investigating further, the sample sizes involved in this are very small for detailed analysis. For a small percentage of workers (5.6 percent Migrants, 3.6 percent Youth and 8.7 percent Mature Age workers) either the paperwork was too much hassle or their compensation entitlement was too low (or a mix of both) so that they did not bother to fill in the necessary paperwork for filing a claim. To sum up the information in Table 20, it appears

that a large majority of those who do not apply for a Workers' Compensation do this because the specific circumstances of their WRI do not warrant an application. There is also a sizeable minority of cases who do not apply (e.g. those who fear negative employment repercussions and those who seem to be inadequately informed) for reasons that could give rise for concern about the application of current Workers' Compensation regulations.

## **8. Income sources following a WRI**

In this section we examine the financial circumstances of individuals who experienced WRIs. Table 21 lists all sources of financial assistance provided to injured workers in order to cover medical expenses or loss of income due to absence from work. It would have been informative if we could have identified medical expenses and other loss of income separately, however the WRIS data does not allow this. Around 30 percent of injured workers report that they receive financial assistance from Workers' Compensation (around 30 percent of all injured workers), and around 45 to 47 percent report that they received no assistance at all (a percentage that tallies with the large percentages of those who reported to be not eligible, not covered or that they thought it is not necessary to apply for Workers' Compensation – see Table 20). Employer provided assistance such as regular sick leave is also one of the main sources of financial assistance for these individuals. The proportion of migrant workers who are assisted by their employer is much lower than that of Youth and Mature Age workers. Medicare/Social Security/Centrelink provide financial assistance to a small percentage of workers (between 7 and 11 percent), while the involvement of private insurance is only minimal supporting 2.2 percent of Migrants, 2.4 percent of Youth and 5.8 percent of Mature Age workers.

**Table 21: All sources of financial assistance for medical expenses or loss of income following WRI, for persons who experienced a WRI in the previous 12 months**

	Migrants	Youth	Mature Age	All Persons with WRI
Workers' compensation	29.6	30.2	29.4	31.3
Employer – regular sick leave, other payment	14.6	19.0	17.0	19.7
Medicare/ Social Security/ Centrelink	11.1	7.1	10.5	8.7
Private health insurance/ Income protection insurance	2.2	2.4	5.8	4.2
Other sources	4.9	3.7	3.9	3.6
Did not receive any financial assistance	47.0	47.1	44.9	43.1
Sample size (N)	266	206	446	1,230

Notes: Figures are representative of Australian population as (WRI sample) person weights are applied. Figures for each group (i.e. Migrants, Youth, etc) need not sum to 100.0% since information represents all sources of financial assistance, thus categories are not necessarily mutually exclusive. 'Other sources' category consists of: money from family and friends, Other, Did not know.

Table 22 reports the main source of cash income for persons with work related injury. Survey questions regarding sources of personal income were asked of persons in the main sample but not of persons in the extended work-related injury sample. This reduces the scope of this data set in the present research context.<sup>14</sup> Given that we restrict our sample to individuals who experienced a WRI in the previous 12 months (hence they were employed), it is to be expected that the majority of these individuals drew their main income in the last year before interview from employment. The Youth have the highest percentage (89.6 percent) compared to 76.5 percent for Migrants and 73 percent of Mature Age workers. Business income was the main source of income for about 13 percent of Migrants and Mature Age workers and 2 percent for the Youth. A small proportion of workers who experienced a WRI (between 2.5 and 5.6 percent) reported government allowances and pension as their main source of income after a WRI.

<sup>14</sup> This is another occasion (as with the OHS training question which was only asked of those with a WRI) where the survey design could have benefited from considering possible research questions at the stage of design and piloting.

**Table 22: Main current source of personal income, for persons who experienced a WRI in the previous 12 months**

	Migrants	Youth	Mature Age	All Persons with WRI
Employee cash income	76.5	89.6	73.0	82.1
Unincorporated business cash income	12.9	2.1	13.6	8.5
Government pension or allowance	2.5	5.6	3.8	4.4
Other cash income	3.4	0.0	7.1	3.0
Not known	1.8	0.0	1.0	0.7
No specified income source	2.9	2.7	1.6	1.3
Sample size (N)	119	93	184	557

Notes: Figures are representative of Australian population as (WRI sample) person weights are applied. Survey questions regarding sources of personal income are asked of persons in the main sample and not of persons in the extended work-related injury sample, thus sample sizes are reduced.

## 9. Employment circumstances following a WRI

Table 23 reports the proportion of individuals who returned to work after a WRI and the reasons for changing jobs after a WRI. There are two factors that are likely to affect the numbers reported in Table 23. First, since the WRIS data is a cross sectional study, we can only observe post-WRI employment outcomes for those individuals who have returned to work within one year of their injury. Second, due to the way the WRI supplementary sample was selected by the ABS, we cannot observe any workers who may not have worked at all in the 12 months prior to their interview date because of past serious illness or injuries. We expect that these shortcomings will bias the sample used here towards over-representing individuals with relatively less severe WRIs, whose pre- and post injury employment patterns and outcomes are least likely to be disrupted by the WRI.

In Table 23, we present three sets of information. First, the return to work rates of Migrants, Youth and Mature Aged is presented. Most individuals amongst those who experienced a WRI (97.6 percent) had returned to work within the year of when the WRI occurred. Although the rate of return to work for Migrants, Youth and Mature Aged are

similar<sup>15</sup>, we see differences in the rate of return to the same job where the injury occurred. Mature Aged workers are more likely to go back to the same job than other groups. Youth are the group most likely to move to a new job after a WRI.<sup>16</sup> The main reason for leaving the job where their WRI occurred varies across groups. For Youth the job change is more likely to be involuntary; 8.9 percent of this group report that they were laid off or retrenched after a WRI.

**Table 23: Return to work outcomes, for persons who experienced a WRI in previous 12 months**

	Sample Size <sup>(a)</sup>	Migrants (%)	Youth (%)	Mature Age (%)	All Persons with WRI (%)
<i>Return to any work at any time after WRI</i>					
Returned to work	1,198	96.5	97.1	96.7	97.6
Did not return to work	32	3.5	2.9	3.4	2.4
<i>Return to work at job where WRI occurred</i>					
Ceased job	192	13.9	21.4	11.3	14.4
Returned to job	1,038	86.1	78.6	88.7	85.6
<i>Main reason for ceasing job where WRI occurred</i>					
Result of workplace injury or illness	52	4.6	3.6	5.0	4.1
Job related reasons – laid off or retrenched	65	4.1	8.9	2.5	4.4
Holiday job/ Returned to studies/ Other health or disability	75	5.3	8.8	3.8	5.9
Returned to job	1,038	86.1	78.6	88.7	85.6
Sample size (N)		266	206	446	1,230

Note: Figures are representative of Australian population as (WRI sample) person weights are applied.(a) Sample Size refers to the number of observations in a given sub-category.

<sup>15</sup> In fact, Wald tests of the proportions of persons that returned to work for each group (Migrants, Youth, and Mature Age) reveal that these proportions are not statistically significantly different from the proportion in the all persons group. That is, the proportion of Migrants that returned to work (96.5%) is not statistically significantly different from the proportion of all persons that returned to work (97.6%), and similarly for the Youth and Mature Age groups.

<sup>16</sup> Wald tests of the proportions of persons that returned to job where work related injury or illness occurred for each group (Migrants, Youth, and Mature Age) reveal that these proportions are statistically significantly different from the proportion in the all persons group for the Youth and Mature Age groups. That is, the proportion of Youth that returned to the job where the work related injury or illness occurred (78.6%) is statistically significantly different from the proportion of all persons that returned to job where the work related injury or illness occurred (85.6%). The same holds for Mature Age workers but not for Migrants.

An equally likely reason for Youth to change their job after a WRI (8.8 percent) was because the job where the WRI occurred was temporary, or because of health reasons unrelated to the WRI. The occurrence of the WRI was the main reason for changing jobs for Mature Age workers only.

In the previous sections we mentioned that due to the time limitation of the sampling frame of the WRIS data and due to the nature of our selected sample it is possible that our analysis will over-represent individuals with relatively less severe injuries. This possibility is highlighted by the high percentage of individuals who return to work after a WRI, and by the high probability that employment circumstances remain largely the same for most of the workers who experience a WRI (see Section B for the employment characteristics of the injured workers). Additional information on the impact of WRIs on employment can be gained by investigating the working hours following a WRI. Table 24 below compares the working hours of injured workers before and after their injury. We use the information contained in two variables: the working hours in their current main job and the working hours where the injury has occurred. We restricted the sample to individuals who report that their current main job is the same job they had when their WRI occurred.

Table 24, shows that 35 percent of all injured workers reduced their working hours after the injury. Mature Age workers were the most likely to reduce their working hours (40.5 percent of them decreased their working hours after injury). 37.5 percent of the injured Youth also reported reduced hours in the main job after a WRI. Migrants are the least likely to reduce their working hours. Between 17 and 21 percent of the workers who experienced a WRI find themselves working longer hours after their WRI. This high proportion of workers who increase their working hours after a WRI (one would rightly presume *not* because of the WRI) indicates that WRIs may also act as triggers for a job change.



**Table 24: Employment characteristics, for persons who experienced a WRI in the previous 12 months and had returned to work (and currently employed)**

	Migrants	Youth	Mature Age	All Persons with WRI
<i>Changes in hours per week usually worked in the main job after work injury (%)</i>				
Decreased Hours	34.9	37.6	40.5	34.9
Increased Hours	17.5	20.9	17.6	18.3
Hours Unchanged	47.6	41.5	41.8	46.7
Sample size (N)	227	154	394	1,038

Note: Figures are representative of Australian population as (WRI sample) person weights are applied.

## 10. Social circumstances following a WRI

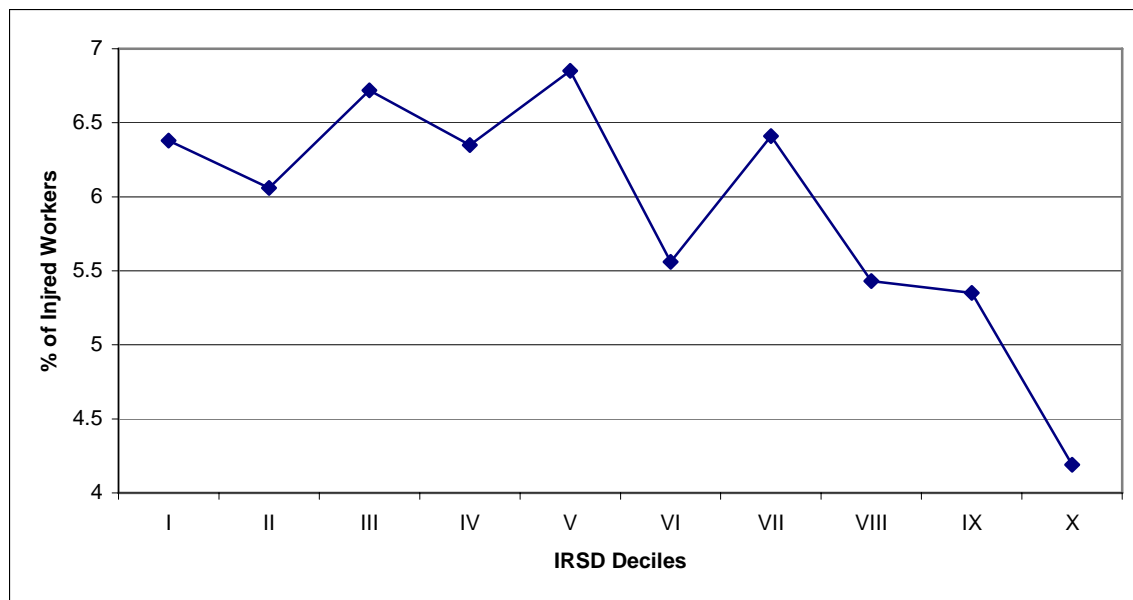
Ultimately, we are interested in the association between socio-economic environment and the prevalence of WRIs. What is the impact of WRIs on socio-economics circumstances? Are WRIs more likely for those who come from relatively disadvantaged socio-economic backgrounds? Unfortunately, these two questions can not be answered separately using WRI data.

The WRI data includes indices that measure different aspects of socioeconomic conditions at the Census Collection District (CD) level. These measures do not reflect the social circumstances of a particular individual directly, but they summarise the socioeconomic level of people in the area they live. The indices are calculated by the ABS using a data reduction method called Principal Component Analysis. The variables that are used to construct these indices typically contain information on education, employment, occupation, family type and wealth. For example, the *Index of Relative Socio-Economic Disadvantage* (IRSD) summarises twenty census variables that are considered to be good indicators of socio-economic disadvantage, such as the prevalence of low income, high unemployment and low levels of education<sup>17</sup>. Given that the information contained in these indices is relative, they have been standardised so that

<sup>17</sup> See Table A5 in Appendix 3 for the complete list of variables and their associated weights used to construct IRSD index.

they all have a mean of zero. The WRI data does not report the ‘raw’ index values, instead, it contains the index deciles that each respondent belongs to.<sup>18</sup> A low decile IRSD area contains many low income families, many people with little training and many people working in unskilled occupations. A high decile IRSD area contains fewer families with low incomes, fewer people with little or no training and fewer people working in unskilled occupations. Although the IRSD includes variables that describe economic conditions at the CD level, it is shown to be associated with other aspects of life. According to Adhikari (2006), a low IRSD decile is significantly associated with worse physical health (e.g. higher rates of obesity, lower levels of self reported health) and worse mental health (i.e. higher prevalence of high or very high distress levels).

**Figure 1: Percentage of Individuals with WRI by IRSD Deciles**



Notes: Figures are representative of Australian population as (main sample) person weights are applied. The percentages are calculated using 17,354 individuals who were employed within 12 month prior to data collection.

We ask first whether it is more likely to observe workers who experienced WRIs in disadvantaged areas compared to less disadvantaged areas. The Figure 1 presents the percentage of individuals with WRIs in each IRSD decile. Note that in order to facilitate the interpretation, we have enlarged the graph (it is scaled to have a minimum of 4

<sup>18</sup> The ABS imposes an unnecessary data restriction by not including the raw variables that are used to construct the indices (especially if one considers the imposed RADL access of the data) which is detrimental to the research potential of the data.

percent instead of zero) therefore the numerical differences between deciles are smaller than they appear in the Figure. In Figure 1 we see a slight but negative relationship between the degree of disadvantage and the percentage of individuals with WRIs. The likelihood of observing an injured worker in the working population is around 6 to 7 percent in the first 5 IRSD deciles. When we move to the 10<sup>th</sup> decile (the area that has the least socioeconomic disadvantage) the likelihood of observing a WRI is remarkably lower (around 4.2 percent of all the working population in that area). It may be that individuals who live in areas with limited access to training have a higher likelihood of finding employment in ‘risky’ occupations. It must be noted that the data at hand is not sufficient for the empirical identification of a causal relationship. This is so because we only observe a higher percentage of WRIs amongst workers living in areas that are socioeconomically disadvantaged and we have no further information on possible underlying causes and structures.

We conclude this analysis by comparing the socioeconomic advantage distribution of workers with and without injuries. We use the *Index of relative socio-economic advantage/disadvantage* (IRSAD) provided by the WRI survey. The IRSAD summarises CD level variables that represent both advantage and disadvantage, allowing us to measure advantage and disadvantage as a continuum. This index includes variables such as percentage of families with high income and low income as well as percentage of individuals that work in high and low skilled occupations.<sup>19</sup> Areas in the lower deciles of IRSAD can be thought of as relatively disadvantaged areas, and areas in the higher deciles can be thought of as relatively advantaged areas.

In Table 25 we list the IRSAD deciles for the whole working population also distinguishing between those with and those without WRIs. Table 25 confirms our previous findings using the IRSD index, in that, individuals with WRIs are more likely to be living in areas with undesirable socio-economic characteristics such as low income, unemployment and low levels of education compared to individuals without work injuries. The difference between the two groups becomes more pronounced at the tails of

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<sup>19</sup> See Table A6 in Appendix 3 for the complete list of variables and their associated weights used to construct IRSAD index.

the IRSAD distribution. 21 percent of work injured persons live in the lowest two IRSAD deciles compared to 15.4 percent of persons without injuries. Similarly, only 16 percent of individuals with WRI live in the highest two IRSAD deciles compared to 22.5 percent of individuals without WRI.

**Table 25: Social circumstances by whether experienced a WRI in previous 12 months, for employed persons**

	Employed persons who experienced WRI	Employed persons who did not experience WRI	All employed persons
<i>Index of relative socio-economic advantage/ disadvantage – Deciles (%)</i>			
1 <sup>st</sup> decile	8.9	6.8	6.9
2 <sup>nd</sup> decile	12.0	8.6	8.8
3 <sup>rd</sup> decile	8.5	9.4	9.3
4 <sup>th</sup> decile	9.7	10.0	10.0
5 <sup>th</sup> decile	13.6	10.2	10.4
6 <sup>th</sup> decile	9.4	10.7	10.6
7 <sup>th</sup> decile	9.1	10.7	10.6
8 <sup>th</sup> decile	12.4	10.6	10.7
9 <sup>th</sup> decile	7.9	11.0	10.8
10 <sup>th</sup> decile	8.2	11.5	11.3
Undetermined	0.4	0.5	0.5
Sample size (N)	1,143	16,211	17,354

Notes: Figures are representative of Australian population as (main sample) person weights are applied.

## **11. Conclusion**

The main objective of this report is to analyse the factors associated with workplace injury among Migrants, Mature Age workers and Youth. Workers belonging to each of these groups are in their own way both different and more vulnerable than the representative member of the Australian working population. The motivation for this analysis is that by furthering our understanding of health and safety issues in the workplace we can enhance labour force participation and retention of these groups of workers. A further motivation of this analysis is the recent release of a new data set by the ABS that was sponsored by the Department of Education, Employment and Workplace Relations, the ABS 2006 Workplace Related Injuries Survey (WRIS).

The nature of workplace injuries and their main preventive mechanism (OHS Training) is highly self-limiting, in that we can expect workers in riskier jobs to show more willingness for taking up OHS training and to be more careful and capable of handling physical risk in an attempt to protect themselves and limit the probability of a workplace injury. At the same time we can expect employers to be keen to eliminate hotspots of risky activity in their workplace where the risks have been identified as unacceptably high. One of the ways to do this is by making the workplace safer and another is by offering OHS training more widely and more rigorously. Employers motivated by pure profit-making incentives will act this way as a reasonably safe workplace will help them protect their ability to hire good employees at reasonable wages. Thus we can expect self-interested behaviour from both sides of the employment relationship to provide incentives to intervene and reduce the risk of workplace injuries. This observation suggests that we cannot expect to find in our data many striking systematic and persistent differences in workplace injury rates. This will be so because if for some reason an exogenous factor increased the riskiness of one or another job activity, both employees and employers would intervene to eliminate it and return it to a reasonable level of workplace risk. This level of risk is by its very nature very hard to predict at the individual level, which is what the analysis of this report shows.

This report contains the first in depth analysis of a newly released ABS data set, the 2006 Workplace Related Injuries Survey (WRIS). This report identifies a number of serious shortcomings in the design of the data set which seriously limit its use for in depth economic and econometric analysis. For example, the OHS training information was only asked of those who reported a workplace injury. Hence, comparisons to the wider working population are not feasible. The report makes the strong recommendation that more piloting be carried out during the data design phase, jointly involving the research and the policy communities, in order to maximize the scope and usefulness of national data sets. Given that such data sets are a unique national asset in their contribution towards the design of evidence-based policy, every effort must be made to target the evidence collected towards the policy relevant issues and the questions that may be feasibly addressed. This report also identifies that access to the data via the RADL system limits the type of statistical analysis that can be performed. This could be addressed through the use of safe rooms in full compliance with the confidentiality requirements of the Commonwealth.

The analysis defines Migrants as those who reported a Country of Birth other than Australia, Youth as those aged between 15 and 24 years and Mature Age as those aged 45 years and over, making the further distinction of those aged 45 to 54, 55 to 64 and 65 and over where pertinent.

Empirical examination of the different types of workplace injuries and illnesses suggested that we use the following categorisation: Fracture and crushing injury / internal organ damage; Chronic joint or muscle condition; Cut or open wound and superficial injury; Stress or other mental condition and other injuries; Sprain or strain (*used as the reference category in all estimations*).

With the exception of the length of absence from work following a workplace injury, the data does not contain any other information by which we can judge the severity of the workplace injury. Multivariate regressions have shown that the following categories of length of absence are empirically relevant. *Low severity*, which contains all injuries that

resulted in an absence of up to four working days (including the cases with no absence at all); *Medium severity*, which contains absences from five to ten days; *High severity* which contains absences of eleven days or more but workers had returned to work by the time of interview; *Very High severity* which contains a small percentage of workers who had not returned to work by the time of their interview. Clearly the last category is closely related to the issue of labour force retention following a workplace injury.

A number of factors related to workplace injuries and outcomes following a workplace injury have been examined. These include the length of absence from work, whether there have been changes in full time and part time status for those who return to work, whether they received any financial assistance for the work absence (and the source of this assistance), the relationship between OHS training and workplace injuries, whether Workers' Compensation was applied for or not (and the reasons why it was not applied for)

The descriptive analysis of the three groups of interest highlighted a number of similarities and differences between them and the representative member of the Australian working population. On average Migrants are more educated and more likely to be residing in major cities. Youth workers are more likely to be in casual employment with fewer than average work hours and entitlements. Participation in OHS training was higher for Youth compared to either Mature Age workers or Migrants. Workplace injuries are more common amongst those in the lower two socio-economic advantage deciles and less common amongst those in the higher two deciles. The rate of applications for Workers' Compensation by workers who experienced a workplace injury is different between Migrants, Mature Age workers and Youth. However, there is no discernible pattern that arises from the regression results.

The core of the econometric analysis is based on multivariate analysis using a number of LOGIT and PROBIT estimations. The econometric analysis generated a number of informative results which include the following.

*OHS Training:* A weak suggestion that higher prevalence of OHS training is associated with shorter absences from work following a workplace injury. Statistically, this result is very weak. We explained that this weakness in the estimated relationship could well be the case of two-way causalities being present and working in opposite directions: high risk jobs may be more likely to generate more/better OHS training (a positive relationship between workplace injury prevalence and OHS training prevalence, resulting from higher demand for training by employers and employees where they perceive the job risk to be higher) and more/better OHS training being able to generate lower rates of workplace injury (a negative relationship between workplace injury prevalence and OHS training prevalence, resulting from effective training). The evidence we have suggests that the positive (causal) effect of OHS training on workplace injury rates is stronger than the negative (causal) effect of job riskiness on the take up rate of OHS training. This implies that OHS training makes a useful contribution to prevention of workplace injury in Australia, but a number of data caveats that are examined in the data section of the report do not allow a statistically precise quantification of this effect.

*Severity of workplace injuries:* Once the socio-demographic and employment characteristics of Migrants, Mature Age workers and the Youth are considered, there are no differences in the severity of workplace injuries between these groups. In the absence of a direct measure in the data set, severity has been approximated by the length of stay off work and is found to be associated only with the employment variables in the estimation.

*Return to work after a workplace injury:* Around 97 percent of all workers who reported having experienced a workplace injury in the last 12 months were at work at the time of interview. Workplace injuries do not appear to be a major cause of leaving the labour market altogether. However, they appear to be associated with changes in work circumstances. Between one in five and one in six of those who returned to work after a workplace injury returned to another job. The reason for the job change for one third of them was because they were either retrenched or laid off. The reason for job change for the other two thirds was not related to their workplace injury. Most of the negative effect



of the workplace injury seems to have been confined to a reduction in the hours worked for those who returned to work after a workplace injury. Between 35 and 40 percent work decreased their work hours. It is noteworthy that between 17 and 21 percent increased their work hours after a workplace injury, supporting the view that we are also looking at normal job turnover changes, many of which would have happened without the workplace injury.

*Migrants, origin and length of stay in Australia:* Although raw data appear to suggest that more recently arrived Migrants experienced fewer workplace injuries than their more assimilated (older arrivals) counterparts, this relationship is primarily driven by the occupation and sector choices of newer migrant arrivals. Migrants who have been in Australia for less than five years experience fewer workplace injuries because of their choice of industry and occupation. The distinction between Migrants originating from English speaking and non-English speaking countries appears to be empirically relevant in that non-English speaking country Migrants are less likely to experience a workplace injury. The margin of only one percent, however, is too small to be of any practical significance.

*Applications for Workers' Compensation following a workplace injury:* Not everyone who experienced a workplace injury applied for Workers' Compensation. In most of these cases the injury was considered too minor to make such an application. A sizeable minority of workers who experienced a workplace injury, however, did not apply for compensation for reasons that could give rise to concerns. These include 'not covered or not aware of workers' compensation', 'did not think eligible', 'inconvenient/required too much effort' and last but not least, due to fears of 'negative impact on current or future employment'. This last category, particularly prevalent amongst the Youth, may be the result of higher job insecurity in this part of the labour force.

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## Appendix 1: List of WRIS variables used in the analysis

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WRIS Variable:	Definition:
AGEC	Age
SEX	Sex
MARSTAT	Social marital status
RELINHHC	Relationship in household
COBCURF	Country of birth
YEARARCU	Year of arrival to Australia
STATEUR	State/territory
AREASR	Capital city/balance of state
MESCCURF	Whether comes from main English speaking countries
UNDER15	Whether household has children aged under 15 years old
FCOMPHHC	Family composition of Household
DSEIFAD	Index of relative socio-economic index disadvantage – Deciles
DSEIFAA	Index of relative socio-economic index advantage/disadvantage - Deciles
REMOTEC	Remoteness
EDATTAIC	Level of highest educational attainment (ASCED)
MAININCC	Principal source of cash income*
	<i>* categories include : Employee cash income, Unincorporated business cash income, Government Pension and Allowance, Other cash income, Not known, No specified income source.</i>
HRUWAJC	Hours usually worked in all jobs
DURUNEMC	Duration of unemployment
STATEMPC	Status in employment*
	<i>* categories include : Employees, Employers, Own account workers.</i>
FTPTEMP	Full-time or part-time status in employment
LFSTATUS	Labour force status
OCCCJOC	Occupation of current job
INDCUJOC	Industry of current job*

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<b>WRIS Variable:</b>	<b>Definition:</b>
	<i>*based on ANZSIC 1-digit classification</i>
WKDHOURE	Hours worked in all jobs
HRAWMJC	Hours worked in main job(actual hours)
TENUREC	Duration of current job
FTPTLJCU	Full-time or part-time status of last job
LFMJSTC	Multiple job holder status
XTRASAMP	Extra sample identifier
EMPCUJOC	Employment type in current main job*
	<i>* categories : With paid entitlements, Without paid entitlements, Owner manager of incorporated enterprises, Owner manager of unincorporated enterprises.</i>
DURCUJOC	Duration of current main job
SHIFCJOB	Whether worked shift work in current main job
CONTCJOC	Whether worked on a contract in current main job
WRIJOBHC	Usual weekly hours in job where most recent WRI occurred
FTPTWRIJ	Whether worked full time or part time in job where most recent WRI occurred
STEMWRIC	Status in employment of job in which most recent WRI occurred*
	<i>* categories: Employees, Employers/own account workers.</i>
CONJWRIC	Whether worked on a contract in job where most recent work-related injury or illness occurred
SHIFTWRI	Whether worked shift work in job where most recent WRI occurred
OCWRIJCB	Occupation in job where most recent WRI occurred
INDWRICC	Industry in job in which most recent occurred
DUWRIJC	Duration of employment in job where most recent WRI occurred

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<b>WRIS Variable:</b>	<b>Definition:</b>
EMTYWRCU	Employment type of job where most recent WRI occurred*  <i>* categories : With paid entitlements, Without paid entitlements, Owner manager of incorporated enterprises, Owner manager of unincorporated enterprises</i>
WRISUMC	Work-related injury or illness status
WRIJOB	Whether most recent WRI occurred in current main job,
ABSENWRI	Days or shifts absent from work in the last 12 months due to WRI
FINASSC	All sources of financial assistance for medical expenses or income loss for most recent WRI*  <i>* multiple response variable. Categories include : Workers' compensation, Employer regular sick leave or other payment, Medicare, Social Security, Centrelink, Private Health Insurance, Income Protection Insurance, Other sources, Did not receive any financial assistance</i>
APPWORCO	Whether applied for or received workers compensation
WRISUSC	Most recent work-related injury or illness sustained*  <i>* categories include: Fracture, Chronic joint or muscle condition, Sprain/strain, Cut or open wound, Crushing injury/internal organ damage/amputation, Superficial injury, Stress or other mental condition, Other</i>
RETURWRK	Whether returned to any work at any time after WRI
OHSTRAIN	Whether received any formal training in OHS risks in workplace at any time prior to WRI

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## Appendix 2: Demographic and employment characteristics, disaggregated Mature Age categories

Table A1: Demographic characteristics

	Migrants	Youth	Mature Age: 45-54	Mature Age: 55-64	Mature Age: 65 plus	All Persons
<i>Gender (%)</i>						
Male	55.5	51.3	52.9	59.2	63.5	54.6
Female	44.5	48.7	47.1	40.8	36.5	45.4
Average age	42.0	20.1	49.2	58.6	69.0	39.0
<i>Age categories (%)</i>						
15-24 years	9.5	100.0	0.0	0.0	0.0	18.2
25-34 years	19.6	0.0	0.0	0.0	0.0	22.0
35-44 years	26.8	0.0	0.0	0.0	0.0	23.2
45-54 years	25.4	0.0	100.0	0.0	0.0	21.7
55-64 years	16.5	0.0	0.0	100.0	0.0	12.6
65 years and above	2.1	0.0	0.0	0.0	100.0	2.4
<i>Highest educational attainment (%)</i>						
Postgraduate degree	7.3	0.1	4.7	5.2	2.9	3.9
Graduate diploma/ graduate certificate	2.3	0.3	3.8	3.1	2.5	2.7
Bachelor degree	22.4	9.9	16.3	13.2	13.2	17.0
Advanced diploma/ Diploma	9.1	5.7	10.4	8.3	10.3	8.9
Certificate III/ IV	13.7	12.0	16.4	17.2	14.2	16.4
Certificate I/ II	0.0	0.5	0.2	0.3	1.4	0.4
Certificate not further defined	0.4	0.1	0.8	1.3	3.4	0.5
Year 12	19.1	37.9	13.1	9.2	11.3	19.7
Year 11	5.2	12.3	6.8	4.0	5.0	7.3
Year 10	11.0	15.5	18.3	20.3	14.1	15.3
Year 9	3.1	4.6	4.0	7.8	6.7	3.7
Year 8 or below (includes no school attendance)	5.3	0.5	3.8	9.0	13.2	3.2
Not determined	1.2	0.6	0.6	1.6	1.3	1.1
<i>Marital status (%)</i>						
Married	72.0	14.4	78.7	79.7	72.9	63.4
Not married	28.0	85.6	21.3	20.3	27.1	36.7
<i>Family type (%)</i>						
Couple with dependent/s	40.6	39.7	42.4	11.6	3.1	39.6
Couple without dependent/s	23.1	9.5	21.9	48.3	60.3	22.6
Single with dependent/s	2.9	8.2	4.4	0.7	1.3	4.7
Other family types	17.4	26.4	18.6	21.2	12.9	17.2
Lone person	8.6	4.1	9.9	14.0	20.2	9.4
Group household	4.7	8.7	1.3	1.2	0.7	4.3
Unknown	2.8	3.6	1.6	3.0	1.7	2.2

	Migrants	Youth	Mature Age: 45-54	Mature Age: 55-64	Mature Age: 65 plus	All Persons
<i>Children aged under 15 years in Household (%)</i>						
HH has at least one	35.3	24.6	29.4	5.3	3.0	34.6
HH has none	64.7	75.5	70.6	94.8	97.0	65.4
<i>State or territory of residence (%)</i>						
New South Wales	36.7	32.3	33.4	31.9	35.6	32.8
Victoria	25.7	22.9	24.7	23.9	22.0	24.6
Queensland	17.0	21.7	18.9	19.8	23.5	19.9
South Australia	5.7	6.9	7.8	8.3	5.2	7.4
Western Australia	11.8	11.1	10.3	11.0	9.0	10.4
Tasmania	0.9	2.4	2.4	2.5	2.7	2.3
Northern Territory	0.7	0.8	0.8	0.8	0.4	0.8
Australian Capital Territory	1.4	1.9	1.7	1.8	1.6	1.8
<i>Area/ Remoteness of residence (%)</i>						
Major city	84.6	71.5	64.1	65.6	61.8	68.3
Inner regional	9.7	18.2	22.1	20.8	22.0	19.7
Other	5.7	10.4	13.8	13.5	16.2	12.0
Sample size (N)	4,575	2,500	3,978	2,601	548	18,789

Note: Figures are representative of Australian population as (main sample) person weights are applied.

Table A2: Labour force status

	Migrants	Youth	Mature Age: 45-54	Mature Age: 55-64	Mature Age: 65 plus	All Persons
<i>Labour force status (%)</i>						
Employed	92.1	87.6	96.0	92.2	83.8	92.6
Full-time employed	75.7	56.7	74.1	70.3	38.1	71.5
Part-time employed	24.3	43.3	25.9	29.7	61.9	28.5
Unemployed	2.3	4.8	1.3	1.4	0.1	2.3
Not in labour force	5.7	7.7	2.7	6.4	16.1	5.2
Sample size (N)	4,575	2,500	3,978	2,601	548	18,789

Note: Figures are representative of Australian population as (main sample) person weights are applied.

Table A3: Employment characteristics, for persons employed

	Migrants	Youth	Mature Age: 45-54	Mature Age: 55-64	Mature Age: 65 plus	All Persons
<i>Hours per week usually worked in all jobs (%)</i>						
1 to 15 hours	8.0	26.8	7.2	10.5	34.7	11.4
16 to 29 hours	11.5	14.9	13.1	14.1	19.5	13.0
30 to 34 hours	6.0	3.1	7.0	6.4	8.6	5.4
35 to 39 hours	21.4	20.9	20.9	19.7	10.6	21.2
40 hours	26.2	22.0	21.3	19.6	7.3	22.3
41 to 44 hours	3.0	2.2	3.1	3.2	0.9	3.0
45 to 49 hours	8.4	5.7	7.9	8.3	5.1	7.9
50 to 59 hours	8.9	2.8	10.2	10.8	5.7	9.2
60 hours and above	6.6	1.6	9.4	7.5	7.6	6.6
<i>Number of jobs (%)</i>						
Multiple jobs	4.7	4.6	5.5	4.9	4.9	5.2
Single job	95.4	95.5	94.5	95.1	95.1	94.8
<i>Employment type (Main job) – Status (%)</i>						
Employee	87.8	97.3	85.6	83.5	58.5	87.6
Employer	2.7	0.1	3.7	3.8	7.3	2.8
Own account worker	9.6	2.6	10.7	12.8	34.3	9.7
<i>Employment type (Main job) – Leave entitlements (%)</i>						
Employee with paid leave entitlements	63.5	54.0	63.0	57.4	18.0	62.0
Employee without paid leave entitlements	15.0	43.0	13.4	13.1	22.4	18.5
Owner manager of incorporated enterprise	9.3	0.3	9.1	13.0	18.1	7.1
Owner manager of unincorporated enterprise	12.2	2.7	14.4	16.5	41.6	12.4
<i>Employment type (Main job) – Contract (%)</i>						
Employee on a fixed-term contract	3.9	4.0	4.0	3.3	1.6	4.1
Employee not on a fixed-term contract	74.6	93.0	72.4	67.2	38.4	76.4
Owner manager on contract basis	4.8	1.1	6.1	5.7	8.5	4.8
Owner manager not on contract basis	16.7	1.9	17.5	23.8	51.4	14.8
<i>Employment type (Main job) – Shift work (%)</i>						
Worked under shift arrangements	17.1	22.8	14.4	11.7	5.8	15.9
Did not work under shift arrangements	82.9	77.2	85.6	88.3	94.2	84.1
<i>Duration of employment (Main job) (%)</i>						
Less than 3 months	5.0	11.4	3.8	3.1	2.1	5.7
Between 3 and 6 months	6.5	14.0	3.6	2.0	0.3	6.1
Between 6 and 12 months	9.8	17.4	5.6	3.1	1.2	9.2
Between 1 and 2 years	10.5	21.5	6.1	4.4	0.9	10.8
Between 2 and 5 years	24.7	29.3	17.8	16.6	12.2	24.2
Between 5 and 10 years	17.0	6.3	19.8	18.7	12.1	17.7
10 years and above	26.5	0.1	43.3	52.2	71.2	26.4
Sample size (N)	4,211	2,175	3,780	2,385	456	17,354

Note: Figures are representative of Australian population as (main sample) person weights are applied.



Table A4: Occupation and industry classifications, for employed persons

	Migrants	Youth	Mature Age: 45-54	Mature Age: 55-64	Mature Age: 65 plus	All Persons
<i>Occupation classification (ASCO 1-digit) (%)</i>						
Managers and administrators	7.1	1.4	12.4	14.0	22.4	9.0
Professionals	24.1	10.8	21.6	20.5	19.4	20.5
Associate professionals	14.3	6.9	13.8	14.0	13.3	13.0
Tradespersons and related workers	10.6	16.7	9.9	8.7	5.8	12.0
Advanced clerical and service workers	3.8	3.1	4.0	4.6	7.5	4.2
Intermediate clerical, sales and service workers	14.2	19.0	15.5	13.9	7.9	15.8
Intermediate production and transport workers	8.1	6.5	8.8	9.4	7.8	7.8
Elementary clerical, sales and service workers	7.9	25.4	6.1	5.4	5.6	9.1
Labourers and related workers	9.9	10.2	8.0	9.5	10.3	8.5
Inadequately described	0.0	0.1	0.0	0.0	0.0	0.0
<i>Industry classification (ANZSIC 1-digit) (%)</i>						
Agriculture, forestry and fishing	1.7	1.5	4.1	5.4	19.5	3.8
Mining	1.0	0.5	1.3	1.8	0.5	1.3
Manufacturing	13.2	8.0	10.8	9.9	7.3	10.6
Electricity, gas and water supply	0.6	0.7	0.8	0.9	0.8	0.8
Construction	7.1	9.8	8.0	6.7	7.4	8.6
Wholesale trade	5.0	2.1	4.3	5.5	1.3	3.9
Retail trade	12.3	34.4	8.8	9.3	11.4	14.4
Accommodation, cafes and restaurants	5.5	6.8	2.9	3.2	3.0	4.0
Transport and storage	5.6	3.0	5.2	8.0	5.9	5.0
Communication	2.5	1.5	2.1	1.4	1.6	2.0
Finance and insurance	4.2	1.8	2.7	2.9	1.7	3.5
Property and business services	14.9	10.3	11.8	12.3	17.5	12.5
Government administration and defence	4.6	1.8	6.7	5.9	0.5	4.9
Education	5.4	3.7	11.2	9.5	1.7	7.2
Health and community services	11.3	6.2	13.6	11.3	8.0	10.4
Cultural and recreational services	1.7	3.8	1.9	3.0	4.3	2.7
Personal and other services	3.5	4.1	3.9	3.1	7.8	4.4
Inadequately described	0.1	0.1	0.1	0.0	0.0	0.1
Sample size (N)	4,211	2,175	3,780	2,385	456	17,354

Note: Figures are representative of Australian population as (main sample) person weights are applied.

### Appendix 3: Variables used in construction of IRSD and IRSAD indexes

Table A5: List of Variables used for the Index of Relative Socio-Economic Disadvantage and their weights

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<i>Variable</i>
% Persons aged 15 years and over with no qualifications
% Families with offspring having parental income less than \$15,600
% Females in labour force unemployed
% Males in labour force unemployed
% Employed Females classified as 'Labourers & Related Workers'
% Employed males as classified as 'labourers and related workers'
% One-parent families with dependent offspring only
% Persons aged 15 years and over who left school at Year 10 or lower
% Employed Males classified as 'Intermediate Production & Transport Workers'
% Families with income less than \$15,600
% Households Renting from Government Authority
% Persons aged 15 years and over separated or divorced
% Dwellings with no motor car at dwelling
% Employed Females classified as 'Intermediate Production & Transport Workers'
% Persons aged 15 years and over who did not go to school
% Indigenous
% Lacking fluency in English
% Employed Females classified as 'Elementary Clerical, Sales & Service Workers'
% Occupied private dwellings with two or more families
% Employed Males classified as 'Tradespersons'

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Source: Adhikari (2006)

Table A6: List of Variables used for the Index of Relative Socio-Economic Advantage/Disadvantage and their weights

<i>Variable</i>
% Persons aged 15 years and over with no qualifications
% Persons aged 15 years and over who left school at Year 11 or lower
% Couple families with no children with annual income less than \$20,800
% Couple families with dependent child(ren) only with annual income less than \$36,400
% Employed Females classified as 'Labourers & Related Workers'
% Employed Males classified as 'Labourers & Related Workers'
% Employed Males classified as 'Intermediate Production & Transport Workers'
% Single person household with income less than \$15,600
% Males (in Labour Force) unemployed
% Females (in labour force) unemployed
% Couple families with dependents and non-dependents or with non-dependents only with annual income less than \$52,000
% One-parent families with dependent offspring only
% Employed Males classified as 'Tradespersons'
% Employed Females classified as 'Intermediate Production & Transport Workers'
% Employed Females classified as 'Elementary Clerical, Sales & Service Workers'
% Single parent families with dependents and non-dependents or with non-dependents with annual income less than \$26,000
% Dwellings with four or more bedrooms
% Employed Females classified as 'Advanced Clerical & service Workers'
% Single parent families with dependents and non-dependents or with non-dependents with annual income greater than \$62,399
% Employed Males classified as 'Associate Professionals'
% Persons aged 15 years and over at University or other tertiary institution
% Single parent families with dependent child(ren) only with annual income less than \$15,600
% Couple families with dependents and non-dependents or with non-dependents only with annual income greater than \$103,999
% Persons using Internet at home
% Single person households with income greater than \$36,399
% Employed Females classified as 'Professionals'
% Persons aged 15 years and over having an advanced diploma or diploma qualification
% Employed Males classified as 'Professionals'
% Couple families with no children with annual income greater than \$77,999
% Couple families with dependent child(ren) only with annual income greater than \$77,999
% Persons aged 15 years and over with degree or higher

Source: Adhikari (2006)

## **Appendix 4 : The Computation of Conditional Probability of a WRI**

In this section we provide details on the calculation of the conditional probabilities provided in Tables 9 and 10. In order to derive a meaningful risk measure, we are

interested in the conditional probability of injury given that a person belongs to a specific occupation (i.e.  $P[\text{Injured} \mid \text{Occupation}]$ ). This risk measure is not directly provided but can be obtained using a fundamental statistical identity called Bayes' Theorem. For example, the probability of a WRI given that a person belongs to a specific occupation can be written as follows:

$$P[\text{Injured} \mid \text{Occupation}] = \frac{P[\text{Occupation} \mid \text{Injured}]}{P[\text{Occupation}]} \times P[\text{Injured}]$$

In section 3, the first part of Table 4 provides the occupational distribution of all persons who were in employment within 12 month prior to the data collection. Each number in Table 4 represents a marginal probability of being in a certain occupation (i.e.  $P[\text{Occupation}]$ ). At the same time, the equivalent number in Table 8 represents the occupational distribution among injured workers. In other words Table 8 provides the conditional probability of employment in an occupation *given that a person is injured*, (i.e.  $P[\text{Occupation} \mid \text{Injured}]$ ).

Tables A7 and A8 list the ratio represented by the first term of the right hand side of Bayes' Theorem  $P[\text{Occupation} \mid \text{Injured}] / P[\text{Occupation}]$ . The second term of the theorem, the probability of injury, is provided at the bottom of the tables (labelled as 'Ratio of Injured to All Employed'). The interpretation of these ratios is similar to the odds ratios that are commonly used to present the results of logistic regressions. The odds ratio shows how the probability of injury of each sub-category compares with the probability of the average person in that group. This ratio is one for a category that has a probability equal to the average of the whole group and above (below) one if the probability is more (less) than the average. These ratios allow the reader to compare the observed risks within each of the groups (Migrants, Youth and Mature Age) and for all the categories that a characteristic is divided into. Using professional Migrants as our example, we can see from Table A8 that the probability that an observed injured migrant is a professional is 0.62 percent of the probability that an observed migrant is also

observed to have been injured (which is 6.32 percent), which makes a conditional risk of a WRI for a professional migrant  $0.62\% \times 6.32\% = 0.00392\%$ .

Table A7: Estimated work injury risk by employment characteristics

	Migrants	Youth	Mature Age	All Persons with WRI
<i>Employment status (%)</i>				
Full-time employed	0.96	1.12	1.04	1.03
Part-time employed	1.11	0.84	0.90	0.92
<i>Hours per week usually worked (%)</i>				
1 to 15 hours	1.08	0.81	0.61	0.79
16 to 29 hours	1.26	0.81	0.84	0.87
30 to 34 hours	0.65	0.87	1.26	1.11
35 to 39 hours	0.99	1.26	0.91	0.98
40 hours	0.92	0.79	1.32	1.09
41 to 44 hours	1.03	2.23	0.73	1.00
45 to 49 hours	0.86	1.00	1.03	1.14
50 to 59 hours	1.29	2.21	1.01	1.03
60 hours and above	0.92	1.88	1.05	1.09
<i>Employment type – Status (%)</i>				
Employee	1.04	1.01	1.03	1.04
Employer / Own account worker	0.71	0.78	0.84	0.74
<i>Employment type – Leave entitlements (%)</i>				
Employee with paid leave entitlements	1.02	1.10	1.15	1.09
Employee without paid leave entitlements	1.41	0.89	0.84	0.99
Owner manager of incorporated enterprise	0.57	0.00	0.65	0.65
Owner manager of unincorporated enterprise	0.71	0.78	0.84	0.74
<i>Employment type – Contract (%)</i>				
Employee on a fixed-term contract	0.82	1.73	0.53	0.76
Employee not on a fixed-term contract	1.11	0.98	1.12	1.09
Owner manager on contract basis	0.60	0.27	0.98	0.90
Owner manager not on contract basis	0.67	0.95	0.70	0.65
<i>Employment type – Shift work (%)</i>				
Worked under shift arrangements	1.90	1.48	1.68	1.67
Did not work under shift arrangements	0.81	0.86	0.90	0.87
<i>Ratio of injured to all employed (%)</i>				
Ratio of injured to all employed (%)	6.32	9.47	6.74	7.09
Number of injured	266	206	446	1,230
Number of all employed	4,211	2,175	6,621	17,354

Table A8: Estimated work injury risk by occupation and industry

	Migrants	Youth	Mature Age	All Persons with WRI
<i>Occupation classification (ASCO 1-digit) (%)</i>				
Managers and administrators	0.66	0.79	0.72	0.82
Professionals	0.62	0.46	0.68	0.61
Associate professionals	0.79	0.83	0.72	0.78
Tradespersons and related workers	1.59	1.77	1.45	1.61
Advanced clerical and service workers	0.47	0.32	0.45	0.43
Intermediate clerical, sales and service workers	1.21	0.67	0.99	0.87
Intermediate production and transport workers	1.44	1.63	1.58	1.64
Elementary clerical, sales and service workers	1.42	0.78	1.16	1.01
Labourers and related workers	1.03	1.42	1.80	1.53
Inadequately described	-	-	-	-
<i>Industry classification (ANZSIC 1-digit) (%)</i>				
Agriculture, forestry and fishing	1.29	0.80	1.37	1.58
Mining	1.60	6.20	0.93	1.31
Manufacturing	1.30	1.41	1.35	1.30
Electricity, gas and water supply	1.33	0.00	1.11	0.88
Construction	1.54	1.23	1.45	1.28
Wholesale trade	0.20	1.90	0.53	0.82
Retail trade	0.95	1.09	1.02	1.10
Accommodation, cafes and restaurants	1.60	1.43	1.57	1.25
Transport and storage	1.07	0.97	1.08	1.16
Communication	0.44	0.33	0.83	0.55
Finance and insurance	0.29	0.11	0.56	0.29
Property and business services	0.52	0.30	0.44	0.50
Government administration and defence	1.26	1.17	1.33	1.04
Education	0.70	0.38	0.77	0.74
Health and community services	1.33	1.27	1.09	1.11
Cultural and recreational services	2.65	0.66	0.46	0.96
Personal and other services	0.23	0.15	0.97	0.95
Inadequately described	-	-	-	-
Ratio of Injured to All Employed (%)	6.32	9.47	6.74	7.09
Number of Injured Workers	266	206	446	1,230
Number of Employed	4,211	2,175	6,621	17,354

## Appendix 5 : Additional Regression Results on the Estimation of the Probability of WRI, by Type of WRI

Tables A9 and A10 list the marginal effects of time since immigration categories from the estimation of multinomial logit regression of type of injury. The results suggest that new Migrants are 14 percent more likely to have a fracture and crushing injury compared to Australian born injured workers. This result is significant at the 10 percent significance level. Another significant result is that the injury of Migrants who have been in Australia more than 25 years is more likely to be cut or open wound type injuries.

Table A9: Multinomial logit estimation of type of injury sustained, for persons who experienced a WRI in previous 12 months – Migrants by length of time in Australia, Specification I

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain<sup>(a)</sup></i>		<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
	M.E.	P-Val.	M.E.	P-Val.	M.E.	P-Val.	M.E.	P-Val.	M.E.	P-Val.
[Australian-born]										
Migrant – in Australia 5 years or less	0.139	0.064	-0.050	0.816	-0.044		0.078	0.420	-0.123	0.193
Migrant – in Australia 6-15 years	-0.044	0.509	0.080	0.170	-0.056		0.060	0.293	-0.041	0.821
Migrant – in Australia 16-25 years	-0.019	0.695	0.081	0.262	-0.009		-0.098	0.262	0.044	0.453
Migrant – in Australia 26 years or more	-0.007	0.624	0.012	0.283	-0.076		0.070	0.070	0.000	0.437
Other Demographic Characteristics	<i>INCLUDED</i>									
Employment Characteristics	<i>NOT INCLUDED</i>									
Log likelihood						-1,817.01				
LR test (Joint significance)						162.78				
Pseudo R-squared						0.042				
Sample size (N)						1,230				

Columns labelled as ‘P-Val.’ refer to the probability values of the coefficient estimates. Computation of significance levels for the marginal effects failed due to memory restrictions in RADL. (a) The probabilities for the ‘Sprain and Strains’ outcome can not be calculated since this category is the reference outcome category in the estimations and therefore is omitted by Stata. Statistics in the bottom four rows refer to the actual model not to the estimation of the marginal effects.

These variables remain significant even after the employment details are included in Table A10. This implies that the type of employment and nature of the job are not the reason why we observe a significant association between type of injury and time since immigration. Recall also that other demographic characteristics are already controlled for, indicating that any age differences between these groups have been controlled for in the estimation.

Table A10: Multinomial logit estimation of type of injury sustained, for persons who experienced a WRI in previous 12 months – Migrants by length of time in Australia, Specification II (employment related information is included)

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain</i>		<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
	M.E.	P-Val.	M.E.	P-Val.	M.E.	P-Val. <sup>(a)</sup>	M.E.	P-Val.	M.E.	P-Val.
[Australian-born]										
Migrant – in Australia 5 years or less	0.147	0.064	-0.035	0.949	-0.046		0.054	0.524	-0.119	0.194
Migrant – in Australia 6-15 years	-0.044	0.466	0.084	0.190	-0.051		0.045	0.401	-0.034	0.864
Migrant – in Australia 16-25 years	-0.019	0.697	0.091	0.244	-0.009		-0.095	0.306	0.032	0.565
Migrant – in Australia 26 years or more	-0.002	0.466	0.022	0.179	-0.089		0.073	0.051	-0.003	0.404

Other Demographic Characteristics

*INCLUDED*

Employment Characteristics

*INCLUDED*

Log likelihood

-1,761.46

LR test (Joint significance)

273.89

Pseudo R-squared

0.072

Sample size (N)

1,230

Note: See Table A9

Tables A11 and A12 analyse the role of the speaking background of Migrant workers in the likelihood of specific types of work injuries. The variables are very imprecisely estimated. It may be expected that the language based classification (English Speaking and Non-English Speaking background) that we have used to categorise migrant workers is not an adequate proxy for their cultural and language background.



Table A11: Multinomial logit estimation of type of injury sustained, for persons who experienced a WRI in previous 12 months – Migrants by country of origin, Specification I

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain.<sup>(a)</sup></i>		<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
	M.E.	P-Val.	M.E.	P-Val.	M.E.	P-Val.	M.E.	P-Val.	M.E.	P-Val.
[Australian-born] Migrant – English Speaking Background	0.009	0.517	0.020	0.407	-0.038		0.027	0.370	-0.018	0.995
Migrant –Non-English Speaking Background	-0.017	0.966	0.056	0.085	-0.064		0.029	0.241	-0.004	0.549
Other Demographic Characteristics	<i>INCLUDED</i>									
Employment Characteristics	<i>NOT INCLUDED</i>									
Log likelihood	-1,825.58									
LR test (Joint significance)	145.64									
Pseudo R-squared	0.038									
Sample size (N)	1,230									

Note: See Table A9

Table A12: Multinomial logit estimation of type of injury sustained, for persons who experienced a WRI in previous 12 months – Migrants by country of origin, Specification II (employment related information is included)

	<i>Fracture and Crushing injury / internal organ damage</i>		<i>Chronic joint or muscle condition</i>		<i>Sprain and Strain</i>		<i>Cut or open wound and Superficial injury</i>		<i>Stress or other mental condition and Other injuries</i>	
	M.E.	P-Val.	M.E.	P-Val.	M.E.	P-Val. <sup>(a)</sup>	M.E.	P-Val.	M.E.	P-Val.
[Australian-born] Migrant – English Speaking Background	0.011	0.446	0.035	0.253	-0.045		0.027	0.348	-0.028	0.858
Migrant –Non-English Speaking Background	-0.017	0.916	0.056	0.083	-0.070		0.028	0.235	0.003	0.434
Other Demographic Characteristics	<i>INCLUDED</i>									
Employment Characteristics	<i>INCLUDED</i>									
Log likelihood	-1,769.20									
LR test (Joint significance)	258.39									
Pseudo R-squared	0.0019									
Sample size (N)	1,230									

Note: See Table A9