AUSTRALIAN TRANSPORT SAFETY BUREAU

ROAD SAFETY RESEARCH REPORT
CR 196

ROAD SAFETY

Road Trauma and Overseas Born Road Users:

A study of the Australian resident population

COMMONWEALTH DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

Department of Transport and Regional Services

Australian Transport Safety Bureau

Road Trauma and Overseas Born Road Users:
A study of the Australian resident population

Authors

A Dobson (University of Newcastle)
N Smith (University of Newcastle)
M McFadden (ATSB)
M Walker (ATSB)

Australian Transport Safety Bureau

DOCUMENT RETRIEVAL INFORMATION

Report No.	Date	Pages	ISBN	ISSN
CR 196	January 2001	35	0 642 25526 1	0810-770X

Title and Subtitle

ROAD TRAUMA AND OVERSEAS BORN ROAD USERS: A study of the Australian resident population

Authors

A Dobson (University of Newcastle)
N Smith (University of Newcastle)
M McFadden (ATSB)
M Walker (ATSB)

Performing Organisation

Research Institute for Gender and Health
The University of Newcastle
CALLAGHAN NSW 2308

Sponsored by / Available from

Australian Transport Safety Bureau
PO Box 967
CIVIC SQUARE ACT 2608

Abstract

The current study examined whether residents born overseas had higher rates of death and hospital separation due to road crashes than those born in Australia. The study found that overseas born drivers had rates of involvement equal to or safer than Australian born drivers. On the other hand, pedestrians born overseas, especially the elderly, had a higher level of involvement in both fatal and severe crashes. Driving convention rather than language differences was the major factor. Those born in countries where traffic travels on the right hand side of the road were mainly at risk.

Keywords

ROAD TRAUMA, MIGRANTS, DRIVERS, PEDESTRIANS

NOTES:

(1) ATSB research reports are disseminated in the interests of information exchange.

(2) The views expressed are those of the author(s) and do not necessarily represent those of the Commonwealth Government.

TABLE OF CONTENTS

1. SUMMARY

The purpose of this study was to examine whether residents born overseas had higher rates of death and hospital separation due to road crashes than those born in Australia. This study followed earlier research into the driving behaviour among women in Australia, where the self reported rate of motor vehicle accidents was significantly higher among those born in a non-English speaking country (BNESC), (Dobson, Brown, Ball, Powers & McFadden, 1999).

The study categorised those born overseas according to language of country of birth (English speaking, non-English speaking) and road convention in country of birth (left hand side, right hand side). Classification by language replicated the categorisation in the earlier study noted above. The cultural differences between Australia and non-English speaking countries are likely to be greater than those between Australia and other English speaking countries and these may contribute to differences in involvement in road crashes. A more obvious contributor to road safety outcomes concerns the road convention in the country of origin. Obviously, those familiar with traffic travelling on the left hand side of the road will have less difficulty in adapting to Australian conditions than those familiar with travel on the right hand side.

Data on deaths that occurred in Australia between 1994 and 1997 and hospital separations that occurred in New South Wales between 1 July 1995 and 30 June 1997 due to road crashes were analysed. The rates of death and hospital separation for various migrant groups adjusted for age and area of residence (country versus city) were calculated, using population data from the 1996 census.

There is no evidence to suggest that overseas born drivers are more likely than Australian born drivers to be involved in crashes resulting in death or serious injury. Overall, the mortality and hospital separation rates for those born overseas tended to be equal to or better than those for Australian drivers. In particular, female drivers born overseas tend to have lower rates of hospitalisation regardless of language or road convention. Male drivers from English speaking countries or those that drive on the left hand side of the road also have lower rates.

The most concerning results of the study were with respect to pedestrians. Pedestrians born in other English speaking and non-English speaking countries where the convention is to drive on the left hand side of the road were equally safe or safer than Australian born pedestrians. On the other hand, pedestrians born in countries with a right side driving convention were at significantly greater risk of being hospitalised or dying on the road relative to Australian born pedestrians. Road convention appears to have a greater influence on pedestrian safety than language in country of origin.

The difference in risk for the overseas born and locally born population is greatest for the 60 years and over age groups. Those in this age group who were born in countries that drive on the right hand side have at least 10 times the risk of being killed or injured as pedestrians when compared to the Australian born. The actual impact of this increased risk is exacerbated by demographic patterns. Pedestrian casualties for the overseas born comprised more older people than for the Australian born. Of the pedestrian deaths involving those from countries driving on the right hand side of the road 70% were 60 years of age or older compared to 32% for Australian born. The difference for hospital separations is less marked but in the same direction.

Results for passengers are of less interest as passengers rarely influence crash outcomes. The results suggest that males born overseas are under represented as passengers in

terms of hospital admissions. In contrast female passengers are over represented in both deaths and hospital admissions when these women are from non-English speaking countries or from those that drive on the right hand side. This finding probably reflects differences in travel patterns for these groups.

These results rely on the assumption that driver licence rates, passenger behaviour and pedestrian activity are the same for both overseas and locally born residents. For example, if people born overseas are less likely to hold a licence the number of road crashes per 100,000 population could appear low while the number per licensed driver is actually as high or higher than that for Australian born drivers. Similarly if one group of pedestrians travels further, then their greater exposure to injury is not reflected in the rate of death or injury per capita.

It is of concern that while overseas born drivers are not over represented in trauma statistics, overseas born pedestrians clearly are. The reason for this may in part lie with the influence of spatial indicators on road related behaviour. Regardless of the side of the road on which traffic travels, there are various spatial cues which assist the driver. In the first place, the driver is always seated closest to the centre line of the road. Travelling with the driver adjacent to the curb is a clear indication that something is wrong. Furthermore, if a driver inadvertently strays to the wrong side of the road, oncoming traffic will be seen approaching directly prompting avoidance manoeuvres. Pedestrians lack such spatial cues to guide their behaviour. The pedestrian who looks the wrong way will be struck by a car that is not seen or even anticipated.

It is probable that pedestrian behaviour (looking to the left or to the right) is learnt at an early age and may be difficult to change. Certainly, educational material could be directed to increase public awareness of the issue for those most at risk. There is an obvious place for appropriate community based organisations to play a lead role in any communication strategy.

On the basis of these findings, it would appear that if the relative safety of those born in countries that drive on the right hand side of the road could be improved to match those born in Australia then 34 pedestrian lives would be saved each year and many more hospital admissions avoided. This is approximately a 10% reduction in the total pedestrian road toll for 2000.

2. AIM

The purpose of this study was to examine whether Australian residents born overseas had higher rates of death and hospital separation due to road crashes than those born in Australia.

3. BACKGROUND

In a study of driving behaviour among women in Australia, the self reported rate of motor vehicle accidents was significantly higher among those born in non-English speaking countries (BNESC), (Dobson, Brown, Ball, Powers & McFadden, 1999). This result was consistent in two age groups of women, aged 19-23 and 46-51 in 1998. It remained after adjustment for area of residence (urban, rural and remote) and other demographic factors. This is in apparent contrast to an earlier study by Burvill, McCall, Stenhouse and Reid (1973) that found only a minor difference for immigrant death in road crashes in Australia. It should be noted that Burvill et al reported deaths for all road users and that for a significant proportion of these deaths, ie passenger, the individual has practically nil effect on the occurrence of the crash. If there is a relationship between road trauma outcomes and being born overseas, it will most likely occur for those groups that influence crash outcomes, ie drivers/riders and pedestrians.

The Roads and Traffic Authority of New South Wales has also indicated its concern about BNESC involvement in road crashes. A number of studies were commissioned by the Authority to investigate road safety related behaviours and attitudes among the BNESC population in New South Wales (Derewlany & Preece, 1991; Preece, 1994; Walker, 1991). None of these studies attempted to quantify the degree of involvement of the BNESC population in serious crashes. Other anecdotal evidence from enforcement and hospital sources in Australia suggests that BNESC people are over-represented among those injured in road crashes. However, the accidents reported by the women in the Dobson et al (1999) study were predominantly minor ones in which no one was injured. Also the BNESC women's scores, for various aspects of driving behaviour, did not differ from those of other women in the study.

There is little direct evidence in the literature on the relative safety of migrants. Lawson and Edwards (1991) reported that in pedestrian collisions young Asians in Birmingham were twice as likely as young non-Asians to be seriously injured. There were no differences for other road user groups. Recent American studies have identified race as a road safety issue (Johnson, Gruenewald & Treno, 1998; Lang, Waller & Shope, 1996; Shin, Hong & Waldron, 1999). These studies are predominantly concerned with African Americans and Hispanics. African Americans generally, are not recent arrivals in North America and no data are given on the proportion of Hispanics who were born in the USA. These results are less relevant to the current study, which was interested in the crash risk associated with those born in other countries.

The current study categorised those born overseas according to language of country of birth (English speaking, non-English speaking) and road convention in country of birth (left hand side, right hand side). Classification by language replicated the categorisation in the earlier Australian study by Dobson et al (1999). The cultural differences between Australia and non-English speaking countries are likely to be greater than those between Australia and other English speaking countries and these may contribute to differences in involvement in road crashes.

A more obvious contributor to road safety outcomes concerns the road convention in the country of origin. Obviously, those familiar with traffic travelling on the left hand side of the road will have less difficulty in adapting to Australian conditions than those familiar with travel on the right hand side. Of course how long the person had been in Australia and where they learnt to drive are likely to be relevant. Unfortunately this information was not available from any of the sources of routinely collected data used in this study.

Risk, in road safety terms, is generally expressed as the number of deaths or injuries per vehicle kilometre travelled. As distance travelled is often difficult to obtain, surrogates such as the number of registered vehicles or the number of driving licence holders are also used. In Australia, such measures are not available according to country of birth.

Population figures are also used to indicate the public health risk posed by road travel (for example, Lawson & Edwards, 1991) and this measure was used in the present study. The measure has limitations that vary according to road user type. For example, if the proportions of drivers or passengers or the distances driven vary according to country of birth, then this will produce bias that cannot be easily identified. The effect on estimates of risk for pedestrians is likely to be less problematic as nearly all the population can be classified as pedestrians. Nevertheless, Roberts, Norton and Taua (1996) noted that higher rates of pedestrian deaths among Pacific Island children in New Zealand may be related to different patterns of exposure as pedestrians.

Differences in demographic patterns could also influence the outcome of the current study. Rates of severe road crash involvement tend to be higher in country areas than in cities (Federal Office of Road Safety, 1996). Migrants are more likely to live in urban areas. Furthermore, the age distributions of migrants from various countries differ and they also differ from the age distribution of people born in Australia, due to various waves of immigration from different parts of the world. Rates of road crash involvement are also related to the age of the driver, with young males having particularly high rates. As a result, the current study controlled for age, sex and place of residence.

In addition to these main factors which could affect rates of death and hospital separation due to road crash involvement, the availability of data is a determinant of the analyses presented in this report. Three sources of data were used: deaths due to road crash involvement for the whole of Australia; hospital separations related to injuries due to road crashes in New South Wales (NSW), and population data from the 1996 Australian Census.

4. METHOD

The data for analysis were records of deaths or hospital separations due to road crash involvement classified according to the Australian version of The International Classification of Diseases, 9th Revision, Clinical Modification (ICD9-CM) into categories E810-819. These codes cover road crashes involving collision with another vehicle (such as motor vehicles, trains or pedal cycles), pedestrians, and objects on and off the highway, and non-collision motor vehicle traffic accidents such as accidents while boarding or alighting from a motor vehicle. Injured persons involved in road crashes were classified as one of four groups: 'driver of motor vehicle other than motorcycle', 'passenger of motor vehicle other than motorcycle', 'pedestrian' and 'other'. The 'other' category included motorcyclist, passenger on motorcycle, occupant of streetcar, rider of animal, occupant of animal-drawn vehicle, pedal cyclist, other specified person and unspecified person.

The data on deaths from road crash involvement were extracted from the Australian Bureau of Statistics (ABS) unit record files of all deaths that occurred in Australia between 1994 and 1997. Variables used for this report included year of death, 5-year groups for age at death (from 0-4 to 80-84, and 85 and over), sex, country of birth and area of usual residence.

Hospital separation data were extracted from the NSW Department of Health Inpatient Statistics Collection. This is a database of all inpatients treated in NSW public and private hospitals (www.health.nsw.gov.au/iasd/isc/index1.html). Records were obtained for the period between 1 July 1995 and 30 June 1997 from the Hunter Health Statistics Unit. The data used for this report were details of all hospital separations resulting from road crash involvement as the external cause of injury. Variables included date of separation, five-year groups for age at hospitalisation, sex, country of birth and area of usual residence.

Population figures were extracted from the ABS 1996 Census data and aggregated by sex, five-year age groups, country of birth groupings and area of usual residence.

The Australian standard classification of countries for social statistics (ASCCSS) was used to categorise countries of birth into 26 countries or groups of countries (Australian Bureau of Statistics, 1990). For the purpose of analysis the 26 countries or groups of countries used were classified according to whether they were non-English speaking or English speaking and whether motor vehicles are driven on the left or right side of the road (as shown in Appendix A). Not every country in a group of countries had the same non-English speaking or English speaking and left or right driving convention, hence the classification represents the dominant characteristic of the group.

Area of usual residence in Australia was categorised using the rural, remote and metropolitan areas classification (RRMA) developed to give an indication of remoteness in terms of population density and distance to population centres (Department of Primary Industries and Energy and Department of Human Services and Health, 1994). Seven RRMA categories were used: capital city, other metropolitan centres, large rural centre, small rural centre, other rural area, remote centre and other remote area using the Australian Standard Geographical Classification (ASGC), the ABS classification of localities within Australia available for each case (Australian Bureau of Statistics, 1996). Where the number of deaths or hospital separations in an area was small these categories where combined to facilitate reporting.

Details of statistical methods are provided in Appendix B. The age standardised mortality ratios (SMR) and age standardised hospital separation ratios (SHR) for road crash involvement were compared across gender, type of road crash injury or fatality, area of residence and country of birth. These ratios were calculated using the observed number of deaths or hospital separations divided by the expected number of deaths or hospital separations based on the Australian-born rates. Values of SMRs or SHRs greater than unity indicate that the rate of deaths or hospital separations, respectively, was higher for the migrant group than the Australian-born group, and values of SMRs or SHRs less than unity indicate that the corresponding rates for migrants were lower.

Ninety-five per cent confidence intervals were computed for SMRs and SHRs to indicate the extent to which differences from unity are more than could be expected from chance variability. If the confidence interval does not contain unity the rate for the migrant group is 'statistically significantly' different from the rate for the Australian-born group. As the tables in this report contain large numbers of SMRs and SHRs and 95% confidence intervals, about 5% of the confidence intervals will not include unity by chance alone.

5. RESULTS

Detailed results are provided in Appendix C. Separate tables are provided for gender and place of residence (ie capital city/rural) as well as combined estimates adjusted by area of residence. It should be noted that the number of those born overseas residing in rural areas was relatively small, and smaller still when analysed by road user group, and caution is advised when interpreting these results separately. In the interests of robustness, the body of the report summarises estimates adjusted by age, sex and place of residence.

The following sections present results by road user group in terms of the two categories of interest; language in country of birth (Australian/other English speaking/non-English speaking) and road convention in country of birth (Australian/other driving on the left hand side of the road/right hand side). The following table indicates the sample sizes available to the study. Note that the same data are categorised by both 'Language' and 'Road Convention'.

Table 1.
Deaths and hospital separations by categories of interest

	Deaths (Australia 1994–1997)		***Hospital separations (New South Wales June 1995–1997)***	
	Male	*Female*	*Male*	*Female*
Australia	3,953	1,630	10,894	6,484
Language:				
Other English speaking	459	197	572	417
Non-English speaking	632	323	1,973	1,585
Road Convention:				
Other left hand side of road	569	261	1,080	888
Right hand side of road	522	259	1,465	1,114

In general, it may be assumed that the ratio between deaths and hospital admission will remain relatively constant for men and women. Table 1 reveals a surprisingly low number of individuals, especially men, from other English speaking countries admitted to hospital. It appears that such individuals are less likely to identify or be identified as being born overseas.

5.1 Drivers

There is no evidence to suggest that overseas born drivers are more likely than Australian born drivers to be involved in crashes resulting in death or serious injury. Table 2 has details of standardised mortality and hospital separation ratios for male and female drivers by language and road convention. Overall, the mortality and hospital separation rates for those born overseas tended to be equal to or better than those for Australian born drivers.

Table 2.
Standardised ratios for male and female drivers

		Deaths		*Hospital separations*	
		Male	*Female*	*Male*	*Female*
Australia	SMR/SHR	1.00	1.00	1.00	1.00
Language:					
Other English speaking					
	SMR/SHR	1.04	1.03	0.49	0.56
	95% CI	0.90, 1.18	0.79, 1.26	0.42, 0.56	0.47, 0.65
Non-English speaking					
	SMR/SHR	0.96	0.86	0.98	0.75
	95% CI	0.85, 1.08	0.68, 1.03	0.91, 1.04	0.69, 0.82
Road Convention					
Other left hand side of road					
	SMR/SHR	0.99	1.00	0.66	0.69
	95% CI	0.87, 1.11	0.8, 1.19	0.59, 0.72	0.62, 0.77
Right hand side of road					
	SMR/SHR	1.00	0.84	0.98	0.70
	95% CI	0.87, 1.13	0.64, 1.04	0.91, 1.06	0.63, 0.77

Female drivers born overseas tend to have lower rates of hospitalisation regardless of language or road convention. Male drivers from English speaking countries or those that drive on the left hand side of the road also have lower rates.

5.2 Passengers

Passengers rarely influence crash outcomes so that over or under representation of passengers by any demographic variable probably indicates correlations between that variable and travelling patterns. Table 3 has details of standardised mortality and hospital separation ratios for male and female passengers by language and road convention.

In general, males born overseas are under represented as passengers in terms of hospital admissions although they do not differ by any appreciable amount in terms of mortality ratios. Female passengers, on the other hand, are over represented in terms of both deaths and hospital admissions when these women are from non-English speaking countries or those that drive on the right hand side.

Table 3.
Standardised ratios for male and female passengers

		Deaths		*Hospital separations*	
		Male	*Female*	*Male*	*Female*
Australia					
	SMR/SHR	1.00	1.00	1.00	1.00
Language:					
Other English speaking					
	SMR/SHR	0.91	1.13	0.53	0.72
	95% CI	0.66, 1.15	0.86, 1.40	0.41, 0.65	0.60, 0.84
Non-English speaking					
	SMR/SHR	1.11	1.54	0.87	1.31
	95% CI	0.89, 1.34	1.27, 1.82	0.77, 0.96	1.21, 1.42
Road Convention:					
Other left hand side of road					
	SMR/SHR	0.90	1.18	0.74	1.02
	95% CI	0.70, 1.11	0.94, 1.42	0.63, 0.85	0.91, 1.13
Right hand side of road					
	SMR/SHR	1.20	1.60	0.80	1.24
	95% CI	0.93, 1.47	1.28, 1.91	0.68, 0.91	1.12, 1.36

5.3 Pedestrians

The most concerning results of the study were with respect to pedestrians. There is clear evidence of increased risk for both males and females of death and hospital admission where these individuals were born in a non-English speaking country or where the right hand side of the road was used for driving. Table 4 has details of standardised mortality and hospital separation ratios for male and female pedestrians by language and road convention.

Table 4.
Standardised ratios for male and female pedestrians

		Deaths		*Hospital separations*	
		Male	*Female*	*Male*	*Female*
Australia					
	SMR/SHR	1.00	1.00	1.00	1.00
Language:					
Other English speaking					
	SMR/SHR	0.95	0.93	0.79	0.99
	95% CI	0.74, 1.15	0.63, 1.22	0.64, 0.93	0.76, 1.22
Non-English speaking					
	SMR/SHR	1.28	1.57	1.19	1.99
	95% CI	1.09, 1.48	1.26, 1.88	1.07, 1.31	1.77, 2.21
Road Convention:					
Other left hand side of road					
	SMR/SHR	0.88	0.98	0.82	1.55
	95% CI	0.71, 1.05	0.72, 1.25	0.70, 0.94	1.32, 1.78
Right hand side of road					
	SMR/SHR	1.44	1.66	1.28	1.78
	95% CI	1.21, 1.67	1.3, 2.02	1.14, 1.43	1.54, 2.01

It is important to note that the composition of pedestrian casualties by age varies for the Australian and the overseas born population. Table 5 has details. Pedestrian casualties for the overseas born comprised more older people compared with the Australian born. Of the pedestrians deaths involving those from countries driving on the right hand side of the road 70% were 60 years of age or older compared to 32% for Australian born. The difference for hospital separations is less marked but in the same direction.

Table 5.
Percentage by age of deaths and hospital separations by categories of interest

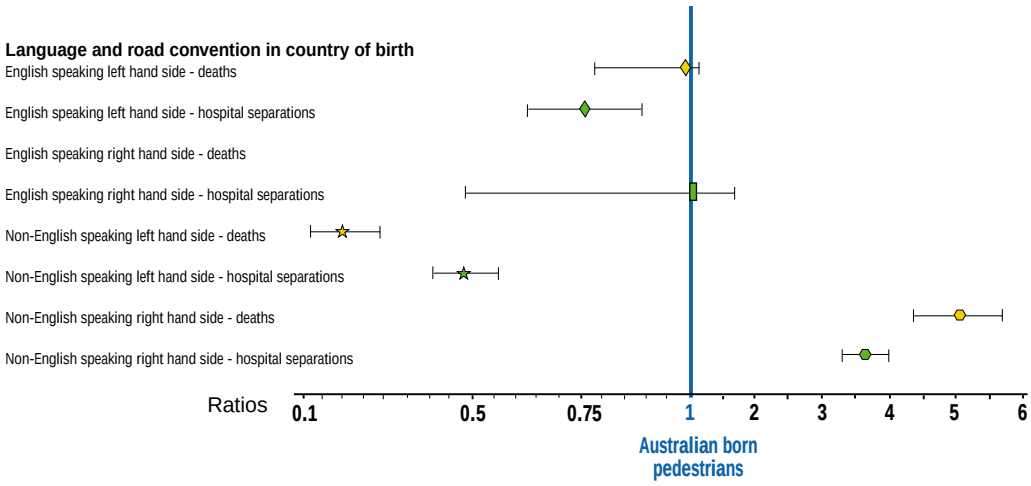
	Deaths (Australia 1994–1997)				*Hospital separations (New South Wales June 1995–1997)*			
	0-14	15-24	25-59	≥60	0-14	15-24	25-59	≥60
Australia	14	20	35	32	29	21	28	22
Language:								
Other English speaking	3	7	37	53	6	9	47	38
Non-English speaking	2	5	28	66	12	10	43	36
Road Convention:								
Other left hand side	5	9	36	50	13	15	44	28
Right hand side	0	3	27	70	9	6	44	41

Further analysis was conducted to separate the effects of language and road convention on pedestrian safety. Mortality and hospitalisation ratios were calculated for pedestrians of urban residence, standardised for age and sex for each of the eight combinations of language and road convention. The analysis focused on pedestrians of urban residence due to the stronger effect found in metropolitan areas and insufficient numbers for rural areas. The results are summarised in Table 6. Refer Appendix C, Tables C.61-62 for details.

Table 6.
Standardised ratios for pedestrians of urban residence by language and road convention of country of birth

	Deaths	*Hospital separations*
Australia		
SMR/SHR	1.00	1.00
English speaking/left hand side		
SMR/SHR	0.97	0.76
95% CI	0.78, 1.16	0.63, 0.89
English speaking/right hand side		
SMR/SHR	-	1.09
95% CI	-	0.48, 1.71
Non-English speaking/left hand side		
SMR/SHR	0.21	0.48
95% CI	0.14, 0.29	0.41, 0.56
Non-English speaking/right hand side		
SMR/SHR	5.05	3.65
95% CI	4.36, 5.74	3.31, 4.00

Figure 1.
Standardised ratios for pedestrians of urbane residence by language and road conventio



The results demonstrate that pedestrians born in other English speaking and non-English speaking countries where the convention is to drive on the left hand side of the road were equally safe or safer than Australian born pedestrians. On the other hand, pedestrians born in non-English speaking countries with a right side driving

convention were at significantly greater risk of being hospitalised or dying on the road relative to Australian born pedestrians. The results for English speaking/right hand side residents were equivocal given the relatively small numbers and the probable under identification of such cases at hospitals. The results never the less suggest that road convention may have a greater influence on pedestrian safety than language in country of origin.

The difference in risk for the overseas born and locally born population is greatest for the 60 years and over age groups. Those in this age group who were born in countries that drive on the right hand side have at least 10 times the risk of being killed or injured as pedestrians when compared to the Australian born. Tables C.61-62 in Appendix C report the risk ratios for all age groups of overseas born residents.

5.4 Other road users

Table 7 has details of standardised mortality and hospital separation ratios for male and female other road users by language and road convention.

This category is a mix of road user classes making interpretation somewhat more difficult. Overall, those born overseas tended to have lower rates of hospital admission than those born in Australia. Results relating to mortality rates varied. Women from 'right hand side' countries and men from other English speaking countries had higher rates. Conversely men from 'right hand side' countries or from non-English speaking countries had lower rates.

These results reflect both the mixed nature of this group and the relatively low numbers involved.

Table 7.
Standardised ratios for male and female other road users

		Deaths		*Hospital separations*	
		Male	Female	Male	Female
Australia					
	SMR/SHR	1.00	1.00	1.00	1.00
Language:					
Other English speaking					
	SMR/SHR	1.36	1.59	0.50	0.49
	95% CI	1.11, 1.6	0.88, 2.31	0.43, 0.58	0.35, 0.64
Non-English speaking					
	SMR/SHR	0.67	0.85	0.45	0.86
	95% CI	0.53, 0.82	0.40, 1.29	0.40, 0.49	0.74, 0.99
Road Convention:					
Other left hand side of road					
	SMR/SHR	1.10	1.37	0.48	0.59
	95% CI	0.91, 1.29	0.8, 1.94	0.43, 0.54	0.47, 0.71
Right hand side of road					
	SMR/SHR	0.75	0.89	0.44	0.90
	95% CI	0.58, 0.93	0.36, 1.41	0.39, 0.49	0.76, 1.05

6. DISCUSSION

There is no evidence to suggest that overseas born drivers are more likely than Australian drivers to be involved in crashes resulting in death or serious injury. Overall, the mortality and hospital separation rates for those born overseas tended to be equal to or better than those for Australian born drivers. In particular, female drivers born overseas tend to have lower rates of hospitalisation regardless of language or road convention. Male drivers from English speaking countries or those that drive on the left hand side of the road also have lower rates of hospitalisation.

Of course, licence holding rates may differ among those born locally and those born overseas and this could influence these results. For example, if people born overseas are less likely to hold a licence the number of road crashes per 100,000 population could appear low while the number per licensed driver is actually as high or higher than that for Australian born drivers.

The most concerning results of the study were with respect to pedestrians. Pedestrians born in other English speaking and non-English speaking countries where the convention is to drive on the left hand side of the road were equally safe or safer than Australian born pedestrians. On the other hand, pedestrians born in countries with a right side driving convention were at significantly greater risk of being hospitalised or dying on the road relative to Australian born pedestrians. Road convention appears to have a greater influence on pedestrian safety than language in country of origin.

The difference in risk for the overseas born and locally born population is greatest for the 60 years and over age groups. Those in this age group who were born in countries that drive on the right hand side have at least 10 times the risk of being killed or injured as pedestrians when compared to the Australian born. The actual impact of this increased risk is exacerbated by demographic patterns. Pedestrian casualties for the overseas born comprised more older people than for the Australian born. Of the pedestrian deaths involving those from countries driving on the right hand side of the road 70% were 60 years of age or older compared to 32% for Australian born. The difference for hospital separations is less marked but in the same direction.

Results for passengers are of less interest as passengers rarely, if ever, influence crash outcomes. The results suggest that males born overseas are under represented as passengers in terms of hospital admissions although they do not differ by any appreciable amount in terms of mortality ratios. Female passengers, on the other hand, are over represented in terms of both deaths and hospital admissions when these women are from non-English speaking countries or from those that drive on the right hand side. These results probably reflect differences in travel patterns for these groups.

This study has some limitations. If smaller proportions of migrants from some countries are drivers compared to the rest of the population, then it is possible that rates of deaths and hospital separations were underestimated. Similarly if relatively higher proportions of migrants tend to be passengers or pedestrians then the rates of death or hospitalisation could have been over-estimated. This form of bias, due to lack of data for the denominators of the rate calculations, is hard to assess or avoid, except through very detailed studies of transport use.

The apparent under-reporting of hospital admissions by those born in other English speaking countries was another limitation especially as it is unclear whether those that

were identified as belonging to this group were representative of the actual population. Furthermore, the absence of data on length of stay in Australia also restricted the extent of our ability to interpret the results. Further research is needed to establish whether more recent arrivals are most at risk.

Despite these limitations, it is of interest that while overseas born drivers are not over represented in trauma statistics, overseas born pedestrians clearly are. The reason for this may in part lie with the influence of spatial indicators on road related behaviour. Regardless of the side of the road on which traffic travels, there are various spatial cues which assist the driver. In the first place, the driver is always seated closest to the centre line of the road. Travelling with the driver adjacent to the curb is a clear indication that something is wrong. Furthermore, if a driver inadvertently strays to the wrong side of the road, oncoming traffic will be seen approaching directly prompting avoidance manoeuvres. Pedestrians lack such spatial cues to guide their behaviour. The pedestrian who looks the wrong way will be struck by a car that is not seen or even anticipated.

Such behaviour may be difficult to influence, especially given the advanced age of the majority of victims. It is probable that pedestrian behaviour (looking to the left or to the right) is learnt at an early age and becomes an unconscious action for the majority of individuals. Certainly, educational material could be directed to increase public awareness of the issue for those most at risk. There is an obvious place for appropriate community based organisations to play a lead role in any communication strategy.

On the basis of these findings, it would appear that if the relative safety of those born in countries that drive on the right hand side of the road could be improved to match those born in Australia then 34 pedestrian lives would be saved each year and many more hospital admissions avoided. This is approximately a 10% reduction in the total pedestrian road toll for 2000.

7. REFERENCES

Australian Bureau of Statistics (1990). *Australian standard classification of countries for social statistics.* Australian Bureau of Statistics, Canberra, Australia.

Australian Bureau of Statistics (1996). *Australian standard geographical classification* (ASGC). Catalogue No. 1216.0. Australian Bureau of Statistics, Canberra, Australia.

Burvill, P.W., McGall, M.G., Stenhouse, N.S. & Reid, T.A. (1973). Deaths from suicide, motor vehicle accidents and all forms of violent death among migrants in Australia, 1962-66, *Acta Psychiatrica Scandinavica, 49,* 28-50.

Derewlany, R. & Preece, R.A. (1991). *A Study of non-English Speaking Background Attitudes and Knowledge about Seat Belts and Child Restraints.* Roads and Traffic Authority of New South Wales, Road Safety Bureau Consultant Report CR 2/91.

Department of Primary Industries and Energy and Department of Human Services and Health (1994). *Rural, remote and metropolitan area classification:1991 Census edition.* Canberra, Australia Government Publishing Service.

Dobson, A., Brown, W., Ball, J., Powers, J. & McFadden, M. (1999). Women drivers' behaviour, socio-demographic characteristics and accidents. *Accident Analysis and Prevention 31,* 525-535.

Federal Office of Road Safety (1996). *Monograph 5 Driving in unfamiliar surroundings Part 3: Country driving/city driving.* Federal Office of Road Safety, Canberra, Australia.

International classification of diseases, 9th revision, clinical modification: ICD-9-CM annotated Ann Arbor, Mich.: Commission on Professional and Hospital Activities, 1993. Edition 10th (ed).

Johnson, F.W., Gruenewald, P.J. & Treno, A.J. (1998). Age-related differences in risks of drinking and driving in gender and ethnic groups. *Alcoholism: Clinical and Experimental Research, 22(9),* 2013-2022.

Lang, S.W., Waller, P.F. & Shope, J.T. (1996). Adolescent Driving: Characteristics associated with single-vehicle and injury crashes. *Journal of Safety Research, 27(4),* 241-257.

Lawson, S.D. & Edwards, P.J. (1991). The involvement of ethnic minorities in road accidents: Data from three studies of young pedestrian casualties. *Traffic Engineering and Control, 32,* 12-19.

Preece, R. (1994). *Evaluation of the 1993 Rear Child Restraint Use Campaign in NSW Amongst Three Non-English Speaking Background Communities,* Roads and Traffic Authority of New South Wales, Road Safety Bureau Research Note RN 19/94.

Roberts, I., Norton, R. & Taua, B. (1996). Child pedestrian injury rates: the importance of 'exposure to risk' relating to socioeconomic and ethnic differences, in Auckland, New Zealand. *Journal of Epidemiology and Community Health, 50,* 162-165.

Shin, D., Hong, L. & Waldron, I. (1999). Possible causes of socioeconomic and ethnic differences in seat belt use among high school students. *Accident Analysis and Prevention, 31,* 485-496.

Walker, M.B. (1991). *Seat Belt and Child Restraint Usage Among Car Occupants from non-English Speaking Backgrounds: Comparison of Anglo, Italo, Lebanese and Vietnamese Communities.* Roads and Traffic Authority of New South Wales, Road Safety Bureau Research Note RN 6/91, RTA 91.150.

www.health.nsw.gov.au/iasd/isc/index1.html

APPENDIXES

Appendix A: Classification of Country of Birth

Country of Birth	*Drive on left or right*	*Non-English Speaking or English Speaking*	*Australian Population (1996)*	*NSW Population (1996)*	*Australia No.of Deaths (1994-1997)*	*NSW Hospital Admissions (1995-1997)*
Australia	Left	English Speaking	14,052,061	4,685,408	5,583	16,911
New Zealand	Left	English Speaking	315,054	95,493	172	287
Other Oceania and Antarctica	Left	Non-English Speaking	94,852	46,650	34	167
Germany	Right	Non-English Speaking	120,753	35,624	42	92
Greece	Right	Non-English Speaking	141,750	46,204	59	113
Italy	Right	Non-English Speaking	259,125	72,083	75	204
United Kingdom and Ireland	Left	English Speaking	1,220,013	332,911	460	829
Former Yugoslav Republics	Right	Non-English Speaking	193,775	73,401	34	99
Other Europe & former USSR	Right	Non-English Speaking	480,508	162,959	282	623
Lebanon	Right	Non-English Speaking	77,293	57,631	24	253
Other Middle East & North Africa	Right	Non-English Speaking	134,561	69,448	69	293
Malaysia	Left	Non-English Speaking	85,021	22,608	9	48
Philippines	Right	Non-English Speaking	102,675	52,347	20	101
Viet Nam	Right	Non-English Speaking	164,164	66,572	60	196
Other Southeast Asia	Left	Non-English Speaking	145,951	54,557	54	99
China	Right	Non-English Speaking	121,145	71,571	53	190
Hong Kong & Macao	Left	Non-English Speaking	79,224	45,058	26	102
Other Northeast Asia	Left	Non-English Speaking	79,682	42,906	29	127
India	Left	Non-English Speaking	84,770	31,411	20	85
Sri Lanka	Left	Non-English Speaking	51,960	15,817	14	48
Other Southern Asia	Right	Non-English Speaking	22,913	12,868	5	40
North America	Right	English Speaking	27,835	9,432	12	28
United States of America	Right	English Speaking	54,296	19,264	12	59
Sth & Central America & Caribbean	Right	Non-English Speaking	82,958	43,502	18	121
South Africa	Left	Non-English Speaking	61,371	23,096	12	51
Other Africa (excluding North Africa)	Right	Non-English Speaking	57,004	15,907	16	40
Total			**18,422,695**	**6,204,728**	**7,194**	**21,206**

Appendix B: Statistical Methods and Formulas

Indirect standardisation was used to calculate standardised mortality ratios (SMR) for road crashes after adjustment for age or for age and area of residence. The reference population was people born in Australia.

Mortality rates for people born in Australia (AMRs) were calculated using the formula:

$$AMR_{ijkl} = \frac{D_{ijkl}}{N_{jkl}}$$

where

AMR_{ijkl} is the mortality rate for Australian born people for fatal injury type i and for each group jkl,

D_{ijkl} is the total number of deaths for Australian born people in group jkl for 1994-97,

N_{jkl} is the total number of Australian born residents in group jkl at the 1996 census,

i denotes the injury type (driver, passenger, pedestrian and other),

j denotes sex (female or male),

k denotes the RRMA category (capital city, other metropolitan centres, large rural centre, small rural centre, other rural area, remote centre and other remote area), and

l denotes the age categorised into 5-year age groups.

To calculate the SMR, the expected number of deaths for migrants, if they had the same mortality rate as Australian-born residents, was calculated.

For standardisation by age the expected number of deaths is given by the formula:

$$E_{ijk\bullet m} = \sum_{l} N_{jklm} AMR_{ijkl}$$

where

$E_{ijk\bullet m}$ is the expected number of deaths for persons born in country m of sex j, injury type and area k, standardised for age,

N_{jklm} is the number of Australian residents born in country m of group $ijkl$, and

AMR_{ijkl} is the mortality rate for injury type i for Australian born people in for group jkl.

For standardisation by age and area of residence the expected number of deaths is given by the formula:

$$E_{ij\bullet\bullet m} = \sum_{l}\sum_{k} N_{jklm} AMR_{ijkl}$$

where

$E_{ij\bullet\bullet m}$ is the expected number of deaths for persons born in country m of sex j for injury type i.

The observed number of deaths in the same period was calculated with:

O_{ijkm} denoting the number of deaths that occurred due to injury type i for residents born in country m, of sex j and who reside in area k, and

$O_{ij\bullet m}$ denoting the number of deaths that occurred due to injury type i for residents born in country m of sex j, summed over all areas.

The age standardised mortality ratio was calculated for each country of birth, sex, area and injury type using the formula:

$$SMR_{ijk\bullet m} = \frac{O_{ijk\bullet m}}{E_{ijk\bullet m}}$$

The age and area standardised mortality ratio was calculated for each country of birth, sex and injury type using the formula:

$$SMR_{ij\bullet\bullet m} = \frac{O_{ij\bullet\bullet m}}{E_{ij\bullet\bullet m}}$$

Approximate 95% confidence limits for an age standardised mortality ratio were calculated using the formula:

$$SMR_{ijk\bullet m} \pm 1.96 \frac{\sqrt{O_{ijk\bullet m}}}{E_{ijk\bullet m}}$$

Approximate 95% confidence limits for an age and area standardised mortality ratio were calculated using the formula:

$$SMR_{ij\bullet\bullet m} \pm 1.96 \frac{\sqrt{O_{ij\bullet\bullet m}}}{E_{ij\bullet\bullet m}}$$

Standardised ratios for hospital separations (SHR) and the corresponding confidence limits were computed similarly.

Appendix C: Statistical Tables

Table C.1. Female age and area standardised mortality ratios (all areas of Australia) for all road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	1630	1.00	-
Right	259	1.27	(1.12,1.43)
Left	261	1.08	(0.95,1.21)

Table C.2. Female age standardised mortality ratios (capital cities and other metropolitan areas) for all road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	863	1.00	-
Right	219	1.28	(1.11,1.45)
Left	183	1.02	(0.87,1.17)

Table C.3. Female age standardised mortality ratios (rural centres and remote areas) for all road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	767	1.00	-
Right	40	1.26	(0.87,1.65)
Left	78	1.22	(0.95,1.49)

Table C.4. Female age and area standardised mortality ratios (all areas of Australia) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	635	1.00	-
Right	67	0.84	(0.64,1.04)
Left	97	1.00	(0.8,1.19)

Table C.5. Female age standardised mortality ratios (capital cities and other metropolitan areas) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	313	1.00	-
Right	50	0.76	(0.55,0.98)
Left	62	0.90	(0.68,1.13)

Table C.6. Female age standardised mortality ratios (rural centres and remote areas) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	322	1.00	-
Right	17	1.20	(0.63,1.76)
Left	35	1.20	(0.81,1.60)

Table C.7. Female age and area standardised mortality ratios (all areas of Australia) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	579	1.00	-
Right	98	1.60	(1.28,1.91)
Left	90	1.18	(0.94,1.42)

Table C.8. Female age standardised mortality ratios (capital cities and other metropolitan areas) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	283	1.00	-
Right	86	1.70	(1.34,2.05)
Left	63	1.16	(0.88,1.45)

Table C.9. Female age standardised mortality ratios (rural centres and remote areas) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	296	1.00	-
Right	12	1.05	(0.46,1.64)
Left	27	1.20	(0.75,1.65)

Table C.10. Female age and area standardised mortality ratios (all areas of Australia) for pedestrian

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	295	1.00	-
Right	83	1.66	(1.3,2.02)
Left	52	0.98	(0.72,1.25)

Table C.11. Female age standardised mortality ratios (capital cities and other metropolitan areas) for pedestrian

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	216	1.00	-
Right	75	1.64	(1.27,2.01)
Left	47	1.03	(0.73,1.32)

Table C.12. Female age standardised mortality ratios (rural centres and remote areas) for pedestrian

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	79	1.00	-
Right	8	-	-
Left	5	-	-

Table C.13. Female age and area standardised mortality ratios (all areas of Australia) for other road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	121	1.00	-
Right	11	0.89	(0.36,1.41)
Left	22	1.37	(0.8,1.94)

Table C.14. Female age standardised mortality ratios (capital cities and other metropolitan areas) for other road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	51	1.00	-
Right	8	-	-
Left	11	1.06	(0.43,1.69)

Table C.15. Female age standardised mortality ratios (rural centres and remote areas) for other road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	70	1.00	-
Right	3	-	-
Left	11	1.86	(0.76,2.95)

Table C.16. Male age and area standardised mortality ratios (all areas of Australia) for all road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	3953	1.00	-
Right	522	1.08	(0.98,1.17)
Left	569	0.98	(0.9,1.06)

Table C.17. Male age standardised mortality ratios (capital cities and other metropolitan areas) for all road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	2080	1.00	-
Right	440	1.05	(0.96,1.15)
Left	410	0.93	(0.84,1.02)

Table C.18. Male age standardised mortality ratios (rural centres and remote areas) for all road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	1873	1.00	-
Right	82	1.13	(0.89,1.38)
Left	159	1.08	(0.91,1.25)

Table C.19. Male age and area standardised mortality ratios (all areas of Australia) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	1730	1.00	-
Right	223	1.00	(0.87,1.13)
Left	262	0.99	(0.87,1.11)

Table C.20. Male age standardised mortality ratios (capital cities and other metropolitan areas) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	848	1.00	-
Right	178	0.96	(0.82,1.10)
Left	174	0.90	(0.77,1.04)

Table C.21. Male age standardised mortality ratios (rural centres and remote areas) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	882	1.00	-
Right	45	1.15	(0.81,1.48)
Left	88	1.14	(0.91,1.38)

Table C.22. Male age and area standardised mortality ratios (all areas of Australia) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	690	1.00	-
Right	75	1.20	(0.93,1.47)
Left	74	0.90	(0.7,1.11)

Table C.23. Male age standardised mortality ratios (capital cities and other metropolitan areas) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	334	1.00	-
Right	66	1.25	(0.95,1.55)
Left	57	0.95	(0.70,1.19)

Table C.24. Male age standardised mortality ratios (rural centres and remote areas) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	356	1.00	-
Right	9	-	-
Left	17	0.75	(0.39,1.11)

Table C.25. Male age and area standardised mortality ratios (all areas of Australia) for pedestrian

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	677	1.00	-
Right	154	1.44	(1.21,1.67)
Left	101	0.88	(0.71,1.05)

Table C.26. Male age standardised mortality ratios (capital cities and other metropolitan areas) for pedestrian

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	450	1.00	-
Right	135	1.37	(1.14,1.60)
Left	82	0.84	(0.66,1.03)

Table C.27. Male age standardised mortality ratios (rural centres and remote areas) for pedestrian

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	227	1.00	-
Right	19	2.25	(1.24,3.27)
Left	19	1.12	(0.62,1.62)

Table C.28. Male age and area standardised mortality ratios (all areas of Australia) for other road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	856	1.00	-
Right	70	0.75	(0.58,0.93)
Left	132	1.10	(0.91,1.29)

Table C.29. Male age standardised mortality ratios (capital cities and other metropolitan areas) for other road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	448	1.00	-
Right	61	0.76	(0.57,0.95)
Left	97	1.06	(0.85,1.28)

Table C.30. Male age standardised mortality ratios (rural centres and remote areas) for other road users

Country of Birth	*Number of Deaths*	*Standardised Mortality Ratio*	*(95% CI)*
Australia	408	1.00	-
Right	9	-	-
Left	35	1.13	(0.75,1.50)

Table C.31. Female age and area standardised hospital separation ratios (all areas of Australia) for all road users

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	6484	1.00	-
Right	1114	1.00	(0.95,1.06)
Left	888	0.87	(0.81,0.93)

Table C.32. Female age standardised hospital separation ratios (capital city and other metropolitan areas) for all road users

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	4417	1.00	-
Right	1017	1.00	(0.94,1.06)
Left	752	0.87	(0.81,0.93)

Table C.33. Female age standardised hospital separation ratios (rural centres and remote areas) for all road users

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	2045	1.00	-
Right	82	1.23	(0.96,1.50)
Left	101	0.77	(0.62,0.93)

Table C.34. Female age and area standardised hospital separation ratios (all areas of Australia) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	2587	1.00	-
Right	350	0.70	(0.63,0.77)
Left	315	0.69	(0.62,0.77)

Table C.35. Female age standardised hospital separation ratios (capital city and other metropolitan areas) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	1710	1.00	-
Right	308	0.69	(0.61,0.77)
Left	256	0.68	(0.60,0.76)

Table C.36. Female age standardised hospital separation ratios (rural centres and remote areas) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	867	1.00	-
Right	39	1.21	(0.83,1.59)
Left	54	0.88	(0.64,1.11)

Table C.37. Female age and area standardised hospital separation ratios (all areas of Australia) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	2156	1.00	-
Right	405	1.24	(1.12,1.36)
Left	313	1.02	(0.91,1.13)

Table C.38. Female age standardised hospital separation ratios (capital city and other metropolitan areas) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	1446	1.00	-
Right	374	1.26	(1.13,1.39)
Left	270	1.05	(0.93,1.18)

Table C.39. Female age standardised hospital separation ratios (rural centres and remote areas) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	703	1.00	-
Right	26	1.28	(0.79,1.77)
Left	17	0.42	(0.22,0.62)

Table C.40. Female age and area standardised hospital separation ratios (all areas of Australia) for pedestrian

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	836	1.00	-
Right	215	1.78	(1.54,2.01)
Left	173	1.55	(1.32,1.78)

Table C.41. Female age standardised hospital separation ratios (capital city and other metropolitan areas) for pedestrian

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	657	1.00	-
Right	204	1.55	(1.33,1.76)
Left	157	1.43	(1.20,1.65)

Table C.42. Female age standardised hospital separation ratios (rural centres and remote areas) for pedestrian

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	177	1.00	-
Right	6	-	-
Left	13	1.32	(0.60,2.03)

Table C.43. Female age and area standardised hospital separation ratios (all areas of Australia) for other road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	905	1.00	-
Right	144	0.90	(0.76,1.05)
Left	87	0.59	(0.47,0.71)

Table C.44. Female age standardised hospital separation ratios (capital city and other metropolitan areas) for other road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	604	1.00	-
Right	131	0.91	(0.75,1.07)
Left	69	0.56	(0.42,0.69)

Table C.45. Female age standardised hospital separation ratios (rural centres and remote areas) for other road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	298	1.00	-
Right	11	1.15	(0.47,1.84)
Left	17	0.92	(0.48,1.36)

Table C.46. Male age and area standardised hospital separation ratios (all areas of Australia) for all types of road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	10894	1.00	-
Right	1465	0.81	(0.77,0.85)
Left	1080	0.63	(0.59,0.67)

Table C.47. Male age standardised hospital separation ratios (capital city and other metropolitan areas) for all types of road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	7113	1.00	-
Right	1345	0.83	(0.79,0.88)
Left	930	0.65	(0.61,0.70)

Table C.48. Male age standardised hospital separation ratios (rural centres and remote areas) for all types of road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	3741	1.00	-
Right	90	0.82	(0.65,0.99)
Left	126	0.58	(0.48,0.68)

Table C.49. Male age and area standardised hospital separation ratios (all areas of Australia) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	3612	1.00	-
Right	691	0.98	(0.91,1.06)
Left	422	0.66	(0.59,0.72)

Table C.50. Male age standardised hospital separation ratios (capital city and other metropolitan areas) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	2303	1.00	-
Right	637	1.05	(0.97,1.13)
Left	363	0.70	(0.63,0.77)

Table C.51. Male age standardised hospital separation ratios (rural centres and remote areas) for driver of motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	1299	1.00	-
Right	48	0.99	(0.71,1.28)
Left	49	0.54	(0.39,0.69)

Table C.52. Male age and area standardised hospital separation ratios (all areas of Australia) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	1853	1.00	-
Right	193	0.80	(0.68,0.91)
Left	181	0.74	(0.63,0.85)

Table C.53. Male age standardised hospital separation ratios (capital city and other metropolitan areas) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	1149	1.00	-
Right	175	0.86	(0.73,0.98)
Left	146	0.77	(0.64,0.89)

Table C.54. Male age standardised hospital separation ratios (rural centres and remote areas) for passenger in motor vehicle other than motorcycle

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	693	1.00	-
Right	10	0.65	(0.25,1.06)
Left	30	0.93	(0.60,1.26)

Table C.55. Male age and area standardised hospital separation ratios (all areas of Australia) for pedestrian

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	1548	1.00	-
Right	304	1.28	(1.14,1.43)
Left	179	0.82	(0.70,0.94)

Table C.56. Male age standardised hospital separation ratios (capital city and other metropolitan areas) for pedestrian

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	1217	1.00	-
Right	289	1.13	(1.00,1.26)
Left	168	0.78	(0.66,0.89)

Table C.57. Male age standardised hospital separation ratios (rural centres and remote areas) for pedestrian

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	323	1.00	-
Right	5	-	-
Left	8	-	-

Table C.58. Male age and area standardised hospital separation ratios (all areas of Australia) for other road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	3881	1.00	-
Right	277	0.44	(0.39,0.49)
Left	298	0.48	(0.43,0.54)

Table C.59. Male age standardised hospital separation ratios (capital city and other metropolitan areas) for other road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	2444	1.00	-
Right	244	0.45	(0.39,0.50)
Left	253	0.51	(0.44,0.57)

Table C.60. Male age standardised hospital separation ratios (rural centres and remote areas) for other road crash involvement

Country of Birth	*Number of Hospital Separations*	*Standardised Hospital Separation Ratio*	*(95% CI)*
Australia	1426	1.00	-
Right	27	0.73	(0.45,1.00)
Left	39	0.51	(0.35,0.68)

Table C.61. Standardised mortality ratios by country of birth compared with Australia born people, for pedestrian females and males of urban residence, standardised for age.

Country of Birth	*0-14 Number of Deaths*	*SMR*	*(95% CI)*	*15-24 Number of Deaths*	*SMR*	*(95% CI)*	*25-59 Number of Deaths*	*SMR*	*(95% CI)*	*60+ Number of Deaths*	*SMR*	*(95% CI)*
Females												
Australia	29	1.00	-	27	1.00	-	62	1.00	-	98	1.00	-
English/Left	0	-	-	1	-	-	10	0.93	(0.35,1.5)	21	1.03	(0.59,1.48)
English/Right	0	-	-	1	-	-	1	-	-	0	-	-
Non-English/Left	2	-	-	2	-	-	7	-	-	4	-	-
Non-English/Right	1	-	-	2	-	-	20	3.61	(2.03,5.2)	50	13.87	(10.02,17.71)
Males												
Australia	62	1.00	-	103	1.00	-	172	1.00	-	113	1.00	-
English/Left	3	-	-	5	-	-	26	0.79	(0.48,1.09)	33	1.18	(0.78,1.58)
English/Right	0	-	-	0	-	-	0	-	-	0	-	-
Non-English/Left	1	-	-	4	-	-	3	-	-	7	-	-
Non-English/Right	0	-	-	3	-	-	36	2.49	(1.67,3.3)	96	21.56	(17.25,25.87)

Table C.62. Standardised hospital separation ratios by country of birth compared with Australian born people, for pedestrian females and males of urban residence, standardised for age.

Country of Birth	0-14 Number of Hospital Admissions	SHR	(95% CI)	15-24 Number of Hospital Admissions	SHR	(95% CI)	25-59 Number of Hospital Admissions	SHR	(95% CI)	60+ Number of Hospital Admissions	SHR	(95% CI)
Females												
Australia	168	1.00	-	106	1.00	-	145	1.00	-	199	1.00	-
English/Left	5	-	-	1	-	-	18	0.81	(0.43,1.18)	29	0.92	(0.59,1.26)
English/Right	0	-	-	1	-	-	3	-	-	0	-	-
Non-English/Left	9	-	-	16	1.34	(0.68,2.00)	40	0.84	(0.58,1.10)	24	0.47	(0.28,0.66)
Non-English/Right	15	2.43	(1.20,3.66)	13	1.29	(0.59,1.99)	72	4.26	(3.28,5.25)	89	12.45	(9.86,15.04)
Males												
Australia	337	1.00	-	249	1.00	-	340	1.00	-	180	1.00	-
English/Left	2	-	-	11	0.89	(0.36,1.41)	43	0.77	(0.54,1.00)	22	0.61	(0.35,0.86)
English/Right	2	-	-	0	-	-	3	-	-	3	-	-
Non-English/Left	22	1.31	(0.76,1.86)	17	0.62	(0.32,0.91)	27	0.25	(0.15,0.34)	7	-	-
Non-English/Right	23	1.95	(1.15,2.74)	15	0.63	(0.31,0.95)	118	3.19	(2.61,3.76)	93	13.46	(10.73,16.20)

www.atsb.gov.au

1800 621 372

ISBN 0 642 25526 1