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The impact of migration on deaths and hospital admissions from work-related injuries in Australia.

A Reid<sup>1\*</sup>, S Peters<sup>2</sup>, N Felipe<sup>3</sup>, E Lenguerrand<sup>4</sup>, S Harding<sup>4</sup>

1. School of Public Health, Curtin University, Western Australia, Australia
2. School of Population Health, The University of Western Australia, Australia
3. Harry Perkins Institute of Medical Research, The University of Western Australia, Australia
4. Social & Public Health Sciences Unit, University of Glasgow, Lilybank Gardens, Glasgow

\*Corresponding author

Dr Alison Reid

School of Public Health

Curtin University

Kent Street

Bentley WA 6102

Western Australia

Australia

Tel: +61 8 9226 1361

Email: [alison.reid@curtin.edu.au](mailto:alison.reid@curtin.edu.au)

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## The impact of migration on deaths and hospital admissions from work-related injuries in Australia.

### Abstract

**Objective:** The shift from industrial to a service based economy has seen a decline in work-related injuries (WRIs) and mortality. How this relates to migrant workers, who traditionally held high risk jobs is unknown. The aim of this study was to examine deaths and hospital admissions from WRI, among foreign and Australian-born workers.

**Methods:** Tabulated population data from the 1991 to 2011 censuses, national deaths from 1991-2002 and hospital admission for 2001-2010. Direct age standardised mortality and hospital admission rates (DSRs) and rate ratios (RRs) were derived to examine differences in work-related mortality/hospital admissions by gender, country of birth, employment skill level and years of residence in Australia.

**Results:** DSRs and RRs were generally lower or not different between Australian and foreign-born workers. Among men mortality DSRs were lower for 9 of 16 country of birth groups, and hospital admissions DSRs for 14 groups. An exception was New Zealand-born men, with 9% (95% CI 9-13) excess mortality and 24% (95% CI 22-26) excess hospital admissions.

**Conclusions:** Four decades ago, foreign-born workers were generally at higher risk of WRI than Australian-born. This pattern has reversed. The local born comprise 75% of the population and a pro-active approach to health and safety regulation could achieve large benefits.

**Key words** work-related injury fatalities, migrants, country of birth, Australia

## Introduction

The global migrant population in 2010 was estimated to be 214 million (3% of the world's population)(1). Most migrants cross borders to seek better social and economic opportunities and labour mobility has increased with globalisation. An increasingly ageing population and workforce demand in receiving countries suggests that the need for migrant workers in those countries will not decline in the near future(2). Several countries choose to recruit more skilled workers. In 2005/06 one third of all recent immigrants to OECD countries were tertiary educated(3).

Australia's migrant intake has mirrored the country's industrial and economic development. In the post war period up until the 1960s nearly six million European migrants arrived building Australia's manufacturing industries and infrastructure. As the country transitioned in the mid-1970s from a manufacturing and industrial to a service based economy, migrants with increased skill and educational levels were sought and it became increasingly difficult to come to Australia as an unskilled worker without family sponsorship (4). The requirement for skilled workers tightened further in the mid-1990s. Professionals are now the largest group of recent migrants (40%) followed by technicians and trade workers (19%). In 2008, skilled migrants to Australia came from 180 countries, mainly from the UK, India, China and South Africa (5).

Every year more than 2.3 million workers globally die from a work-related injury or disease and 317 million accidents occur at work(6). Work health and safety legislation and practice differ widely between countries and the heavy burden of accidents and deaths tends to fall on workers in developing countries, where large numbers are employed in the high risk industries of agriculture, fishing and mining(6). Australian states and territories began

developing their own Occupational health and safety legislation in the 1970s and enacting their legislation from the mid-1980s (7). The movement of workers from the high risk industries to the service industry occurred from the 1970s in Australia. During the same time period road traffic fatalities, estimated to be the cause of up to 30% of all work-related deaths in Australia(8), declined markedly(9). These factors and the transition from manual work to automation has led to a reduction of workers in hazardous conditions and in work-related injuries (WRI) and work-related mortality (WRM) (7). The work-related injury mortality rate in Australia in 1982-84 was 8.06 per 100 000, 12.05 for men and 1.34 for women (10). It declined to 3.8 per 100,000, 8.9 for men and 0.7 for women between 1989-92(11) and to 1.93 per 100 000, 3.26 for men and 0.33 for women in 2010-11(12).

Deindustrialisation was associated with a 10-15% decline in the incidence of work-related injury mortality in the US between 1980 to 1996(13). Yet as WRM for the entire US reduced between 1996 and 2001, it increased among foreign-born workers from 4.3 in 1998 to 5.7 per 100 000 employed workers in 2001(14). Similarly, Latino immigrants working in non-agricultural jobs reported a WRI rate that was almost twofold that of the US-born rate(15). Higher work-related fatalities and injuries in migrant workers have been reported in several other countries, suggesting that migrant workers are likely to be overrepresented in jobs that involve a high risk of injury (16). In Canada, foreign-born men in their first five years of residence had an increased risk of WRI that required medical treatment, compared with the Canadian-born population(17). Similarly, WRIs were twice as likely among foreign-born than local born workers in Germany, the Netherlands, Switzerland and France(16). In Australia, overall WRM among foreign-born workers were similar to those of Australian-born workers between 1982 and 1984(18). However foreign-born workers from non-English speaking countries, e.g. Italy, Greece and Germany working in mining and rural occupations

had higher WRM than Australian-born workers, but a general convergence toward the Australian rate was observed with increasing length of residence. The aim of this study was to examine trends in WRM and in hospital admissions due to WRIs, among foreign and Australian-born workers over the last two decades.

## Methods

### Data Sources

This study used national censuses to assess the population at risk, and deaths records and hospital admissions records to determine work-related injuries and deaths. Use of the data sources was limited by potential disclosure but across all three we obtained or derived similar categories of age groups, country of birth groupings, and length of residence.

### Census data

The population at risk of WRI was derived from the 1991, 1996, 2001, 2006 and 2011 censuses. Tabulated population data were provided by the Australian Bureau of Statistics (ABS). At each census the following country birth groupings were used; Australia, United Kingdom and Ireland, New Zealand, Italy, Greece, Germany, Viet Nam, India and Sri Lanka, China, Malaysia, the Philippines, South Africa, or region of birth; Americas, North Africa and the Middle East, Southern and Eastern Europe, Sub-Saharan Africa and All other countries. In some of the analyses, these were further aggregated due to potential disclosure :Australia; New Zealand; UK & Ireland; Europe main land (Southern & Eastern Europe, Italy, Germany and Greece); Americas; Asia (Viet Nam, India & Sri Lanka, China, Philippines, Malaysia); North Africa and the Middle East and Southern Africa and all other countries (South Africa, Sub-Saharan Africa, all other countries). Age was classified in five year groups (15-24, 25-34, 35-44, 45-54, 55-64), and length of residence in Australia as 0-10 years or 11+ years.

Occupational Skill level was aggregated as per the Australian Standard Classification of Occupations (ASCO) 2<sup>nd</sup> Edition (19) for the 1991-2001 Census as; Skill Level 1: Managers and Administrators and Professionals; Skill Level 2: Associate Professionals; Skill Level 3: Tradespersons and related workers and advanced clerical and service workers; Skill Level 4: Intermediate clerical, sales and service workers and intermediate production and transport workers and Skill Level 5: Elementary clerical, sales and service and labourers and related workers. Because of small numbers skill levels 1-2 and 4-5 were combined (see online table).

#### Death records

Anonymised individual level death records were obtained from the ABS, for the period 1991 and 2002. Information on occupation ceased to be recorded on death certificates thereafter (see online table X).

The main and contributing causes of death were classified by the ABS according to the International Classification of Diseases (ICD) volumes ICD9 (1979-1998) (20) and ICD10 (1998-2002) (21). Work-related fatalities were identified from the External codes (E800 – E999) from ICD9 and Chapters V W, X and Y from ICD 10 where a cause of death was classified as occurring in a workplace e.g. farm, mine and quarry, industrial place and premises, or ICD 10 trade and service area, industrial and construction area, and farm were included as a WRM. Other E-codes that identified deaths specific to workers were also included, e.g. from ICD 9 E831.2: accident to watercraft causing other injury – occupation of other watercraft – crew(20) and from ICD 10 V 83.0: occupant of special vehicle mainly used on industrial premises injured in transport accident – driver of special industrial vehicle injured in traffic accident(21). Any death coded as “working for income” or “other work” in

the activity code on the death certificate, available from 1998 onwards (ICD10) were included as a WRM. Other variables available on the death records included country of birth, gender, date of birth, date of death and length of residence in Australia in years.

#### Hospital admissions data

The Australian Institute for Health and Welfare (AIHW) provided anonymised individual level hospital admission records for any WRI that was paid for by workers' compensation for the period of financial year 2001/02 to 2009/10. The data provided were by gender and country of birth groupings as per the census records. The data was also aggregated by age (15-24 years, 25-34 years, 35-44 years, 45-54 years and 55-64 years).

#### Statistical analysis

The censuses provided only a snapshot of the population at 1991, 1996, 2001, 2006 and 2011 Censuses while the mortality and hospital admissions were continually recorded. Annual estimation of the population at risk was therefore derived using linear interpolation applied to population totals in consecutive censuses. Deaths, hospital admissions and population at risk were then summed over five-year periods due to small numbers of events.

Gender specific WRM rates and hospital admission rates by country of birth were directly standardized (DSR) using the age structure of the World Standard Population(22) to allow the examination of absolute country differences in WRM.

Negative binomial regressions were used to compare the country-specific WRM rates of the foreign-born workers with those of Australian-born workers, and to account for over dispersion. The regression models were stratified by gender and adjusted for age, census



period and employment skill level. The same approach was used to compare hospital admission rates but the models were adjusted for only age and census period. The effect of length of residence among foreign-born workers was examined using the rates of Australian-born workers as the reference category.

## Results

There were 5156 WRM between 1991 and 2002 and 659 563 hospital admissions between 2001 and 2010 due to a work-related injury or illness. Death rates and hospital admission rates were far higher in men than women (Table 1).

Among men, death rates were lower for 9 country of birth groupings than for those born in Australia. Men born in UK and Ireland, Southern and Eastern Europe, North Africa and the Middle East, Vietnam, Americas, India and Sri Lanka, Malaysia, South African and Sub-Saharan Africa all had lower rates. There was a consistent pattern of lower admission rates for all groups except for those born in New Zealand. The lowest rates were observed for Vietnam, China and Malaysia.

Among women, death rates did not differ significantly and small numbers of deaths may have limited significance for the generally low mortality pattern. Hospital admissions were less likely for 12 country or region of birth groupings than for those born in Australia. The rates were higher for those born in the UK and Ireland, and in New Zealand. The lowest rates were for those born in Vietnam, China and Malaysia (Table 1).

Table 2 shows the distributions by skill level and country of birth grouping. In 2001, compared with the Australian-born, the proportion in the top employment skill level was either similar or higher for 10 of 17 country of birth groupings among males, 9 among females. At both Census points workers from the Philippines had the most disadvantaged distribution. Only small changes occurred in employment skill level among Australian, New Zealand, Indian and Sri Lankan, Philippines and Sub-Saharan African-born men over the period 1991 and 2001. In contrast, among men born in China, 16% more were working in employment skill level 1 occupations in 2001 compared with 1991. Similar, although not as marked, increases were also observed among men born in Germany, Greece, Italy and Vietnam. Among women, there were marked increases in those employed in employment skill level 1 occupations between 1991 and 2001 in all country of birth groupings (Table 2).

Figure 1 shows mortality rate ratios (MRRs) adjusted for census time point, employment skill level and age, by regional groupings (a higher level aggregation due to potential disclosure). Adjusted MRRs among men were significantly lower among workers born elsewhere than Australia (Figure 1). Among women, the confidence intervals were wide reflecting imprecision of the MRRs, but lower MRRs for those from Europe mainland and Asia were of borderline significance. For both men and women, the time trend reflected general improvement in WRM over time, irrespective of region or country of birth, age and employment skill level, (MRR 0.90, 95%CI 0.89–0.91 and MMR 0.83, 95%CI 0.81 – 0.86) respectively.

Table 3 shows MRRs (death rate for Australian born as the reference) by duration of residence among men. Apart from New Zealanders who had lived in Australia for less than 11y, there was a broad pattern of lower mortality for most regional grouping, regardless of

length of residence. The small number of deaths among most of the groups for women prevented any reliable interpretation (data not shown). The only notable results were for women from the United Kingdom and Ireland. MRR for those who had been resident for more than 11y was lower (MRR 0.71, 95% CI 0.50-99, n=37), and not significant for those who had lived there for fewer years (MRR 2.17, 95%CI 0.49-3.63, n=15).

The pattern of lower hospital admission rates among men for all country or region of birth groupings compared with Australian-born workers remained the same after adjusting for age and census time point (Figure 2). These adjustments did not remove the excess hospital admissions for New Zealand men or those born in 'All Other Countries'. The lowest rate ratios were observed for workers born in China, Vietnam and Malaysia. The pattern was similar for women although women born in 'All Other Countries', New Zealand and the United Kingdom and Ireland had higher rate ratios for hospital admission. The lowest rate ratios were observed for workers born in China, Vietnam and Malaysia. For both men and women, adjusted for region of birth and age, the risk of admissions for a WRI increased across time (RR 1.324, 95%CI 1.323 – 1.326 and RR 1.323, 95%CI 1.321 – 1.326), respectively.

## Discussion

This study is the first examination of deaths and hospital admissions due to WRI among foreign and Australian-born workers, after the transition to a service based economy and the consequent demand for more skilled migration. A consistent pattern was lower mortality and likelihood of hospital admissions for foreign-born workers, including workers from countries historically thought to be at greater risk. For example both men and women from the Eastern Asian countries had lower hospital admissions than Australian-born workers. Men from New

Zealand, on the other hand, appeared to be at greater risk of hospital admissions due to WRI. Overall the rates of WRM fell in Australia from the 1990s.

Studies from other countries have found disparities in fatal (23-26) and non-fatal work-related injuries(15, 17, 27, 28) among migrants compared with native-born populations, in contrast to this current study. In those other studies migrants or foreign-born workers tended to work in agriculture and construction and were often temporary and unskilled workers (15, 24, 28). This is not the case in Australia. From the 1970s it became increasingly difficult for unskilled migrants to enter Australia other than on a humanitarian or family reunion basis (4) and from the mid-1990s Australia has specifically encouraged skilled migration(29). Most migrants to Australia come as permanent migrants. Participation in the labour force (75%) and unemployment (6.3%) is higher compared with 68% and 3.2% respectively for the Australian-born(30). Working in jobs below their qualification level is an issue with 29% of professionals being employed as professionals in their first job, increasing to 39% in a subsequent job(5, 31). Illegal migration is not a significant problem and was estimated to be 60,900 at June 2012(32). Substantial changes in migrant stock to Australia and the industry they work in after arrival may explain why this study did not find an excess risk of WRM.

In this present study, Australian-born workers have higher rates of WRM and WRI than foreign-born workers. The findings correspond with recent analyses of the national multi-purpose household surveys conducted in 2005-6 and 2009-10 that showed higher rates of WRI among Australian-born compared with foreign-born workers. Australian-born workers were more likely to work in agriculture (4.2% v 1.2%)and construction (8.3% v 7.1%), and less likely to work in the service industry (46.4% v 48.9%) than foreign-born workers(33). Transport, agriculture, mining, manufacturing and construction industries consistently have

the highest WRM in Australia(34, 35). Australian-born workers were also more likely to work without paid leave entitlements (17.3%) than foreign-born workers (16.2%), but other conditions of shift work; working fixed term or contracts and working longer than 38 hours per week did not differ between Australian or foreign-born workers (33). Foreign-born workers who have migrated to Australia as skilled migrants based on their educational qualifications, work experience and skills and English language proficiency are more likely to work in the services (48.9%), manufacturing (10.8%) and hospitality (5.9%) industries compared with Australian-born(33). The New Zealanders were an exception, and their generally greater mortality risks compared to the Australian born might be related to their greater likelihood to work in high risk industries (e.g. construction, manufacturing) (36), New Zealand males are more likely to work in construction (21%) and manufacturing (13%) than the Australian population 15% and 12% respectively. Of those working in construction 46% were technicians or trade workers and 28% were labourers, whilst those in manufacturing were technician or trade workers (29%), machinery operator or driver (20%), manager (19%) and labourer (18%). New Zealand women tend to work in manufacturing, retail and health care and social assistance(36). These occupational disparities may explain why New Zealanders have a higher risk of hospitalization for work-related injuries and a suggestion of a higher risk of work-related injury fatalities than Australian-born workers.

Australia ranked seventh among ten European countries and New Zealand in a comparison of WRM based on data from 1998-99 and 2000-1, after standardising for differences in industrial sector(34) . Only Belgium and Germany (3.0 per 100 000) and New Zealand (3.6 per 100 000) had higher WRM than Australia (2.8 per 100,000). The UK and Sweden had the fewest fatalities at 1.7 per 100 000(34). Other work showed higher WRM rates for New Zealand (4.9 per 100 000) compared with Australia (3.8 per 100 000) and the US (3.2 per 100

000)(37) between 1989-92. Our findings suggest that without migration and the attenuating impact of migrant workers on work-related injury statistics, Australia may fare worse internationally in terms of injury rankings.

### *Limitations and strengths*

A limitation of this study is that in Australia hospital admissions for work-related injury or illness can only be identified if the payment status for the admission was workers' compensation. Other work has shown that this method of capturing is associated with an underestimate in the number of WRI. For the State of New South Wales, 69% of all WRI hospital admissions (38, 39) were identified using this method and under counting was larger among persons from non-English speaking backgrounds than English speaking, where 60% and 71% of hospital admissions for WRI were identified respectively(38). Differential access to workers compensation could depress the hospital admissions for WRI among foreign-born than Australian-born workers but this issue has not been examined in Australia(40).

Another limitation refers to the use of death certificate as a source of WRM as Australian death certificates do not specifically identify WRM. We used the External Cause codes in the relevant ICD volumes. The major cause of WRM is traffic accidents, e.g. driving as part of the job and commuting to/from work. Half of all WRM in Australia in 2010-2011 were the result of a traffic incident(41). However, we were unable to examine traffic incidents as they are not coded in the ICD volumes if they are work-related or not. There is little information on whether the incidence of traffic fatalities differs by migration status, but Factor et al (2008) reported an increased risk of involvement in fatal or severe traffic accidents among

people from Africa or Asia compared with Europe or the United States of America.

Excluding traffic accidents may have underestimated the risk of WRM among foreign-born workers(42).

We found that the risk of hospital admission for a work-related injury or illness increased over time in contrast to WRM which decreased. There are several possible explanations for this disparity. Firstly is that the hospital admissions data captures all hospital admissions paid for by workers compensation, including illness as well as injury. So included in our data would be admissions for occupational cancers (e.g. mesothelioma) or other work-related illnesses such as asthma. It has been estimated that 5000 invasive cancers and 34,000 non-melanoma skin cancers per year in Australia are caused by occupational exposure to carcinogens(43). In addition work-related injuries resulting from road traffic accidents will have been included in the hospital admissions data but not included in the mortality records.

The remainder group 'All other countries' had a greater likelihood of hospital admissions but not of mortality than the Australian-born. We were unable to examine this group in detail due to disclosure. However, further analysis of the 2001 Census showed that 30% of males from this group worked as tradespersons and related workers, and 24% worked as labourers and related workers suggesting that they may be working in the more risky occupations. Sixty two percent were aged less than 45 years. Among females 65% were aged less than 45 years. Fifty two percent worked as intermediate clerical, sales and service workers and 21% as labourers.

There are two key strengths of this study. It is based on national data over a sixteen year time span, and covers both hospital admissions and mortality from WRIs. It is one of a few studies

to examine WRM and hospital admissions among all foreign-born workers across different occupations, not limited to those who work in the high risk industries.

## Conclusion

The rates of WRM have fallen since the 1990s, but Australian-born workers appear to be at a greater risk than foreign-born workers. These findings signal the need to continue to promote occupational health and safety in all industries and high risk industries specifically to further reduce the risk of work-related accidents and injuries to all workers in Australia.

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Online Table X. Description of data sources for hospital admissions and deaths from work related injuries and for denominators

Variables	Death records	Hospitalisations	Censuses
Data type	Individual level data	Individual level data	Aggregated data
Data provider	Australian Bureau of Statistics	Australian Institute for Health and Welfare	Australian Bureau of Statistics
Years	1991-2002	2001-2010	1991, 1996, 2001, 2006, 2011
Age	Age at Death (years), aggregated to; 15-24 years 25-34 years 35-44 years 45-54 years 55-64 years	Age at Admission (aggregated age groups) 15-34 years 35-44 years 45-54 years 55-69 years	Age at Census (aggregated) 15-24 years 25-34 years 35-44 years 45-54 years 55-64 years
Sex	√	√	√
Duration of residence in Australia	Years; aggregated to ≤10 years 11+ years	Not available	Derived from year of arrival, aggregated to; ≤10 years 11+ years
Occupation	Job or duties at time of death or former occupation if retired. Coded to Australian Standard Classification of Occupations	Not available	Occupation at time of Census ASCO coded and aggregated as per death

	(ASCO) Aggregated to; Skill Level 1 (Managers/Professionals/Associate Professionals) Skill Level 2 (Tradespersons/advanced clerical) Skill Level 3 (Intermediate/elementary skilled workers)		records
Country or Region of birth	Coded to Australian Standard Classification of Countries for Social Statistics  Aggregated to match census records	Aggregated by provider as per Census records	Aggregated by ABS*
Work-related injury	ICD9 – E codes (E800-E999) and  ICD10 - Chapters V, W, X and Y where a cause of death was identified as being in a workplace	All hospitalisations paid for by workers' compensation	Not applicable

\*Country Of Birth aggregated on census records to the ten most common migrant source countries and regions of birth; Australia, UK & Ireland, New Zealand, Italy, Viet Nam, India and Sri Lanka, Greece, China, Germany, Philippines, Malaysia, South Africa, Southern & Eastern Europe, Americas, North Africa & the Middle East, Sub-Saharan Africa, All other countries

Table 1. Directly standardised work-related mortality and hospital admission rates per 100 000 for males and females by country of birth, 1991-2002 (mortality) and 2001-2010 (morbidity), Australia

	Country/Region of birth	Mortality (1991-2002)			Morbidity (2001-2010)		
		N Fatalities	Person years	DSR (95%CI)	N Hospital admissions	Person years	DSR (95%CI)
<b>Males</b>	Australia	3489	50213390	6.97 (6.74,7.20)	366031	27653171	1333.29 (1328.97,1337.62)
	UK & Ireland	265	4886981	5.60 (4.76,6.60)	28482	2404641	1132.85 (1116.72,1149.22)
	Southern & Eastern Europe	112	1888993	4.28 (3.41,5.51)	12341	956168	1156.78 (1132.7,1181.35)
	New Zealand	115	1496619	7.27 (5.95,8.85)	15564	907575	1682.62 (1656,1709.57)
	North Africa & the Middle East	31	992477	3.08 (1.99,4.72)	6547	596831	1077.67 (1051.01,1104.89)
	Italy	56	972546	4.34 (2.85,10.3)	5268	411268	1088.11 (1026.6,1154.23)
	Viet Nam	28	749037	4.42 (2.83,6.73)	2216	398822	528.22 (505.71,551.62)
	Americas	26	709580	3.53 (2.26,5.37)	4635	410555	1096.26 (1064.54,1128.73)
	India & Sri Lanka	13	622787	2.42 (1.22,4.49)	3916	479974	817.47 (792.04,843.53)
	Greece	29	566238	3.65 (2.08,10.6)	2104	239764	813.96 (751.44,882.52)
	China	27	513706	5.86 (3.63,9.22)	1399	393535	344.39 (326.35,363.19)
	Germany	36	496993	7.18 (3.86,13.5)	2363	239445	895.67 (844.46,950.05)
	Philippines	13	286990	4.46 (2.17,9.06)	1698	194274	879.2 (836.52,923.87)
	Malaysia	9	364721	2.35 (1.07,4.77)	851	207446	416.23 (388.62,445.36)
	South Africa	9	285267	2.89 (1.29,5.78)	1768	214635	801.05 (763.91,839.61)
	Sub-Saharan Africa	8	275432	2.55 (1.01,5.86)	2061	189255	1042.8 (997.33,1089.92)
	All other countries	160	2741638	5.60 (4.76,6.56)	28457	1631587	1731.93 (1711.78,1752.26)
	All foreign-born	937	17850006	5.03 (4.68,5.40)	119670	9875775	1169.57 (1162.59, 1176.58)
<b>Females</b>	Australia	545	50697763	1.09 (1.00,1.18)	127804	28211821	463.14 (460.6,465.69)
	UK & Ireland	62	4643013	1.17 (0.82,1.69)	12785	2313117	488.35 (478.38,498.53)
	Southern & Eastern Europe	15	1761235	0.88 (0.39,1.89)	4997	951970	439.33 (426.04,453.06)
	New Zealand	14	1443694	1.16 (0.62,2.02)	4472	889959	491.06 (476.65,505.82)
	North Africa & the Middle East	4	875890	0.40 (0.11,1.34)	1537	532462	269.52 (256.09,283.51)
	Italy	17	857613	0.84 (0.47,8.05)	1543	376601	344.48 (313.88,380.31)
	Viet Nam	6	749337	0.98 (0.32,2.41)	670	437107	150.53 (139.04,162.86)

	Americas	7	733830	0.75 (0.30,1.81)	2065	437524	450.9 (431.53,470.97)
	India & Sri Lanka	3	565057	0.71 (0.11,2.62)	1410	408044	334.56 (317.23,352.62)
	Greece	2	558813	0.27 (0.03,8.08)	1054	246671	370.63 (335.82,411.29)
	China	6	537678	1.29 (0.41,3.44)	633	470048	140.9 (129.98,152.53)
	Germany	9	471239	1.35 (0.50,5.58)	961	237063	342.57 (315,372.72)
	Philippines	2	597417	0.50 (0.05,2.13)	1692	382548	402.33 (382.61,422.9)
	Malaysia	2	416768	0.43 (0.05,2.10)	525	247180	207.55 (190.04,226.3)
	South Africa	2	292313	0.75 (0.08,2.98)	697	221616	310.7 (287.94,334.84)
	Sub-Saharan Africa	2	262732	1.31 (0.16,4.73)	773	184989	410.16 (381.37,440.7)
	All other countries	32	2869573	1.11 (0.76,1.59)	10244	1792520	565.58 (554.68,576.65)
	All foreign-born	185	17636201	0.99 (0.84,1.17)	46058	10129419	413.83 (409.94,417.76)

Table 2. Change in employment skill level<sup>+</sup> between 1991 and 2001 for males and females by country or region of birth.

	Skill level	Males		Females	
		1991 %	Difference	1991 %	Difference
Australia	1	37.8	+2.1%	33.3	+5.8%
	3	39.9	-1.6%	59.3	-8.8%
UK & Ireland	1	42.5	+5.7%	35.3	+8.6%
	3	34.8	-3.7%	57.5	-12.2%
South & East Europe	1	24.4	+5.9%	23.1	+8.2%
	3	46.3	-3.1%	69.4	-10.5%
New Zealand	1	33.7	+2.8%	32.0	+6.6%
	3	42.5	-0.4%	60.3	-9.1%
N Africa & Mid East	1	33.5	+5.1%	29.4	+8.9%
	3	46.4	-4.4%	63.3	-12.2%
Italy	1	27.5	+7.5%	22.4	+6.5%
	3	42.6	-5.9%	66.9	-11.3%
Vietnam	1	21.8	+9.1%	19.1	+10.9%
	3	59.0	-6.9%	71.1	-10.2%
Americas	1	44.6	+4.7%	43.1	+4.3%
	3	36.6	-2.4%	50.9	-6.3%
India & Sri Lanka	1	49.7	+2.6%	33.6	+8.1%
	3	37.6	+0.1%	59.8	-9.9%
Greece	1	24.1	+8.9%	19.6	+9.8%
	3	53.5	-8.9%	72.7	-13.2%
China	1	30.2	+16.0%	25.0	+13.6%
	3	43.8	-8.5%	66.7	-13.8%
Germany	1	40.8	+6.2%	35.2	+8.7%
	3	30.3	-0.9%	56.0	-11.7%
Philippines	1	24.7	+3.5%	23.5	+3.3%
	3	56.8	-1.7%	71.7	-4.7%
Malaysia	1	59.8	+5.6%	51.2	+6.5%
	3	29.0	-3.5%	43.5	-8.7%
South Africa	1	56.2	+6.0%	42.1	+10.0%
	3	25.4	-3.7%	50.6	-13.1%
Sub-Saharan Africa	1	44.8	+3.9%	34.6	+7.6%
	3	39.7	-2.1%	58.7	-10.9%
All other Countries	1	39.9	+4.9%	36.5	+3.9%
	3	38.6	0%	56.3	-5.9%

+Employment Skill Level coded from the Australian Standard Classification of Occupations 2<sup>nd</sup> Edition (ASCO). 1= Managers and Administrators, Professionals and Associate Professionals. 3=Intermediate and elementary clerical, sales, transport and production workers, labourers and related workers.

Table 3 –Mortality rate ratios (MRRs) for males 1991-2002 by country or region of birth and duration of residence, adjusted for age, employment skill level and census time point

<b>Duration of residence in Australia ≤10 years</b>		
	<b>Males</b>	
<b>Country/Region of birth</b>	<b>N Deaths</b>	<b>IRR (95%CI)</b>
Australia	3489	1.00 (Ref)
UK & Ireland	34	0.69 (0.50,0.97)
Europe main land	15	0.54 (0.32,0.90)
New Zealand	54	1.25 (0.95,1.63)
North Africa & the Middle East	6	0.35 (0.16,0.78)
Americas	9	0.59 (0.31,1.14)
Asia	51	0.64 (0.48,0.84)
Southern Africa and All Other Countries	44	0.57 (0.43,0.77)
<b>Duration of residence in Australia 11+ years</b>		
Australia	3489	1.00 (Ref)
UK & Ireland	231	0.71 (0.62,0.81)
Europe main land	218	0.72 (0.63,0.83)
New Zealand	61	0.98 (0.76,1.27)
North Africa & the Middle East	25	0.56(0.38,0.83)
Americas	17	0.52 (0.33,0.84)
Asia	39	0.47 (0.34,0.64)
Southern Africa and All Other Countries	133	0.95 (0.80,1.14)



Figure 1. Mortality rate ratios for deaths from work-related injuries by region of birth and sex, adjusted for age, census time point and employment skill level

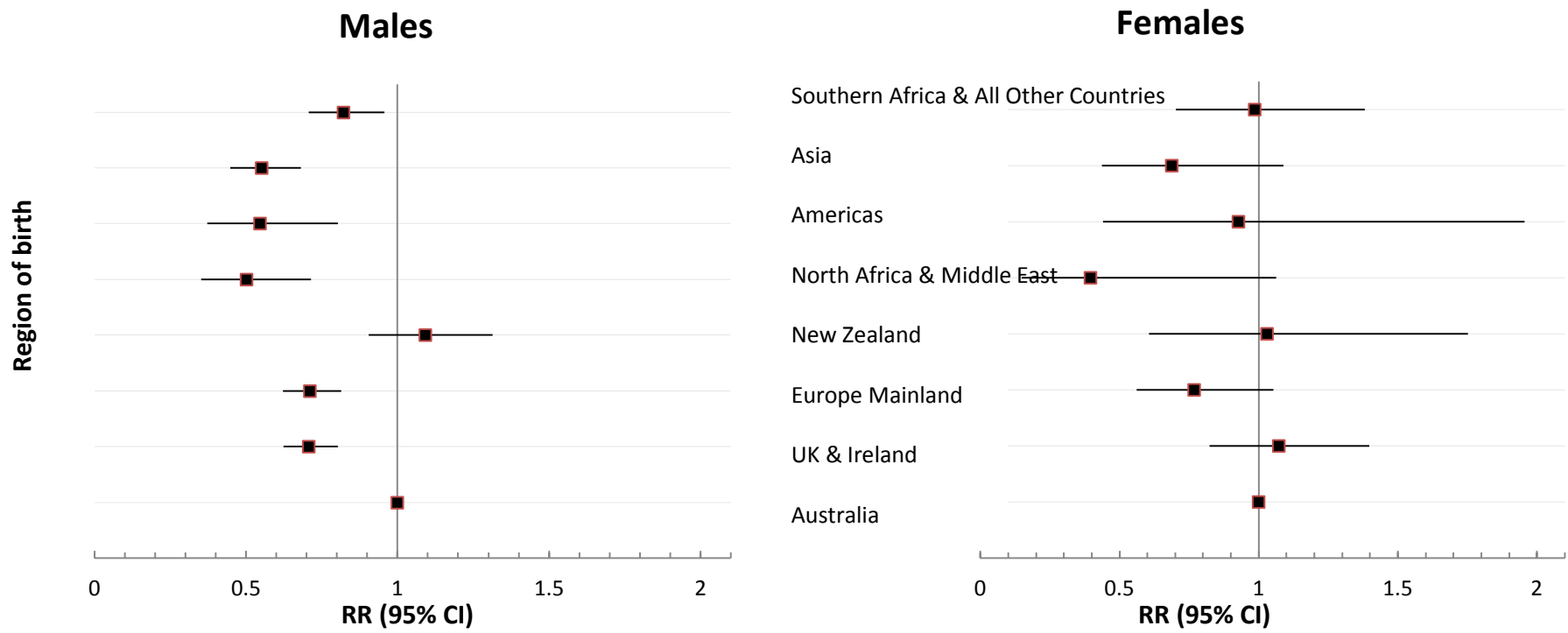


Figure 2. Rate ratios for admissions for work-related injuries by country and region of birth and sex, adjusted for age and census time point

