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The impact of area socioeconomic inequity on serious injury in Victoria

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This study investigates the relationship between the socioeconomic status of the area in which a person lives and their risk of injury.

Summary

Injuries are the largest single cause of death in persons aged 1-44 years in Victoria and a major cause of morbidity (illness) and disability. Social factors such as socioeconomic status (SES) are increasingly being viewed as fundamental causes of premature death and illness and there is a growing body of evidence linking residential location with health outcomes. The aim of this study was to investigate the relationship between the SES of the area in which a person lives and their risk of hospitalisation for injury. Local government areas (LGAs) in Victoria are assigned to SES quintiles (fifths) by the Australian Bureau of Statistics (ABS) based on a composite measure of SES devised by the bureau. For this research project, all individuals living in an LGA were assigned the same SES ranking (1- most disadvantaged through 5- least disadvantaged) and their risk of injury compared.

ALL AGES

People living in the more disadvantaged quintiles were consistently and significantly more likely to be hospitalised than people in the least disadvantaged quintile for assaultive injury (all causes combined), transport injury (but only for injury to car occupants and motorcyclists, not pedestrians and bicyclists), machinery related injury and fire/burns/scalds. Males in the more disadvantaged quintiles were significantly more likely to be hospitalised than males in the least disadvantaged quintile for all injury intents (causes) combined, and natural/environmental/animal-related injury. By contrast, females in the more disadvantaged quintiles were significantly less likely to be hospitalised for fall injury (the leading cause of injury) than females in the least disadvantaged quintile.

CHILDREN (0-14 years)

Children in the more disadvantaged quintiles were consistently and significantly more likely to be hospitalised for transport injury (specifically due to their higher risk of motorcycling injury) than children in the least disadvantaged quintile.

ADOLESCENTS AND YOUNG ADULTS (15-24 years)

Adolescents and young adults in the more disadvantaged quintiles were consistently and significantly more likely to be hospitalised than persons in the least disadvantaged quintile for all injury intents (causes) combined, unintentional injury (all causes combined), assaultive injury (all causes combined) and transport injury (for motor vehicle occupants and motorcyclists but not for pedestrians and cyclists).







ADULTS (25-64 years)

Adults in the more disadvantaged quintiles were consistently and significantly more likely to be hospitalised than adults in the least disadvantaged quintile for self-harm (all causes combined) and machinery-related injury and, for males, all injury intents (causes) combined, unintentional injury (all causes combined) and natural/environmental/animal-related injury.

OLDER ADULTS (65 years and older)

In contrast to other age groups, older persons in the more disadvantaged quintiles were shown to be less likely to be hospitalised for fall injury and, among females, for all causes of injury combined and all causes of unintentional injury combined than their counterparts in the least disadvantaged quintile.

The findings from this study suggest that broad generalisations about the relationship between injury occurrence and area SES (at the LGA level of aggregation) are best avoided and that patterns vary by cause of injury, sex and age group. Injury hospital admission rates were generally lowest in the least disadvantaged quintile of LGAs but not often highest in the most disadvantaged quintile. Overall, the regression analysis showed that persons living in the more disadvantaged areas were significantly more likely to be hospitalised than persons in the least disadvantaged area for transport injury (Incident Rate Ratio range 1.18-1.36), machinery-related injury (1.50-1.83), fire/burns/scalds (1.25-1.61) and assaultive injury (1.20-1.77). These injury causes account for 20% of injury hospital admissions.

We found little evidence that area SES influenced the occurrence of injury hospitalisations in older persons and the occurrence of fall injury, the leading cause of injury hospitalisations in Victoria, in any age group. In general, our study found that there was a much stronger relationship between area SES and injury risk in males than females. Overall, we found that the risk conferred by the area in which a person lives is somewhat elevated in some age groups and for some causes.

Tailored area-based interventions at the local government level would appear to be appropriate for the injury causes that showed the strongest relationship with area SES: transport injury for car occupants and motorcyclists (except in older adults), machinery-related injury (in working age adults), self-harm (in working age adults) and assaultive injury (in young people). Further research is needed to increase our understanding of the mechanisms producing area socioeconomic differentials in injury so that appropriate strategies and countermeasures can be developed.

Introduction

Injuries are the largest single cause of death in persons aged 1-44 years in Victoria and Australia and a major cause of morbidity (illness) and disability. Social factors such as socioeconomic status (SES) are increasingly being viewed as fundamental causes of premature death and illness and there is a growing body of evidence linking the SES of residential location with health outcomes. The authors of a recent review of around 300 research studies on socioeconomic disparities and injury, mostly conducted in high income countries similar to Australia, concluded that published research to date supports the proposition that people with low SES are at increased risk of injury (Laflamme et al., 2009).

The studies either used single or aggregated individual-level measures of SES (such as household income, educational level and/or occupational status) or area-level measures that are applied to all individuals living in an area irrespective of their individual SES (such as neighbourhood income levels, proportion of unemployed in a specific area or composite indicators). A few more recent studies were multi-level using both individual and area SES measures in an attempt to untangle the relative contribution of each. The review authors concluded that the weight of current evidence on the relationship between SES and injury occurrence supports the proposition that disparity in injury risk is evident for most major causes of injury such as road traffic, intentional self-harm, interpersonal violence, drowning, falls, poisoning and burns (Laflamme et al., 2009).

The relationship between SES and injury risk is not well studied in Australia. Our literature search found six studies published since 1990, four of which investigated the influence of area SES on child injury mortality (death) and morbidity (illness). An early study of area SES variations in child unintentional injury mortality in NSW by Carey et al. (1993) found that SES was associated with higher child injury mortality in the Sydney metropolitan area but not in the country areas, at the statistical local area (SLA) level of aggregation. Children in the lowest two SES quintiles (fifths) in the Sydney metropolitan area were around twice as likely to die as a result of unintentional injury as children in the highest SES quintile. The increased risk was most significant for child pedestrians from lower SES groups. The aggregate area-level measure of SES used was the Australian Bureau of Statistics (ABS) socioeconomic indicator based on demographic information from the 1986 census on 40 SES variables that fitted into five broad categories: income, education, occupation, wealth and power/prestige.

Contemporaneously, Jolly et al. (1993) reported that residence in a low income area was a significant predictor of child injury morbidity, based on an analysis of emergency department presentations to selected Brisbane and Melbourne hospitals. The authors found a consistent pattern of moderately strong and statistically significant associations between disadvantage and injury rates at the postcode level of aggregation. They concluded that SES was a significant predictor of child injury in Australia and that the association between SES and injury was present across cities, age groups, most types (causes) of injury and for those hospitalised as well as those treated as outpatients. The area-level ABS 1986 socioeconomic indicator was also used in this study.

The findings of two more recent child studies are less clear-cut and indicate that the relationship between SES and injury morbidity in children is more complex than previously thought. Lam (2005) found no differences in the risk pattern of

sports-related injury across different SES levels among children and adolescents in NSW. The SES of individual patients was assessed by the Index of Relative Social Disadvantage (IRSD) for postal areas developed by the ABS. Poulos et al (2007) found no clear overall relationship between area-level SES measured by the IRSD and child unintentional ('accidental') injury hospitalisations in NSW but reported, however, that SES gradients existed for some specific mechanisms (causes) of childhood injury such as transport-related injury, fire/burns/scalds and poisoning.

The two other Australian studies investigated area SES and injury risk across all age groups. An earlier VISU study (conducted in 2002) found that lower SES was associated with increased risk of injury at all levels of severity in Victoria: death, hospital admissions and ED presentations. However, the pattern of disadvantage and injury varied by cause of injury and age group affected (Stokes et al., 2001).

Draper and colleagues compared the difference in death rates for all major causes of death in Australia between the least and the most socioeconomically disadvantaged areas in six age groups by gender: less than 1 year, 0-14 years, 15-24 years, 25-64 years and 65-74 years and 75 years and older (Draper et al., 2004). Mortality rates were significantly higher in the most disadvantaged areas for all accidents and injuries in males and females aged 0-14; suicide and transport accidents in males aged 15-24 years; all accidents and injuries in females aged 15-24 years; suicides in females aged 15-24 years; and all accidents and injury in males aged 65-74 years (Draper et al., 2004).

Study aim

The aim of this study was to investigate the relationship between area SES and non-fatal injury risk for all external causes of injury in Victoria using routinely collected data on hospital admissions. One of the major reasons for investigating the effects of area SES on injury risk is to determine when generic state-wide or tailored and targeted area-based injury prevention interventions are appropriate. Area-based injury prevention interventions are usually delivered at the local government level in Victoria. For this reason we chose to explore the relationship between deprivation and injury risk at the local government area (LGA) of aggregation. We could not aggregate at the Statistical Local Area (SLA) level (a smaller unit of aggregation) because there were changes in SLA boundaries in Victoria during the 3-year study period.

Design

A cross-sectional study involving the analysis of routinely collected hospital admissions data for injury (excluding same day admissions) for Victorian residents over the period 2005-7. All admissions were located to one of 79 local government areas (LGAs) which were grouped into quintiles (fifths) using a measure of area socioeconomic disadvantage devised by the Australian Bureau of Statistics (ABS) (see Box 1 (page 28)).

Methods

Case selection

Cases were selected for the three-year period 2005-2007 from the Victorian Admitted Episodes Dataset (VAED) Injury Subset held by the Victorian Injury Surveillance Unit (VISU). The VAED contains all hospital admissions to public and private hospitals in Victoria and cases are coded to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM).

Admissions were selected if they met the following criteria:

- The patient was a resident of Victoria
- The record contained an external cause of injury code in the range (V01-Y36.9) AND injury or poisoning was the primary diagnosis.

Deaths in hospital, transfers in and between hospitals, and 'short-stays' (patients admitted and discharged on the same day) were excluded to minimise the possibility of double counting and the effect of differential access to medical care.

Assignment of an area SES index to cases

(See Box 1 for full explanation)

Demographic information on injury cases extracted from the VAED included the patient's age, gender and local government area (LGA) of residence (derived from their residential street address and postcode). There were 79 LGAs in Victoria over the study period, ranging in population from approximately 3,000 to 220,000 residents. LGAs are ranked on area SES into quintiles (fifths) based on the 2006 SEIFA Index of Relative Socio-economic Disadvantage (IRSD) devised by the Australian Bureau of Statistics (ABS) (Table 1). Quintile population characteristics are shown in a table at Appendix 1.

The ISRD is a score that summarises a wide range of information about the economic and social resources of people and households within an area including income, education, employment, rental versus home ownership and other variables that are associated with disadvantage, for example proportion of indigenous persons and single parent families. All persons residing in an LGA are given the same score. The appropriate SES ranking (1-5) was assigned to each selected hospital admission consistent with their LGA of residence.

Statistical analysis

All injury hospital admission rates (hospital admissions per 100,000 population per year) were calculated as a 3-year average, thus limiting any random fluctuations in injury hospitalisations in a given year. Rates were age-adjusted using the Victorian 2001 population as the standard.

Poisson regression analysis was used to determine incidence rate ratios (IRRs) for hospital admission rates by quintile of socioeconomic disadvantage (SES quintile). The main exploratory variable was the SES quintile with sex included as a covariate. A sex by SES quintile interaction was also included in the model to assess whether the effects of area SES differed by gender.

ABS categorisation of Victorian Local Government Areas (LGAs) by socioeconomic status quintile using the Index of Relative Social Disadvantage (IRSD) **Table 1**

Quintile 1 (Most disadvantaged)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (Least disadvantaged)
Ararat (RC)	Ballarat (C)	Baw Baw (S)	Cardinia (S)	Bayside (C)
East Gippsland (S)	Bass Coast (S)	Frankston (C)	Golden Plains (S)	Boroondara (C)
Glenelg (S)	Campaspe (S)	Hobsons Bay (C)	Kingston (C)	Glen Eira (C)
Hindmarsh (S)	Hepburn (S)	Mitchell (S)	Mornington Pen. (S)	Manningham (C)
Hume (C)	Mount Alexander (S)	South Gippsland (S)	Unincorporated Vic	Nillumbik (S)
Mildura (RC)	Wellington (S)	Southern Grampians (S)	Wyndham (C)	Port Phillip (C)
Swan Hill (RC)	West Wimmera (S)	Towong (S)	Yarra (C)	Stonnington (C)
Yarriambiack (S)	Whittlesea (C)	Warrnambool (C)	Yarra Ranges (S)	Surf Coast (S)
Brimbank (C)	Benalla (RC)	Alpine (S)	Casey (C)	Banyule (C)
Central Goldfields (S)	Buloke (S)	Corangamite (S)	Indigo (S)	Knox (C)
Greater Dandenong (C)	Colac-Otway (S)	Greater Bendigo (C)	Mansfield (S)	Macedon Ranges (S)
Latrobe (C)	Darebin (C)	Greater Geelong (C)	Melton (S)	Maroondah (C)
Loddon (S)	Gannawarra (S)	Horsham (RC)	Moonee Valley (C)	Melbourne (C)
Maribyrnong (C)	Great.Shepparton (C)	Moreland (C)	Moorabool (S)	Monash (C)
Northern Grampians (S)	Moira (S)	Wangaratta (RC)	Moyne (S)	Queenscliffe (B)
Pyrenees (S)	Strathbogie (S)	Wodonga (RC)	Murrindindi (S)	Whitehorse (C)

Note: RC=rural city; S=shire; C=city
Source: ABS catalogue number 2033.0.55.001 - Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia - Data only, 2006

Results are presented separately for all ages, children aged 0-14 years, adolescents and young adults aged 15-24 years, adults aged 25-64 years and older adults aged 65 years and older.

RESULTS

All ages

Hospital admission rates by area SES quintile

There were 56,796 injury hospital admissions per year in Victoria over the three-year study period 2005-2007. Most admissions (89%) were due to unintentional ('accidental') injury. Falls were the major cause of injury, accounting for almost half of all admissions (47%), followed by transport (14%), self harm (6%), hit/struck/crush (6%), cutting and piercing (4%), and assaults (3%).

Table 2 shows the average (mean) frequency of hospital admissions and age-adjusted injury admission rates by injury cause and area SES quintile. The deeper shading indicates the socioeconomic quintile with the highest age-adjusted admission rate for each cause of injury and the lighter shading indicates the quintile with the lowest.

As shown, the relationship between area SES and injury risk is complex. What is clear is that persons in the least disadvantaged SES areas (quintiles 4 and 5) were at lowest risk of hospitalisation for all of the major causes of injury with the notable exception of unintentional falls. In fact, SES appears to be 'protective' for serious fall injury (falls hospitalisation rate 454/100,000 in quintile 5 vs. 535/100,000 in quintile 1). Because falls comprise nearly half of unintentional injury hospitalisations, people in Quintile 1 (the most disadvantaged) had the lowest overall unintentional injury rate.

Near-drowning was the only major unintentional injury cause where people living in the most disadvantaged area (quintile 1) had the highest admission rate, although the near-drowning rate was the same in quintiles 2 and 3 as in 1. It was much more common for persons in the 2nd most disadvantaged quintile (Quintile 2) to have the highest injury hospitalisation rate for unintentional injury causes.

For self harm (all mechanisms combined), the injury rate was highest for persons in quintile 3, mainly because they were at highest risk of self harm by pharmaceuticals, the leading mechanism of self-harm. Persons in the most disadvantage areas (quintile 1) had the highest admission rate for self harm by sharp object and 'other' mechanisms of self-harm.

The pattern was very different for assaultive injury hospitalisations where the highest age-adjusted admission rate overall and for all major mechanisms (bodily force, sharp object etc.) were found for persons living in the most disadvantaged area (quintile 1).

Comparison of injury risk: Incidence rate ratios by area SES quintile

Regression analysis was performed to determine incidence rate ratios (IRRs) for hospital admission rates by SES quintile for the different injury intents (unintentional,

Average (mean) number of admissions and age-adjusted hospital admission rates per 100,000 persons by injury cause and quintile of area socioeconomic disadvantage, Victoria 2005-07 **Table 2**

INJURY INTENT AND CAUSE1	Average frequency of admissions (per year)	% of all admiss-ions	Age-adjusted admission rate	Age-adjusted admission rate by area SES quintile: Most disadvan-taged	2nd	3rd	4th	Least disadvan-taged
UNINTENTIONAL ('ACCIDENTAL') INJURY								
Falls	26,677	47.0	496.9	453.8	488.3	501.8	471.3	534.6
Transport	8,093	14.2	158.1	156.9	181.3	181.2	161.7	132.8
Hit/struck/crush	3,153	5.6	61.7	61.7	71.1	73.6	56.2	55.2
Cutting & piercing	1,980	3.5	38.7	41.7	47.0	43.7	36.7	33.0
Poisoning	1,437	2.5	27.9	31.9	32.8	29.8	24.2	25.6
Nat/environ/animals	1,414	2.5	27.3	29.8	37.1	32.9	26.3	19.3
Machinery	798	1.4	15.4	19.1	19.2	17.9	15.8	10.4
Fires/burns/scalds	678	1.2	13.2	14.8	16.4	15.3	12.7	10.1
Choking & suffocation	193	0.3	3.7	3.4	4.1	4.2	3.2	3.7
Firearms & explosions	78	0.1	1.52	1.5	1.9	2.0	1.8	0.9
Near drowning	47	0.1	0.94	1.0	1.0	1.0	0.9	0.8
Other unintentional	5,868	10.3	112.8	104.3	119.2	113.8	110.1	116.1
All unintentional injury	**50,415**	**88.8**	**958.2**	**919.8**	**1,019.5**	**1,017.1**	**920.9**	**942.7**
INTENTIONAL SELF-HARM								
Poisoning by pharmaceuticals	2,768	4.9	54.2	61.4	60.8	67.6	48.9	44.5
Sharp object	420	0.7	8.2	10.2	8.0	9.6	7.4	7.2
Poisoning by other substances	190	0.3	3.7	4.0	3.7	4.7	3.0	3.6
Hanging/strangulation	50	0.1	1.0	0.7	1.2	1.5	1.0	0.8
All other mechanisms	103	0.2	2.0	2.7	2.1	2.4	1.7	1.6
All self harm	**3,531**	**6.2**	**69.1**	**79.0**	**75.8**	**85.8**	**61.9**	**57.8**
INTENTIONAL ASSAULTIVE INJURY								
Bodily force	994	1.8	19.5	23.8	21.4	23.6	18.3	15.4
Sharp object	308	0.5	6.1	9.6	7.2	6.3	5.2	4.4
Blunt object	235	0.4	4.6	7.5	4.7	5.5	3.9	3.1
All other mechanisms	318	0.6	6.3	8.4	6.3	8.1	5.7	4.7
All assaults	**1,855**	**3.3**	**36.4**	**49.3**	**39.6**	**43.5**	**33.2**	**27.7**
ALL INTENTS (CAUSES) COMBINED2	**56,796**	**100.0**	**1,083.4**	**1,069.3**	**1,152.6**	**1167.3**	**1037.8**	**1,045.8**

Notes: [1] See Box 2 for ICD-10-AM codes for external causes of injury
[2] 'All intents' includes cases coded to 'other and undetermined' intent (not shown).

Highest rate *Lowest rate*

self-harm, assaults) and for all major causes of injury. This analysis compared the injury risk of persons in the least disadvantaged LGAs (quintile 5) relative to persons in the more disadvantaged LGAs (quintiles 1-4). The main exploratory variable was the SES quintile, with sex included as a covariate. A sex by SES quintile interaction was also included in the model to assess whether SES effects differed by gender. Where the interaction was not significant it was removed from the model.

The sex by SES quintile interaction was significant for:

- All injury intents (causes) combined
- All unintentional injury causes combined
- Fall injury
- Hit/struck/crush injury
- Natural/environmental/animal related injury.

Tables 3A, B and C show IRRs relative to the least disadvantaged, adjusted for age and sex, for injury causes by SES quintile for persons of all ages in Victoria.

Causes for which a statistically significant relationship between SES and injury risk was consistently evident across all quintiles

As shown in Table 3A, persons in the more disadvantaged quintiles were significantly more likely to be hospitalised than persons in the least disadvantaged quintile for:

- Assaultive injury (all causes combined)
- Transport injury
- Machinery related injury
- Fire/burns/scalds

However, the IRR was only highest in quintile 5 (the most disadvantaged LGAs) for assaultive injury.

Analysis separating the major causes of transport injury (pedestrian, bicyclist, motorcyclist and car occupant) showed that persons in the more disadvantaged quintiles were significantly more likely to be hospitalised for car occupant and motorcyclist injury than persons in the least disadvantaged quintile (IRR range 1.28-1.33 and 1.48-1.88 respectively). Although persons in the more disadvantaged quintiles were more likely to be hospitalised for pedestrian injury than persons in the least disadvantaged quintile, the difference was not statistically significant across all quintiles. No relationship was found between SES and injury to bicyclists.

Males in the more disadvantaged quintiles were significantly more likely to be hospitalised than males in the least disadvantaged quintile for:

- All injury intents (causes) combined
- Natural/environmental/animal-related injury

Females in the more disadvantaged quintiles were significantly less likely to be hospitalised for fall injury (the leading cause of injury) than females in the least disadvantaged quintile.

Causes for which a consistent but not always significant statistical relationship between SES and injury risk was evident

As shown in Table 3B, persons from the more disadvantaged quintiles were more likely to be admitted to hospital than persons

Table 3A

ALL AGES
Adjusted incidence rate ratios (IRR) for causes of injury in persons of all ages for which a consistent and statistically significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07

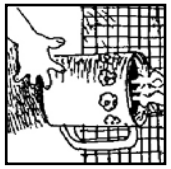
	ASSAULTIVE INJURY		TRANSPORT		MACHINERY		FIRE/BURNS/SCALDS	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.77 (1.54 to 2.02)	.000	1.18 (1.10 to 1.26)	.000	1.81 (1.45 to 2.26)	.000	1.45 (1.14 to 1.84)	.002
2nd	1.43 (1.23 to 1.67)	.000	1.36 (1.27 to 1.46)	.000	1.83 (1.45 to 2.31)	.000	1.61 (1.26 to 2.06)	.000
3rd	1.57 (1.37 to 1.80)	.000	1.36 (1.28 to 1.45)	.000	1.71 (1.38 to 2.13)	.000	1.51 (1.20 to 1.90)	.000
4th	1.20 (1.04 to1.37)	.010	1.22 (1.14 to 1.29)	.000	1.50 (1.22 to 1.85)	.000	1.25 (1.00 to 1.56)	.048
Least disadvantaged	1.00		1.00		1.00		1.00	
	ALL INJURY (MALES)		**NATURAL/ENVIR./ANIMALS (MALES)**		**FALLS (FEMALES)**			
	IRR (95% CI)	**p value**	**IRR (95% CI)**	**p value**	**IRR (95% CI)**	**p value**		
Most disadvantaged	1.12 (1.08 to 1.16)	.000	1.90 (1.50 to 2.40)	.000	0.81 (0.77 to 0.85)	.000		
2nd	1.21 (1.17 to 1.26)	.000	2.38 (1.88 to 3.02)	.000	0.87 (0.82 to 0.92)	.000		
3rd	1.22 (1.18 to 1.26)	.000	1.92 (1.53 to 2.41)	.000	0.89 (0.85 to 0.94)	.000		
4th	1.04 (1.01 to 1.08)	.010	1.46 (1.16 to 1.83)	.001	0.87 (0.84 to 0.91)	.000		
Least disadvantaged	1.00		1.00		1.00			

inverse relationship

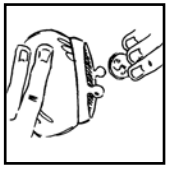











Adjusted incidence rate ratios (IRR) for causes of injury in persons of all ages for which a consistent but not uniformly significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 3B**

	SELF-HARM		CUTTING & PIERCING		FIREARMS/EXPLOSIONS		NEAR DROWNING	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.37 (1.24 to 1.52)	.000	1.25 (1.09 to 1.43)	.002	1.66 (0.77 to 3.59)	.199	1.12 (0.47 to 2.66)	.810
2nd	1.31 (1.18 to 1.47)	.000	1.41 (1.23 to 1.63)	.000	2.06 (0.95 to 4.46)	.066	1.03 (0.40 to 2.69)	.945
3rd	1.49 (1.35 to 1.63)	.000	1.32 (1.16 to 1.50)	.000	2.32 (1.17 to 4.64)	.017	1.10 (0.48 to 2.55)	.820
4th	1.07 (0.98 to 1.18)	.149	1.10 (0.97 to 1.25)	.133	2.06 (1.05 to 4.02)	.035	1.03 (0.47 to 2.28)	.935
Least disadvantaged	1.00		1.00		1.00		1.00	
	ALL UNINTENTIONAL MALES)		ALL UNINTENTIONAL (FEMALES)		HIT/STRUCK/CRUSH (MALES)		NATURAL/ENVIR./ANIMALS (FEMALES ONLY)	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.07 (1.03 to 1.11)	.001	0.88 (0.85 to 0.92)	.000	1.23 (1.08 to 1.40)	.002	1.23 (0.96 to 1.58)	.097
2nd	1.20 (1.15 to 1.25)	.000	0.97 (0.93 to 1.01)	.108	1.40 (1.23 to 1.60)	.000	1.54 (1.20 to 2.00)	.001
3rd	1.18 (1.14 to 1.22)	.000	0.98 (0.94 to 1.02)	.228	1.47 (1.31 to 1.66)	.000	1.52 (1.22 to 1.90)	.000
4th	1.03 (0.99 to 1.07)	.072	0.92 (0.89 to 0.96)	.000	1.08 (0.96 to 1.22)	.185	1.28 (1.03 to 1.60)	.026
Least disadvantaged	1.00		1.00		1.00		1.00	

Adjusted incidence rate ratios (IRR) for causes of injury to persons of all ages in which no relationship between socioeconomic disadvantage and injury risk was evident, Victoria 2005-07 **Table 3C**

	POISONING		CHOKING/SUFFOCATION		OTHER UNINTENTIONAL	
	IRR (95% CI)	P value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.24 (1.06 to 1.45)	.007	0.93 (0.59 to 1.47)	.748	0.90 (0.83 to 0.97)	.009
2nd	1.28 (1.08 to 1.51)	.004	1.15 (0.73 to 1.81)	.558	1.03 (0.94 to 1.12)	.540
3rd	1.17 (1.00 to 1.36)	.051	1.14 (0.76 to 1.72)	.521	0.98 (0.91 to 1.06)	.613
4th	0.95 (0.82 to 1.10)	.489	0.88 (0.58 to 1.33)	.542	0.95 (0.88 to 1.02)	.136
Least disadvantaged	1.00		1.00		1.00	
	FALLS (MALES)		ALL INTENTS (FEMALES)		HIT/STRUCK/CRUSH (FEMALES)	
	IRR (95% CI)	P value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	0.91 (0.86 to 0.97)	.003	0.93 (0.89 to 0.97)	.000	0.84 (0.67 to 1.05)	.120
2nd	0.99 (0.93 to 1.05)	.651	0.99 (0.96 to 1.04)	.805	1.02 (0.81 to 1.27)	.890
3rd	1.01 (0.96 to 1.07)	.732	1.02 (0.98 to 1.05)	.389	1.01 (0.83 to 1.24)	.896
4th	0.91 (0.86 to 0.96)	.000	0.94 (0.91 to 0.98)	.001	0.86 (0.71 to 1.04)	.123
Least disadvantaged	1.00		1.00		1.00	

from the least disadvantaged quintile for the following causes but the difference was not statistically significant across all quintiles:

- Self-harm (all causes combined)
- Cutting and piercing injury
- Firearms/explosions injury
- Near drowning
- Hit/struck/crush injury (males)
- Unintentional injury (all causes combined) (males)
- Natural/environmental/animal-related injury (females)

Females in the more disadvantaged quintiles were less likely to be admitted to hospital for unintentional injury (all causes combined) than females in the least disadvantaged quintile but the difference was not statistically significant across all quintiles.

Causes for which there appeared to be no relationship between SES and injury risk

No relationship was found between SES and these causes: poisoning; choking and suffocation; 'other' unintentional injury; falls among males; all injury intents (causes) combined in females; and hit/struck/crush injury in females. (Table 3C)

Average number of admissions and age-adjusted hospitalisation rates per 100,000 children aged 0-14 years by injury cause and quintile of socioeconomic disadvantage, Victoria 2005-07 **Table 4**

				Age-adjusted admission rate by area SES quintile				
INJURY INTENT AND CAUSE	**Average number of admissions (per year)**	**% of total**	**Age-adjusted admission rate**	**Most disadvan-taged**	**2nd**	**3rd**	**4th**	**Least disadvan-taged**
UNINTENTIONAL ('ACCIDENTAL' INJURY)								
Falls	3,224	49.4	333.4	300.8	358.4	383.7	301.3	337.7
Transport	1,021	15.6	104.6	102.2	143.5	133.5	99.4	72.4
Hit/struck/crush	693	10.6	71.1	73.1	73.6	82.9	66.8	64.9
Poisoning	281	4.3	28.8	30.0	42.0	30.9	25.5	23.6
Nat/envir/animals	246	3.8	25.4	30.0	30.9	27.1	24.9	19.3
Cutting & piercing	219	3.4	22.5	26.3	25.5	24.3	18.5	21.3
Fires/burns/scalds	160	2.5	16.4	17.1	24.2	17.6	15.5	12.1
Choking & suffocation	44	0.7	4.5	5.6	4.0	4.1	4.7	4.1
Near drowning	26	0.4	2.7	2.5	2.4	3.0	3.1	2.2
Machinery	17	0.3	1.8	2.1	1.3	2.4	2.0	1.2
Firearms & explosions	8	0.1	0.8	0.6	0.5	1.5	0.9	0.4
Other unintentional	426	6.5	43.6	46.5	50.3	52.8	36.0	39.6
All unintentional	**6,364**	**97.5**	**655.5**	**636.7**	**756.5**	**763.9**	**598.9**	**598.7**
ALL SELF HARM	**70**	**1.1**	**7.1**	**8.5**	**7.5**	**8.0**	**6.0**	**6.3**
ALL ASSAULTIVE INJURY	**60**	**0.9**	**6.1**	**8.0**	**10.8**	**8.6**	**3.2**	**3.7**
ALL INTENTS (CAUSES) COMBINED[1]	**6,526**	**100**	**672.0**	**655.2**	**780.4**	**785.3**	**610.8**	**611.1**

Note: [1] 'All intents' includes cases coded to 'other and undetermined' intent (not shown)

Highest rate *Lowest rate*

Children (0-14 years)

Hospital admission rates by area SES quintile

There were 6,526 childhood injury hospital admissions per year over the 3-year period 2005-2007. Unintentional ('accidental') injury accounted for almost all admissions (98%). Falls were the leading injury cause and comprised almost half of all child injury admissions (49%) followed by transport (16%) and hit/struck/crush (11%).

Table 4 (page 8) shows the average (mean) frequency of hospital admissions and age-adjusted injury admission rates per 100,000 children aged 0-14 years by injury cause and quintile of socioeconomic disadvantage. The deeper shading indicates the socioeconomic quintile with the highest age-adjusted admission rate while the lighter shading indicates the quintile with the lowest age-adjusted rate for each major cause of injury.

There were only two causes of unintentional (accidental') injury where children in the most disadvantaged SES group (quintile 1) had the highest admission rate: cutting/ piercing and choking/ suffocation. They also had the highest admission rate for self harm but there was a small number of cases of self harm overall (n=70). Notably they had the lowest admission rate for falls, the leading cause of injury in this age group.

By contrast, children in the least disadvantaged SES groups (quintiles 4 and 5) generally had the lowest hospitalisation rate for all specific causes of injury with the notable exceptions of near-drowning where persons in the quintile 4 had the highest rate and falls.

Comparison of injury risk: Incidence rate ratios by SES quintile

The regression analysis showed that the interaction between sex and quintile was not significant for any of the major causes of injury. Tables 5A, B and C show IRRs relative to the least disadvantaged, adjusted for age and sex, for injury causes by SES quintile for children aged 0-14 in Victoria.

CHILDREN

Adjusted incidence rate ratios (IRR) for causes of injury to children for which a consistent and statistically significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 5A**

	TRANSPORT	
	IRR (95% CI)	P value
Most disadvantaged	1.41 (1.15 to 1.74)	.001
2nd	1.98 (1.61 to 2.43)	.000
3rd	1.86 (1.53 to 2.25)	.000
4th	1.38 (1.14 to 1.67)	.001
Least disadvantaged	1.00	

Causes for which a statistically significant relationship between SES and injury risk was consistently evident across all quintiles

As shown in Table 5A (above), transport was the only injury cause for which a statistically significant relationship between SES and injury risk was evident across all quintiles. Children in the more disadvantaged quintiles were significantly more likely to be hospitalised for transport injury than children in the least disadvantaged quintile but children living in the most disadvantaged LGA group (quintile 1) were not at highest risk.

Analysis of the transport hospital admissions for pedestrians, bicyclists, motorcyclists and car occupants separately showed that motorcycling was the only cause of transport injury for which a statistically significant relationship between SES and injury risk was consistently evident across all quintiles. Children in the more disadvantaged quintiles were significantly more likely to be hospitalised for motorcycle injury than children in the least disadvantaged quintile (IRR range 1.8-3.1). The IRRs for bicycling injury and car occupant injury were also consistently higher for children from the more disadvantaged quintiles compared with the least disadvantaged quintile but the difference was not statistically significant across all quintiles.

Causes for which a consistent but not always significant statistical relationship between SES and injury risk was evident

As shown in Table 5B (overleaf), children from the more disadvantaged quintiles were more likely to be admitted to hospital than children from the least disadvantaged quintile for the following causes, but the difference was not statistically significant across all quintiles:

- Unintentional injury (all causes combined)
- Self-harm (all causes combined)
- Hit/struck/crush injury
- Poisoning
- Natural/environmental/ animal-related injury
- Fire/burns/scalds
- Near-drowning
- Machinery-related injury

Causes showing no relationship

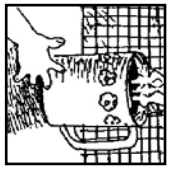
No relationship was observed between injury risk and area SES for the remaining injury causes: all injury intents (causes) combined, falls, cutting and piercing, choking and suffocation, firearms and explosions, 'other' unintentional and assaultive injury (Table 5C, overleaf).

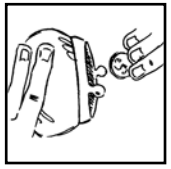








Adjusted incidence rate ratios (IRR) for causes of injury to children for which a consistent but not uniformly significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 5B**

	ALL UNINTENTIONAL		SELF-HARM		HIT/STRUCK/CRUSH		POISONING	
	IRR (95% CI)	P value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.06 (0.98 to 1.15)	.120	1.41 (0.69 to 2.90)	.344	1.13 (0.90 to 1.43)	.294	1.23 (0.88 to 1.86)	.198
2nd	1.26 (1.17 to 1.37)	.000	1.31 (0.59 to 2.88)	.507	1.13 (0.88 to 1.46)	.340	1.79 (1.24 to 2.58)	.002
3rd	1.28 (1.19 to 1.37)	.000	1.39 (0.69 to 2.80)	.363	1.28 (1.03 to 1.60)	.028	1.29 (0.90 to 1.86)	.173
4th	1.00 (0.93 to 1.07)	.996	1.01 (0.50 to 2.04)	.985	1.03 (0.83 to 1.28)	.783	1.08 (0.76 to 1.53)	.689
Least disadvantaged	1.00		1.00		1.00		1.00	
	NATURAL/ENVIR./ANIMALS		FIRE/BURNS/SCALDS		NEAR DROWNING		MACHINERY	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.55 (1.05 to 2.31)	.029	1.42 (0.85 to 2.35)	.178	1.08 (0.31 to 3.82)	.906	1.62 (0.33 to 8.03)	.555
2nd	1.63 (1.07 to 2.48)	.022	1.96 (1.19 to 3.23)	.008	1.05 (0.26 to 4.20)	.950	1.39 (0.23 to 8.34)	.716
3rd	1.42 (0.96 to 2.11)	.082	1.43 (0.88 to 2.35)	.153	1.23 (0.38 to 4.04)	.729	1.97 (0.44 to 8.82)	.373
4th	1.31 (0.90 to 1.90)	.156	1.28 (0.80 to 2.04)	.309	1.43 (0.50 to 4.13)	.505	1.79 (0.43 to 7.50)	.425
Least disadvantaged	1.00		1.00		1.00		1.00	

Adjusted incidence rate ratios (IRR) for causes of injury to children in which no relationship between socioeconomic disadvantage and injury risk was evident, Victoria 2005-07 **Table 5C**

	ALL INTENTS		ASSAULTIVE INJURY		FALLS		CUTTING & PIERCING	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.07 (0.99 to 1.16)	.076	2.11 (0.92 to 4.80)	.077	0.89 (0.80 to 0.99)	.039	1.24 (0.84 to 1.85)	.283
2nd	1.28 (1.18 to 1.38)	.000	2.72 (1.19 to 6.20)	.017	1.06 (0.95 to 1.19)	.319	1.20 (0.77 to 1.84)	.422
3rd	1.28 (1.20 to 1.38)	.000	2.22 (1.00 to 4.94)	.051	1.14 (1.03 to 1.26)	.012	1.14 (0.76 to 1.69)	.528
4th	0.99 (0.93 to 1.07)	.978	0.86 (0.34 to 2.20)	.750	0.89 (0.81 to 0.98)	.021	0.88 (0.60 to 1.30)	.531
Least disadvantaged	1.00		1.00		1.00		1.00	
	CHOKING/SUFFOCATION		FIREARMS/EXPLOSIONS		OTHER UNINTENTIONAL			
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value		
Most disadvantaged	1.32 (0.55 to 3.20)	.532	1.62 (.10 to 25.9)	.732	1.17 (0.87 to 1.57)	.306		
2nd	0.95 (0.33 to 2.74)	.925	-	-	1.29 (0.94 to 1.76)	.113		
3rd	0.94 (0.37 to 2.43)	.901	2.96 (.27 to 32.6)	.375	1.32 (1.00 to 1.75)	.050		
4th	1.17 (0.52 to 2.66)	.703	2.15 (.20 to 23.7)	.532	0.91 (0.69 to 1.21)	.512		
Least disadvantaged	1.00		1.00		1.00			

Adolescents and young adults (15-24 years)

Hospital admission rates by area SES quintile

On average there were 7,613 injury hospital admissions per year in young people aged 15-24 years over the 3-year period 2005-2007. More than three-quarters of admissions (78%) were due to unintentional injury. Transport was the leading cause of injury hospitalisations in this age group (26%), followed by falls (18%), self-harm (12%), hit/struck/crush (10%), assaultive injury (7%) and cutting and piercing (6%).

Table 6 shows the average (mean) frequency of injury admissions and the age-adjusted admission rates per 100,000 persons aged 15-24 years by injury cause and quintile of socioeconomic disadvantage. The deeper coloured shading indicates the socioeconomic quintile with the highest age-adjusted admission rate while the lighter shading indicates the quintile with the lowest rate for each major cause of injury.

For unintentional ('accidental') injury the only cause for which young people in the most disadvantaged SES group (quintile 1) had the highest admission rate is firearms and explosion-related injury. Notably, they had the lowest rate for falls.

Young people in quintile 1 (the most disadvantaged) and quintile 3 had similarly high rates of self-harm hospitalisations, mainly due to their high admission rates for poisoning by pharmaceuticals and other substances.

Among the causes of assaultive injury, the highest age-adjusted admission rate overall and for assaults by sharp and blunt objects were found in quintile 1 (the most disadvantaged).

By contrast, young people in the least disadvantaged SES groups (quintiles 4 and 5) generally had the lowest hospitalisation rate for all specific causes of injury with the notable exception of assault by bodily force where young people in quintile 4 had the highest rate and young people in quintile 5 the lowest, and falls.

Comparison of injury risk: Incidence rate ratios by SES quintile

The regression analysis showed the interaction between sex and SES quintile was not significant for any of the major causes of injury. Tables 7A, B and C show IRRs relative to the least disadvantaged, adjusted for age and sex, for injury causes by SES quintile for adolescents and young adults aged 15-24 in Victoria.

Causes for which a statistically significant relationship between SES and injury risk was consistently evident across all quintiles

Table 7A (overleaf) shows incidence rate ratios (IRRs) relative to the least disadvantaged quintile for only those injury causes for which a statistically significant relationship between SES and injury risk was consistently shown across all quintiles.

Adolescents and young adults in the more disadvantaged quintiles were significantly more likely to be hospitalised than their counterparts in the least disadvantaged quintile for the following injury causes:

- All injury intents (causes) combined
- Unintentional injury (all causes combined)
- Assaultive injury (all causes combined)
- Transport injury

However, the only injury cause where the least disadvantaged group were most at risk was assault. Analysis by the different mechanisms of assault (sharp objects, blunt objects and 'other') showed there was only a significant consistent relationship by SES quintile for assault by bodily force. Adolescents and young adults in the more disadvantaged quintiles were significantly more likely to be hospitalised for injury due to assault by bodily force than adolescents and young adults in the least disadvantaged quintile (IRR range 1.4-1.7).

Analysis of the transport hospital admissions broken down for pedestrians, bicyclists, motorcyclists and car occupants separately showed there were significant consistent relationships by SES quintile only for car occupant and motorcycling injury. Young people in the more disadvantaged quintiles were significantly more likely to be hospitalised for car occupant and motorcycling injury than their counterparts in the least disadvantaged quintile (IRR range 1.5-1.7 and 2.0-2.6 respectively).

The hospital admission rate for bicycling injury was higher, and the rate for pedestrian injury lower, in young people from the more disadvantaged quintiles than the least disadvantaged quintile but the difference was not statistically significant across all quintiles.

Causes for which a consistent but not always significant statistical relationship between SES and injury risk was evident

As shown in Table 7B (overleaf) adoles–cents and young adults from the more disadvantaged quintiles were more likely to be admitted to hospital than adolescents and young adults from the least disadvantaged quintile for the following causes, but the difference was not statistically significant across all quintiles:

- Self harm
- Hit/struck/crush injury
- Cutting and piercing injury
- Poisoning
- Machinery-related injury
- Natural/environmental/animal-related injury
- Fire/burns/scalds
- Firearms/explosions

Conversely, adolescents and young adults in the more disadvantaged groups had lower risk of hospitalisation for choking and suffocation than their counterparts in the least disadvantaged quintile but the difference was not statistically significant across all quintiles.





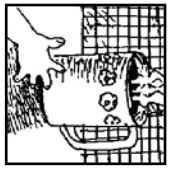


Average number of admissions and age-adjusted hospitalisation rates per 100,000 adolescents and young adults aged 15-24 years by injury cause and quintile of socioeconomic disadvantage, Victoria 2005-07 **Table 6**

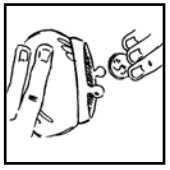
				Age-adjusted admission rate by area SES quintile				
INTENT AND CAUSE OF INJURY	**Average number of admissions (per year)**	**% of total**	**Age-adjusted admission rate**	**Most disadvan-taged**	**2nd**	**3rd**	**4th**	**Least disadvan-taged**
UNINTENTIONAL (ACCIDENTAL) INJURY								
Transport	1,949	25.6	273.8	320.5	329.2	325.0	291.3	190.4
Falls	1,404	18.4	193.8	164.0	216.6	218.8	195.2	185.5
Hit/struck/crush	733	9.6	102.7	104.0	127	137.7	91.3	82.8
Cutting & piercing	440	5.8	58.9	51.2	75.1	76.1	59.7	47.0
Poisoning	200	2.6	28.5	30.1	28.0	36.1	25.6	26.1
Machinery	113	1.5	17.2	19.5	21.4	23.3	22.3	8.5
Nat/envir/animals	121	1.6	15.6	15.1	22.1	19	13.8	13.1
Fires/burns/scalds	96	1.3	11.7	12.7	18.2	13.1	11.3	8.3
Firearms & explosions	22	0.3	2.8	3.0	1.6	6.0	2.9	1.2
Choking & suffocation	11	0.1	1.9	0.9	1.2	3.0	1.5	2.6
Near drowning	3	0.0	0.4	0.3	0.0	1.1	0.4	0.3
Other unintentional	867	11.4	120.7	105.9	134.2	126.6	116.8	122.0
All unintentional injury	**5,958**	**78.3**	**828**	**827.2**	**974.6**	**985.8**	**832.1**	**687.8**
INTENTIONAL SELF HARM								
Poisoning by pharmaceuticals	697	9.2	100.5	121.5	113.3	121.1	88.6	82.9
Sharp object	114	1.5	15.3	19.3	14.1	20.7	14.3	11.6
Poisoning by other substances	29	0.4	5.5	8.7	5.5	6.3	4.3	4.4
Hanging/strangulation	11	0.1	1.2	1.5	1.2	1.6	1.7	0.5
Other mechanisms	27	0.4	3.4	3.6	4.3	5	2.8	2.4
All self harm	**878**	**11.5**	**125.9**	**154.6**	**138.4**	**154.7**	**111.7**	**101.8**
INTENTIONAL ASSAULTIVE INJURY								
Bodily force	302	4.0	39.8	42.8	43.4	43.2	47.8	29.7
Sharp object	101	1.3	12.5	23.5	7.9	10.1	11.8	11
Blunt object	64	0.8	7.6	11.1	7.5	7.9	6.6	6.3
Other mechanisms	75	1.0	10.1	10.0	9.5	12.7	14.0	6.6
All assault	**542**	**7.1**	**70**	**87.4**	**68.3**	**73.9**	**80.2**	**53.6**
ALL INTENTS (CAUSES) COMBINED[1]	**7,613**	**100**	**1,056.8**	**1,101.4**	**1,208.9**	**1,250.2**	**1,063.3**	**873.0**

Note: [1] 'All intents' includes cases coded to 'other and undetermined' intent (not shown).

Highest rate *Lowest rate*






ADOLESCENTS AND YOUNG ADULTS

Adjusted incidence rate ratios (IRR) for causes of injury in adolescents & young adults for which a consistent and statistically significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 7A**

	ALL INTENTS		ALL UNINTENTIONAL		ASSAULTIVE INJURY		TRANSPORT	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.23 (1.14 to 1.31)	.000	1.17 (1.08 to 1.27)	.000	1.71 (1.32 to 2.21)	.000	1.63 (1.41 to 1.87)	.000
2nd	1.34 (1.25 to 1.45)	.000	1.38 (1.27 to 1.50)	.000	1.47 (1.10 to 1.96)	.010	1.70 (1.46 to 1.97)	.000
3rd	1.39 (1.30 to 1.48)	.000	1.39 (1.29 to 1.49)	.000	1.52 (1.17 to 1.96)	.002	1.66 (1.45 to 1.90)	.000
4th	1.21 (1.13 to 1.29)	.000	1.22 (1.13 to 1.31)	.000	1.43 (1.12 to 1.82)	.004	1.56 (1.37 to 1.77)	.000
Least disadvantaged	1.00		1.00		1.00		1.00	

Adjusted incidence rate ratios (IRR) for causes of injury in adolescents and young adults for which a consistent but not uniformly significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 7B**

	SELF-HARM		HIT/STRUCK/CRUSH		CUTTING & PIERCING	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.36 (1.12 to 1.66)	.002	1.15 (0.91 to 1.45)	.252	1.23 (0.91 to 1.67)	.176
2nd	1.18 (0.94 to 1.48)	.154	1.49 (1.18 to 1.88)	.001	1.57 (1.16 to 2.13)	.004
3rd	1.41 (1.16 to 1.70)	.000	1.58 (1.29 to 1.94)	.000	1.56 (1.19 to 2.05)	.001
4th	1.00 (0.83 to 1.22)	.971	1.09 (0.88 to 1.34)	.446	1.31 (1.00 to 1.72)	.047
Least disadvantaged	1.00		1.00		1.00	
	POISONING		**MACHINERY**		**NATURAL/ENVIR./ANIMALS**	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.25 (0.82 to 1.90)	.296	1.97 (1.05 to 3.68)	.035	1.33 (0.75 to 2.36)	.332
2nd	1.17 (0.73 to 1.86)	.521	1.90 (0.96 to 3.76)	.065	1.74 (0.98 to 3.09)	.060
3rd	1.23 (0.82 to 1.85)	.322	2.46 (1.37 to 4.41)	.002	1.84 (1.11 to 3.07)	.019
4th	1.05 (0.71 to 1.56)	.822	2.39 (1.37 to 4.16)	.002	1.17 (0.69 to 2.01)	.561
Least disadvantaged	1.00		1.00		1.00	
	FIRE/BURNS/SCALDS		**FIREARMS/EXPLOSIONS**		**CHOKING/SUFFOCATION**	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.61 (0.86 to 3.03)	.140	4.14 (0.76 to 22.6)	.101	0.52 (0.06 to 4.64)	.558
2nd	1.99 (1.04 to 3.78)	.037	4.07 (0.68 to 24.4)	.124	0.68 (0.08 to 6.10)	.732
3rd	1.47 (0.78 to 2.76)	.235	5.68 (1.15 to 28.1)	.033	0.95 (0.17 to 5.18)	.951
4th	1.19 (0.64 to 2.22)	.579	5.07 (1.05 to 24.4)	.043	0.73 (0.13 to 3.97)	.713
Least disadvantaged	1.00		1.00		1.00	

inverse relationship

Adjusted incidence rate ratios (IRR) for causes of injury in adolescents and young adults in which no relationship between socioeconomic disadvantage and injury risk was evident 2005-07, Victoria **Table 7C**

	FALLS		NEAR DROWNING		OTHER UNINTENTIONAL	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	0.82 (0.69 to 0.98)	.028	-	-	0.84 (0.68 to 1.04)	.108
2nd	1.07 (0.90 to 1.28)	.426	-	-	1.15 (0.93 to 1.42)	.203
3rd	1.16 (1.00 to 1.34)	.059	1.89 (0.12 to 30.2)	.652	0.97 (0.80 to 1.18)	.779
4th	1.06 (0.92 to 1.22)	.413	-	-	0.91 (0.76 to 1.10)	.318
Least disadvantaged	1.00		1.00		1.00	

Causes showing no relationship

No relationship was evident between SES and injury risk for falls, near drowning and 'other' unintentional injury (Table 7C, above)

Adults (aged 25-64 years)

Hospital admission rates by area SES quintile

On average, there were 22,834 adult injury hospital admissions per year in Victoria during 2005-2007. Unintentional injury accounted for most admissions (81%). Falls caused more than a quarter of all adult injury hospital admissions (28%), followed by transport (18%), self-harm (11%), hit/struck/crush (6%), assaults (5%) and cutting and piercing (5%).

Table 8 shows the average (mean) frequency of admissions and age-adjusted hospital admission rates per 100,000 adults aged 25-64 years by injury cause and quintile of socioeconomic disadvantage. The deeper coloured shading indicates the socioeconomic quintile with the highest age-adjusted admission rate while the lighter shading indicates the quintile with the lowest rate for each major cause of injury.

The major cause of injury hospitalisations in adults was falls and area deprivation appeared to have a protective effect with adults in the most disadvantaged group (quintile 1) having the lowest falls hospitalisation rate and adults in the least disadvantaged group (quintile 5) having close to the highest rate. The only unintentional causes of injury where persons in the most disadvantaged SES group had the highest admission rate were poisoning and near drowning.

Among the causes of self harm, adults in quintile 1 had the highest admission rate for self harm by sharp object and 'other' causes but not for the leading cause of self harm (poisoning by pharmaceuticals) where the hospitalisation rate was highest in quintile 3.

The pattern was very different for assaultive injury where the highest age-adjusted admission rates overall and for all major causes were found in quintile 1 (the most disadvantaged).

By contrast, adults in the least disadvantaged SES groups (quintile 4 and 5) commonly had the lowest hospitalisation rate for all specific causes of injury with the notable exceptions of 'other' unintentional injury where quintile 5 had the highest rate and falls and where quintile 5 had close to the highest rate.

Comparison of injury risk: Incidence rate ratios by area SES quintile

Regression analysis found that the interaction between sex and area SES quintile was significant for:

- All injury intents (causes) combined
- Unintentional injury (all causes combined)
- Natural/environmental/animal-related injury

Tables 9A, B and C show IRRs relative to the least disadvantaged, adjusted for age and sex, for injury causes by SES quintile for adults aged 25-64 in Victoria.

Causes for which a statistically significant relationship between SES and injury risk was consistently evident across all quintiles

Table 9A (overleaf) shows incidence rate ratios (IRRs) relative to the least disadvantaged quintile for those injury causes for which a statistically significant relationship between SES and injury risk was consistently shown across all quintiles.

Adults in the more disadvantaged quintiles were significantly more likely to be hospitalised than adults in the least disadvantaged quintile for:

- Self-harm
- Machinery-related injury

However, adults in the most disadvantaged quintile were not at highest risk of injury for either of these causes.

Further analysis of hospital admissions for the major mechanisms of self-harm (poisoning by pharmaceuticals, sharp objects, etc.) showed there was only a significant consistent relationship by SES quintile for self-harm by pharmaceutical poisoning. Adults in the more disadvantaged quintiles were significantly more likely to be hospitalised for self-harm by pharmaceutical poisoning than adults in the least disadvantaged quintile (IRR range 1.2-1.6).

Average number of admissions and age-adjusted hospitalisation rates per 100,000 adults aged 25-64 years by injury cause and quintile of socioeconomic disadvantage, Victoria 2005-7 **Table 8**

INTENT AND CAUSE OF INJURY	Average number of admissions per year	%	Age-adjusted admission rate	Most disadvan-taged	2nd	3rd	4th	Least disadvan-taged
	Age-adjusted admission rate by area SES quintile							
UNINTENTIONAL ('ACCIDENTAL') INJURY								
Falls	6,458	28.3	229.1	214.0	232.8	238.7	218.2	238.1
Transport	4,194	18.4	154.6	146.5	170.0	174.4	160.4	137.3
Hit/struck/crush	1,308	5.7	48.3	50.9	57.3	57.8	43.8	41.9
Cutting & piercing	1,154	5.1	42.4	47.4	52.8	46.8	39.2	36.0
Nat/envir/animals	714	3.1	25.8	28.9	36.7	30.7	25.9	17.0
Poisoning	633	2.8	23.2	28.6	26.7	25.0	18.9	21.6
Machinery	572	2.5	20.7	26.7	27.2	22.7	20.0	14.6
Fires/burns/scalds	298	1.3	10.9	12.5	11.6	13.4	11.3	8.1
Choking & suffocation	59	0.3	2.1	1.7	3.1	2.1	1.6	2.3
Firearms & explosions	41	0.2	1.5	1.4	2.1	1.6	1.8	1.1
Near drowning	16	0.1	0.6	0.9	0.5	0.4	0.5	0.7
Other unintentional	3,139	13.7	114.3	104.7	117.5	115.7	113.4	117.9
All unintentional	**18,588**	**81.4**	**673.6**	**664.2**	**738.3**	**729.3**	**655.0**	**636.6**
INTENTIONAL SELF HARM								
Poisoning-pharmaceuticals	1881	8.2	69.6	79.5	80.8	89.3	63.2	54.3
Sharp object	278	1.2	10.3	12.5	10.9	12.4	9.3	8.7
Poisoning-other substances	146	0.6	5.1	5.0	5.0	6.5	4.2	5.2
Hanging/strangulation	35	0.2	1.3	0.9	1.5	1.9	1.4	1.0
Other mechanisms	66	0.3	2.4	3.3	2.8	2.6	2.2	2.0
All self harm	**2,406**	**10.5**	**89.0**	**101.2**	**101.4**	**112.9**	**80.6**	**71.5**
INTENTIONAL ASSAULTIVE INJURY								
Bodily force	633	2.8	23.6	31.1	24.2	28.9	20.7	19.3
Sharp object	196	0.9	7.4	11.4	9.2	8.1	6.5	5.1
Blunt object	157	0.7	5.9	9.5	6.1	7.6	4.8	3.8
Other mechanisms	205	0.9	7.6	10.6	7.1	9.9	6.6	6.0
All assault	**1,191**	**5.2**	**44.5**	**62.5**	**46.5**	**54.4**	**38.5**	**34.2**
ALL INTENTS (CAUSES) COMBINED[1]	**22,834**	100.0	**831.5**	**855.2**	**907.0**	**922.8**	**800.8**	**763.8**

Note: [1] 'All intents' includes cases coded to 'other and undetermined' intent (not shown). *Highest rate* *Lowest rate*

Males in the more disadvantaged quintiles were significantly more likely to be hospitalised than males in the least disadvantaged quintile for:

- All injury intents (causes) combined
- Unintentional injury (all causes combined)
- Natural/environmental/animal-related injury

Causes for which a consistent but not uniformly significant statistical relationship between SES and injury risk was evident

As shown in Table 9B, adults from the more disadvantaged quintiles were more







ADULTS

Adjusted incidence rate ratios (IRR) for causes of injury in adults for which a consistent and statistically significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 9A**

	SELF-HARM		MACHINERY		ALL INTENTS (MALES)	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.42 (1.25 to 1.60)	.000	1.82 (1.41 to 2.34)	.000	1.16 (1.11 to 1.23)	.000
2nd	1.42 (1.25 to 1.62)	.000	1.86 (1.42 to 2.44)	.000	1.23 (1.17 to 1.30)	.000
3rd	1.58 (1.41 to 1.77)	.000	1.56 (1.21 to 2.02)	.001	1.25 (1.20 to 1.32)	.000
4th	1.13 (1.01 to 1.27)	.042	1.37 (1.07 to 1.75)	.012	1.06 (1.02 to 1.12)	.009
Least disadvantaged	1.00		1.00		1.00	
	UNITENTIONAL INJURY (MALES)		NATURAL/ENVIR./ ANIMALS (MALES)			
	IRR (95% CI)	p value	IRR (95% CI)	p value		
Most disadvantaged	1.09 (1.03 to 1.16)	.002	2.37 (1.69 to 3.31)	.000		
2nd	1.22 (1.15 to 1.29)	.000	3.06 (2.19 to 4.27)	.000		
3rd	1.20 (1.14 to 1.27)	.000	2.30 (1.66 to 3.20)	.000		
4th	1.06 (1.01 to 1.12)	.023	1.77 (1.28 to 2.46)	.001		
Least disadvantaged	1.00		1.00			

Adjusted incidence rate ratios (IRR) for causes of injury to adults for which a consistent but not uniformly significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 9B**

	ASSAULTIVE INJURY		TRANSPORT		HIT/STRUCK/CRUSH	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.82 (1.54 to 2.15)	.000	1.06 (0.96 to 1.17)	.233	1.21 (1.02 to 1.43)	.027
2nd	1.36 (1.12 to 1.65)	.002	1.24 (1.12 to 1.37)	.000	1.36 (1.15 to 1.62)	.001
3rd	1.60 (1.35 to 1.89)	.000	1.27 (1.16 to 1.39)	.000	1.38 (1.18 to 1.62)	.000
4th	1.13 (0.95 to 1.34)	.162	1.17 (1.08 to 1.27)	.000	1.05 (0.90 to 1.22)	.557
Least disadvantaged	1.00		1.00		1.00	
	CUTTING & PIERCING		FIRES/BURNS/SCALDS		FIREARMS/EXPLOSIONS	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.30 (1.09 to 1.55)	.004	1.52 (1.07 to 2.18)	.021	1.33 (0.47 to 3.74)	.588
2nd	1.46 (1.21 to 1.75)	.000	1.44 (0.98 to 2.12)	.067	1.95 (0.73 to 5.23)	.185
3rd	1.30 (1.09 to 1.54)	.003	1.64 (1.16 to 2.30)	.004	1.39 (0.52 to 3.74)	.511
4th	1.09 (0.92 to 1.29)	.305	1.38 (0.99 to 1.91)	.056	1.61 (0.67 to 3.88)	.290
Least disadvantaged	1.00		1.00		1.00	
	OTHER UNINTENTIONAL		ALL INTENTS (FEMALES)		NATURAL/ENVIR./ ANIMALS (FEMALES)	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	0.88 (0.79 to 0.99)	.029	1.04 (0.98 to 1.12)	.216	1.17 (0.82 to 1.67)	.400
2nd	0.99 (0.89 to 1.12)	.960	1.12 (1.04 to 1.20)	.002	1.47 (1.03 to 2.10)	.034
3rd	0.98 (0.89 to 1.09)	.732	1.14 (1.07 to 1.21)	.000	1.43 (1.03 to 1.97)	.031
4th	0.96 (0.87 to 1.06)	.414	1.03 (0.97 to 1.09)	.391	1.33 (0.98 to 1.80)	.067
Least disadvantaged	1.00		1.00		1.00	







Adjusted incidence rate ratios (IRR) for causes of injury in adults in which no relationship between socioeconomic disadvantage and injury risk was evident, Victoria 2005-07 **Table 9C**

	FALLS		POISONING		CHOKING/SUFFOCATION	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	0.90 (0.83 to 0.97)	.008	1.32 (1.05 to 1.66)	.017	0.71 (0.30 to 1.67)	.428
2nd	0.98 (0.90 to 1.06)	.596	1.23 (0.95 to 1.58)	.112	1.39 (0.66 to 2.89)	.386
3rd	1.00 (0.93 to 1.08)	.911	1.15 (0.92 to 1.45)	.225	0.99 (0.47 to 2.06)	.970
4th	0.92 (0.86 to 0.98)	.013	0.87 (0.69 to 1.10)	.239	0.66 (0.31 to 1.41)	.284
Least disadvantaged	1.00		1.00		1.00	
	NEAR DROWNING		UNINTENTIONAL INJURY (FEMALES)			
	IRR (95% CI)	p value	IRR (95% CI)	p value		
Most disadvantaged	1.20 (0.29 to 5.00)	.808	0.98 (0.88 to 1.02)	.178		
2nd	1.00 (0.19 to 5.16)	.999	1.06 (0.98 to 1.15)	.144		
3rd	0.72 (0.14 to 3.69)	.690	1.05 (0.98 to 1.13)	.168		
4th	0.79 (0.19 to 3.30)	.746	0.98 (0.92 to 1.04)	.516		
Least disadvantaged	1.00		1.00			

likely to be admitted to hospital than adults from the least disadvantaged quintile for the following causes but the difference was not statistically significant across all quintiles:

- Assaultive injury
- Transport injury
- Hit/struck/crush injury
- Cutting and piercing injury
- Fire/burns/scalds
- Firearms/explosions

By contrast, adults in the more disadvantaged quintiles were less likely to be hospitalised for 'other' unintentional injury than those in the least disadvantaged quantile but the difference was not statistically significant across all quintiles.

Adult females from the more disadvantaged quintiles were more likely to be admitted to hospital than their counterparts from the least disadvantaged quintile for all causes of injury combined and natural/environmental/animal injury but the difference was not statistically significant across all quintiles.

Causes showing no relationship between injury and area SES

There was no relationship between area SES and the risk of falls, poisoning, choking and suffocation, near drowning, and unintentional injury (in females only) (Table 9C).

Older adults (65 years and older)

Hospital admission rates by area SES quintile

On average, 19,824 older adults were admitted to Victorian hospitals for injury each year over the three-year period 2005-2007. Ninety-eight per cent of hospitalisations were for unintentional ('accidental') injury. In this age group falls comprised more than three-quarters (79%) of all injury hospital admissions, followed by transport (5%).

Table 10 (overleaf) shows the average (mean) frequency of injury admissions and the age-adjusted admission rates per 100,000 persons aged 65 years and older by injury cause and SES quintile. The deepeer coloured shading indicates the socioeconomic quintile with the highest age-adjusted admission rate while the lighter shading highlights the quintile with the lowest rate.

The only unintentional cause of injury where older persons in the most disadvantaged SES group (quintile 1) had the highest admission rate was accidental poisoning. In contrast to the pattern found for the other age groups, persons in the most disadvantaged group had the lowest injury hospitalisation rate overall and for six of the 11 major unintentional injury causes. The most disadvantaged were also not at higher risk of hospitalisation for all causes of self harm combined, any specific cause of self-harm or for assaultive injury.

Persons in the least disadvantaged group (quintile 5) had the highest injury hospitalisation rate for falls, transport and 'other' unintentional injury (the three leading causes of unintentional injury) and for three of the five specific causes of self-harm injury.

Comparison of injury risk: Incidence rate ratio by SES quintile

Regression analysis found that the interaction between sex and SES quintile was significant for all unintentional injury causes combined and all intents (causes) combined.

Tables 11A, B and C show IRRs relative to the least disadvantaged, adjusted for age and sex, for injury causes by SES quintile for adolescents and older adults aged 64 years and above in Victoria. .

Causes for which a statistically significant relationship between SES and injury risk was consistently evident across all quintiles

Table 11A shows incidence rate ratios (IRRs) relative to the least disadvantaged quintile for those injury causes for which a statistically significant relationship between SES and injury risk was consistently shown across all quintiles.

Older persons in the more disadvantaged quintiles were shown to have consistently and significantly lower injury rates than those in the least disadvantaged quintile for:

- Fall injury

Fall injury risk in older persons decreased as area disadvantage increased.

Females in the more disadvantaged quintiles were significantly less likely to be hospitalised than females in the least disadvantaged quintile for:

Average number of admissions and age-adjusted hospitalisation rates per 100,000 older adults aged 65+ years by injury cause and quintile of socioeconomic disadvantage, Victoria 2005-07 **Table 10**

				Age-adjusted admission rate by area SES quintile				
INTENT AND CAUSES OF INJURY	**Average number of admissions (per year)**	**%**	**Age-adjusted admission rate**	**Most disadvan-taged**	**2nd**	**3rd**	**4th**	**Least disadvan-tages**
UNINTENTIONAL ('ACCIDENTAL') INJURY								
Falls	15,591	78.6	2,159.5	1,979.8	2,030.1	2,054.0	2,048.1	2,411.0
Transport	930	4.7	133.8	120.2	134.6	137.5	118.4	145.3
Hit/struck/crush	419	2.1	58.9	49.1	64.8	59.5	51.9	63.5
Natural/environmental/animals	333	1.7	47.3	46.6	63.5	60.1	41.3	36.1
Poisoning	323	1.6	45.8	48.2	47.1	46.5	41.7	46.1
Cutting & piercing	168	0.8	24.6	22.4	25.1	27.3	25.5	23.3
Fires/burns/scalds	123	0.6	17.6	17.8	22.6	19.4	13.4	16.7
Machinery	96	0.5	14.2	15.7	15.9	18.7	14.4	9.5
Choking & suffocation	79	0.4	11.3	9.6	11.7	14.8	9.7	10.5
Firearms & explosions	6	0.0	0.9	0.3	1.7	0.9	1.3	0.6
Near drowning	2	0.0	0.2	0.3	1.4	0.0	0.0	0.0
Other unintentional	1,435	7.2	204.0	188.9	206.3	191.6	205.7	216.6
All unintentional injury	**19,505**	**98.4**	**2,718.0**	**2,498.9**	**2,624.9**	**2,630.3**	**2,571.6**	**2,979.1**
INTENTIONAL SELF HARM								
Poisoning- pharmaceuticals	137	0.7	19.8	19.4	16.1	20.1	19.9	21.3
Sharp object	18	0.1	2.5	2.8	2.7	1.5	1.9	3.4
Poisoning- other substances	12	0.1	1.7	1.6	2.1	2.5	1.5	1.0
Hanging/strangulation	3	0.0	0.4	0.0	0.4	0.7	0.0	0.6
All others	7	0.0	1.1	1.6	0.0	1.2	0.3	1.7
All self harm	**177**	**0.9**	**25.5**	**25.8**	**21.5**	**26.0**	**23.5**	**28.0**
INTENTIONAL ASSAULTIVE INJURY								
Assaultive injury	**63**	**0.3**	**9.1**	**9.0**	**11.2**	**9.7**	**8.4**	**8.4**
ALL INTENTS (CAUSES) COMBINED [1]	**19,824**	**100**	**2,764.4**	**2,547.7**	**2,673.7**	**2,674.0**	**2,615.4**	**3,026.7**

Note: [1] 'All intents' includes cases coded to 'other and undetermined' intent (not shown). *Highest rate* *Lowest rate*







OLDER ADULTS

Adjusted incidence rate ratios (IRR) for causes of injury in older adults for which a consistent and statistically significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 11A**

	FALLS		ALL INJURY INTENTS (FEMALES)		ALL UNITENTIONAL (FEMALES)	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	0.83 (0.79 to 0.87)	.000	0.80 (0.76 to 0.85)	.000	0.80 (0.76 to 0.85)	.000
2nd	0.85 (0.81 to 0.89)	.000	0.85 (0.80 to 0.90)	.000	0.85 (0.80 to 0.89)	.000
3rd	0.86 (0.82 to 0.90)	.000	0.85 (0.81 to 0.89)	.000	0.85 (0.81 to 0.89)	.000
4th	0.86 (0.82 to 0.90)	.000	0.86 (0.82 to 0.90)	.000	0.86 (0.82 to 0.90)	.000
Least disadvantaged	1.0		1.0		1.0	

inverse relationship

- All injury intents (causes) combined
- Unintentional injury (all causes combined)

Again a risk gradient was evident with injury risk decreasing with increasing area disadvantage.

Causes for which a consistent but not always significant statistical relationship between SES and injury risk was evident

As shown in Table 11B (overleaf) older adults in the more disadvantaged quintiles were more likely to be admitted to hospital than older adults from the least disadvantaged quintile for natural/environmental/animal-related injury and machinery injury, but the difference was not statistically significant across all quintiles.

Older adults in the more disadvantaged quintiles were less likely to be admitted to hospital for transport injury, 'other' unintentional injury and self-harm, but the difference was not statistically significant across all quintiles.

Older males in the more disadvantaged groups also were less likely to be hospitalised for all injury (all causes combined) than their counterparts in the least disadvantaged quintile, but the difference was not statistically significant across all quintiles.

Causes showing no relationship between area SES and injury

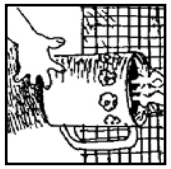
There was no apparent relationship between area SES and the other major causes of injury: hit/struck/crush, poisoning, cutting and piercing, fires/burns/scalds, choking and suffocation, firearms and explosions, and assaultive injury (Table 11C).

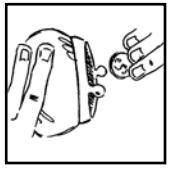








Adjusted incidence rate ratios (IRR) for causes of injury in older adults for which a consistent but not uniformly statistically significant relationship between socioeconomic disadvantage and injury risk was evident across the area SES quintiles, Victoria 2005-07 **Table 11B**

	ALL SELF-HARM		TRANSPORT		OTHER UNINTENTIONAL		NATURAL/ENVIR./ANIMALS	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	0.90 (0.57 to 1.43)	.668	0.82 (0.67 to 1.02)	.069	0.88 (0.74 to 1.04)	.127	1.31 (0.91 to 1.87)	.147
2nd	0.77 (0.47 to 1.26)	.299	0.93 (0.76 to 1.13)	.455	0.96 (0.81 to 1.13)	.600	1.78 (1.27 to 2.48)	.001
3rd	0.91 (0.60 to 1.38)	.660	0.95 (0.79 to 1.13)	.547	0.89 (0.76 to 1.03)	.115	1.69 (1.24 to 2.30)	.001
4th	0.82 (0.53 to 1.26)	.360	0.81 (0.67 to 0.98)	.033	0.95 (0.82 to 1.11)	.523	1.15 (0.92 to 1.63)	.413
Least disadvantaged	1.00		1.00		1.00		1.00	
v	MACHINERY INJURY		ALL INTENTS (MALES)		UNINTENTIONAL INJURY (MALES)			
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value		
Most disadvantaged	1.72 (0.90 to 3.28)	.102	0.94 (0.87 to 1.02)	.132	0.94 (0.67 to 1.02)	.127		
2nd	1.62 (0.83 to 3.16)	.159	0.97 (0.90 to 1.06)	.522	0.98 (0.90 to 1.06)	.580		
3rd	1.96 (1.09 to 3.53)	.025	0.97 (0.91 to 1.04)	.433	0.97 (0.90 to 1.05)	.447		
4th	1.55 (0.83 to 2.88)	.167	0.90 (0.83 to 0.97)	.004	0.90 (0.83 to 0.96)	.003		
Least disadvantaged	1.00		1.00		1.00			

inverse relationship

Adjusted incidence rate ratios (IRR) for causes of injury in older adults in which no relationship between socioeconomic disadvantage and injury risk was evident, Victoria 2005-07 **Table 11C**

	ASSAULTIVE		HIT/STRUCK/CRUSH		POISONING		CUTTING & PIERCING	
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value
Most disadvantaged	1.05 (0.47 to 2.33)	.914	0.77 (0.56 to 1.07)	.117	1.04 (0.74 to 1.47)	.818	0.95 (0.58 to 1.55)	.834
2nd	1.35 (0.64 to 2.86)	.432	1.02 (0.76 to 1.38)	.882	1.01 (0.71 to 1.43)	.973	1.10 (0.68 to 1.77)	.712
3rd	1.14 (0.56 to 2.33)	.715	0.94 (0.72 to 1.24)	.681	1.02 (0.74 to 1.39)	.919	1.20 (0.79 to 1.83)	.403
4th	0.97 (0.46 to 2.06)	.940	0.83 (0.62 to 1.11)	.202	0.92 (0.66 to 1.27)	.604	1.10 (0.72 to 1.70)	.662
Least disadvantaged	1.00		1.00		1.00		1.00	
	FIRES/BURNS/SCALDS		CHOKING & SUFFOCATION		FIREARMS/EXPLOSIONS			
	IRR (95% CI)	p value	IRR (95% CI)	p value	IRR (95% CI)	p value		
Most disadvantaged	1.05 (0.60 to 1.85)	.867	0.82 (0.38 to 1.78)	.617	-	-		
2nd	1.36 (0.80 to 2.30)	.262	1.06 (0.52 to 2.18)	.873	4.34 (0.39 to 47.9)	.230		
3rd	1.14 (0.69 to 1.89)	.603	1.45 (0.80 to 2.61)	.222	3.14 (0.29 to 34.6)	.350		
4th	0.80 (0.45 to 1.40)	.433	0.90 (0.46 to 1.78)	.765	1.56 (0.98 to 24.9)	.753		
Least disadvantaged	1.00		1.00		1.00			

Discussion

Over the 3-year study period (2005-7) there were around 55,000 injury hospital admissions per year in Victoria (excluding same day admissions). Falls accounted for nearly half of all admissions; the proportion of admissions caused by falls varied by age group ranging from 18% in 15-24 year-olds to 79% in persons aged 65 years and older. Other major causes of injury were transport (14%), self harm (6%), hit/struck/crush (6%), cutting and piercing (4%), and assaults (3%).

Our study indicated that the effect of area SES on injury risk varied substantially by age, gender and injury cause. Injury hospital admission rates were generally lowest in the least disadvantaged quintile of LGAs with the notable exception of fall injury but not often highest in the most disadvantaged quintile of LGAs. Overall, the regression analysis showed that persons living in the more disadvantaged areas were significantly more likely to be hospitalised than persons in the least disadvantaged areas for transport injury (Incident Rate Ratio range 1.18-1.36), machinery-related injury (1.50-1.83), fire/burns/scalds (1.25-1.61) and assaultive injury (1.20-1.77). These injury causes account for 20% of injury hospital admissions.

Males in the more disadvantaged areas were significantly more likely to be hospitalised than males in the least disadvantaged areas for all injury causes combined and natural/environmental/animal-related injury. By contrast, a striking finding from our study was that low SES appeared to be a 'protective' factor for fall-related hospitalisations among females, especially older females. Females living in the more disadvantaged areas were at significantly lower risk of hospitalisation for fall injury than females in the least disadvantaged areas. Possible reasons for this finding are included in the discussion of the results for older adults below.

We found sparse evidence that area SES influences the occurrence of injury in older persons and the occurrence of falls, the leading cause of injury hospitalisations in Victoria, in any age group.

Our literature search found only a few published studies that investigated the influence of area SES on nonfatal injury risk in large populations and their results show no clear pattern. It should be borne in mind that study design and methodological issues, particularly the measure of SES used, may play an important role in the results observed.

Similar to our study, Lyons et al. (2003) compared standardised hospital admission rates for all causes combined and specific causes of injury by an area measure of deprivation for all residents of Wales. The primary focus of their published paper was reporting socioeconomic variation in injury in children (aged 0-14) compared with older people (aged 75+). However, results for all ages were tabulated and, although some were similar to ours, the socioeconomic gradients were much more substantial than found in our study. As in Victoria, significantly higher injury rates in the more deprived communities were evident in Wales for assaults and fire/burns/scalds but they were also found in Wales for all admissions (we only found this trend for males in Victoria), pedestrian injury, self-harm, falls and poisoning.

Lyons and colleagues reported no relationship between deprivation status and the likelihood of hospitalisation for injury as a car occupant. The authors speculated that this finding may be related to exposure, as people in poorer areas are probably less likely to have access to cars than their more affluent counterparts and hence are at lower risk of being in a car crash (and perhaps higher risk of being in a pedestrian crash). By contrast, we found a significant consistent relationship between area SES and car occupant (and motorcyclist) injury but no consistent relationship between area disadvantage and pedestrian injury. Higher motor car ownership rates in Victoria than in Wales during the study years (73% in Victoria vs. 47% in Wales) and the likelihood that people in deprived areas drive older and less crashworthy cars may partly explain these conflicting findings.

Two other large-scale studies included both neighbourhood- and individual-level SES variables in an attempt to separate out the relative importance of area and individual characteristics as risk factors for injury. A Swedish study on the influence of neighbourhood SES (measured by income level) on injury risk included the whole Swedish population stratified into three age groups: 0-14; 15-64 and ≥65 years (Li et al., 2008). Neighbourhoods were small contained geographic areas of approximately 1000 people, developed in Sweden during the 1990s for market research purposes. Overall (all-ages) results were not reported. The study found that when neighbourhood SES decreased the odds of injury hospitalisations increased in the 0-14 and 15-64 age groups, but not in the oldest age group. When individual demographic and socioeconomic variables were factored into the analysis the odds ratios only remained significant in children 0-14 years and (as in our study) a protective effect of neighbourhood deprivation was found in the 65+ age group.

Ferrando et al. (2005) included both individual-level and neighbourhood-level variables in a Spanish study that aimed to determine the relationship between SES and injury morbidity (emergency department presentations for hits and cuts, falls and traffic injury) by age group and gender. The study was a cross-sectional survey of adult residents (those aged 20 years and older) of the 38 neighbourhoods of Barcelona, the second largest city in Spain. Area-level SES was measured through percentage of unemployed male residents in the neighbourhood. The individual-level measure of SES was highest educational level attained.

Results were only reported for males and females separately. For men, the all-causes injury rate varied between neighbourhoods and rose with increasing deprivation (male unemployment level) in the neighbourhood, with neighbourhoods with the lowest SES (highest male unemployment level) presenting a greater risk of injury after adjusting for educational level (Relative Risk 1.08; 95% CI 1.04-1.12). Among females the all-causes injury rate varied between neighbourhoods but the effect of area SES was less marked and not significant after adjustment for individual educational level (RR 1.03; 95%CI 0.99-1.12).







U.S. studies rarely use area-level designs and the results of larger scale studies that have measured SES by several different individual-level indicators are conflicting. Collins (1990) reported mixed results with non-fatal injury incidence rates higher for persons of low income but also for persons who have high educational attainment, and for those who are employed. Wagener & Winn (1991) investigated the influence of SES on nonfatal injuries in the working population and reported that injury incidence rates were higher for persons with low income, low educational attainment and blue collar occupation. Kelly & Miles-Doan (1997) found no relationship between non-fatal injury and SES, as measured by poverty level and education in children and adults. In the most recently published study, based on the National Health Interview Survey 1987 through 1994, Cubbin et al. (2000) used three indicators of SES: income, education and occupation/ employment status. The authors found that blue colour workers were at significantly increased odds of non-fatal injury than white collar workers (Odds Ratio 1.46) but that education attainment and income were unrelated to total injury morbidity.

Like our study, research from other countries indicate that it is inappropriate to make broad generalisations about the relationship between injury occurrence and SES and that patterns vary by cause of injury and gender and, as we will see in the next sections, by age group.

Children (0-14 years)

There were 6,562 child injury hospitalisations per year over the 3-year study period, with falls accounting for nearly half of all hospitalisations and transport a further 16%. We found that area SES played a negligible role in fall injury incidence, which is consistent with the findings from previous studies conducted in Australia (Poulos et al., 2007; Lam, 2005; Carey et al., 1993; Jolly et al., 1993) and Sweden (Reimers & Laflamme, 2005; Engstrom et al., 2002). However, studies in England (Hippisley-Cox et al., 2002), Wales (Lyons et al., 2003) and Canada (Faelker et al., 2000) found that fall injury rates increased as deprivation scores increased.

Similar to our study, a recently published NSW study on socioeconomic status and childhood injury found no clear relationship between child injury hospitalisations and area SES when all unintentional injury causes were combined (Poulos et al., 2007). However, the study found that SES gradients were apparent for some causes of injury namely transport injury (for motorcyclists, motor vehicle occupants, pedestrians and pedal cyclists), fire/burns/ scalds and poisoning.

Although our study demonstrated that area deprivation increased the risk of transport injury, further analysis revealed that the relationship was only consistent and statistically significant for motorcycling. Children living in the more disadvantaged LGAs were around two to three times more likely to be hospitalised for motorcycling injury than children from the least disadvantaged LGAs.

Our results showed that motorcycling-related hospitalisation rates were highest among children in quintiles 2 and 3 but there was no excess risk of motorcycling injury among children in Quintile 1 (the most disadvantaged area). The LGAs that fall into SES quintiles 2 and 3 are mainly located on the urban fringe of Melbourne and in rural Victoria. Increased exposure is therefore a possible explanation for the risk differential, as children residing in these LGAs are probably more likely to participate in off-road motorcycling because it is a more accessible leisure activity in outer urban and rural areas and a part of everyday life for children on farms. Increased risk-taking and non-wearing of helmets may also be explanatory factors as there is some evidence that high risk behaviours and non-use of safety related devices (such as seatbelts and helmets) are more prevalent in children from low SES areas (Macpherson et al., 2006; Parkin et al., 2003).

Although we identified that hospitalisation rates for bicycling and car occupant injury were higher among children from the more disadvantaged areas, the difference was not statistically significant across all the quintiles of area disadvantage. Unlike the most recent NSW study (Poulos et al., 2007) and studies conducted in the U.S. (Durkin et al., 1994), Wales (Lyons et al., 2003) and England (Hippisley-Cox et al., 2002), we did not find a statistically significant relationship between area SES and injury risk across all quintiles of disadvantage for pedestrian injury, fire/burns/scalds and poisoning.

Adolescents and young adults (15-24 years)

There were 7,613 injury hospitalisations per year among adolescents and young adults aged 15-24 years predominantly caused by transport (26%), falls (18%) self-harm (12%), hit/struck/crush (10%) and assaults (7%).

We found evidence of statistically significant and consistent relationships between area SES and injury risk in this age group for all causes of injury combined (IRR range 1.21-1.39) and all unintentional injury causes combined (IRR range 1.17-1.39). This was mainly due to the strong relationship between SES and transport injury (IRR 1.56-1.70), specifically for car occupants and motorcyclists, and SES and assaultive injury (IRR 1.43-1.71).

Our study found that adolescent and young adults in the more disadvantaged quintiles had about one-and-a-half times the likelihood of being hospitalised for motor vehicle occupant injury and at least twice the likelihood of being hospitalised for motorcycling injury as their counterparts in the least disadvantaged SES quintile. These differences were statistically significant. A consistent but non-significant relationship between area SES and pedestrian injury was observed.

Two Swedish studies have reported similar findings; both used individual-level measures of SES. A nationwide follow-up of young people aged 16-25 years in Sweden, in which individual census records that included household socioeconomic position were linked to the Hospital Discharge Register so as to identify subjects' road traffic injuries (RTIs) as car drivers, found clear socioeconomic differences in road injury risk. Young drivers from manual worker families were shown to have 80% higher risk for RTIs compared to drivers in families with salaried employee parents (RR 1.83,







CI 1.63-2.05) (Hasselberg & Laflamme, 2008). In this study SES was defined mainly on parental occupation but also took their educational level, type of productive activity and job position into account.

In a similar follow-up study, individual census records of young Swedes aged 16-25 years were linked to police-reported and hospital-based data on the basis of a search for each subject's first registered road traffic injury as a motorcycle driver (Zambon & Hasselberg, 2006). Socioeconomic differences in injury risk were consistently registered among young motorcyclists with the greater discrepancies in their first years of motorcycle driving (ages 17-19). At the age of 18, subjects belonging to low socioeconomic groups ran the risk of motorcycling injury occurrence 2.5 times higher than those belonging to the highest socioeconomic category.

A number of possible explanations for the relationship between motor vehicle-related injuries and area SES have been put forward including different exposure levels among social groups (how much the vehicle is used) and different environmental conditions (i.e. different levels of risk according to area of residence). It has also been suggested that young people belonging to high socioeconomic groups drive newer, safer and better maintained vehicles, have access to better driving training, are more likely to wear safety equipment (helmets and seat belts), are better supervised by their parents and are less likely to use alcohol and drugs (Zambon & Hasselberg, 2006; Hasselberg & Laflamme, 2008). Further research is needed to explore the influence of these factors in Australia.

In contrast, a recently published multi-level study (that included both individual and area level measures of SES) of the social determinants of traffic-related and intentional injury among all children and adolescents aged 7-16 living in Stockholm County showed that the socioeconomic and social attributes of their living area had a 'protective' effect on injuries as a motor vehicle occupant for those who resided in less wealthy parishes (Laflamme et al., 2009). The difference between these results and those reported from earlier Swedish studies may be due to the predominance of children in the population studied. The authors speculated that exposure differentials were the likely explanation for this finding because of low ownership of motorised vehicles among people living in areas with greater social fragmentation and higher concentration of immigrants, and less access to motor vehicles in general in these areas due to reduced possibility of borrowing or sharing motor vehicles with others.

The other striking finding from our study of this age group was that the likelihood of hospitalisation for assaultive injury was 1.4 to 1.7 times higher among adolescents and young adults in the more disadvantaged quintiles than their counterparts in the least disadvantaged quintile. Excluding studies conducted in the U.S. because of the different racial composition, gang and weapons culture, there are surprisingly few studies conducted in comparable countries to Australia that investigate the role of area-based SES in assaultive injury in this or any age group.

Our findings are consistent with previous studies undertaken in the U.K., Sweden and Canada. An area-level study of accident and emergency patients in the West Midlands National Health Service Region of the U.K. (Downing et al., 2003) found that persons of all ages living in the most deprived areas were nearly four times more likely to be admitted to hospital for assaultive injury than those in the least deprived areas (175.9 per 1000 compared with 45.1 per 1000). The highest assaultive injury rates were found in males aged 15-19 and 20-24 (23.7 and 20.1). Similarly, Howe & Crilly (2001) demonstrated a strong correlation (Pearson Correlation Coefficient 0.90; 95% Confidence Intervals, 0.77-0.96) between material deprivation assigned at the electoral ward level of aggregation and attendance to the accident and emergency department following violent assault among residents of the Chorley District in the U.K. No age data were reported.

Two Swedish studies also report that the risk of assaultive injury increases with deprivation but another recent multilevel study found no significant relationship. Engstrom et al. (2002) measured socioeconomic difference in injury risk in all children and adolescents in Sweden and reported that 15-19 year olds from all other SES groups than the highest had an excess risk of injury related to violence (and traffic injury). In this study SES was assigned at the household level using census data. Reimers et al. (2008) investigated the stability over time of the association between area characteristics (including SES) and childhood injuries of various causes. Two time periods (1993-5 and 2003-5) and two age groups (10-14 and 15-19) were considered. The most noteworthy finding was that intentional injuries (self harm and violence) were more frequent during the second time period and were significantly and positively correlated with economic deprivation among 15-19 year olds, in particular among females. In contrast, the recent multi-level Stockholm county study found that the effect of socio-economic deprivation at the area level was not a strong and independent predictor of violence-related injuries but the proportion of social welfare recipients in an area was (Laflamme et al., 2009). However, this study only included adolescents to age 16.

Further supporting evidence for our finding was reported from a recently published multilevel Canadian study on the influence of individual and area SES on hospital admissions for assault injuries in Vancouver (Bell et al., 2009). A social gradient according to individual and neighbourhood SES and frequency of assault injuries was observed for adults of all ages. After controlling for age and individual SES, the odds of assault injury among individuals living in progressively less privileged neighbourhoods remained 1.5-3 times higher than individuals living in the least deprived neighbourhoods. For adults under the age of 35, neighbourhood SES was a more statistically significant indicator of increased odds of assault injury than individual income. The authors suggest that, especially among young males, prevention efforts should utilise both individual and community (neighbourhood) strategies and measures.

Adults (25-64 years)

On average there were 22,834 injury admissions per year among adults aged 25-64 years during 2005-2007. Unintentional

injury accounted for most admissions (81%), mainly due to falls (28%) and transport (18%). Self harm accounted for 11% of admissions and assaults 5%.

Although adults in least disadvantaged SES areas (quintile 5) generally had the lowest hospitalisation rate for each specific causes of injury, it did not follow that there were strong relationships between increasing area deprivation and injury risk. Adults in the more disadvantaged areas were significantly more likely to be hospitalised than adults in the least disadvantaged area for only two causes: machinery-related injury (IRR range 1.37-1.86) and intentional self-harm (IRR range 1.13-1.58). These two causes accounted for 13% of injury hospitalisations in adults.

However, our study found that there was a much stronger relationship between area SES and injury risk in males than females. Males in the more disadvantaged areas were significantly more likely to be hospitalised than males in the least disadvantaged area for all causes of injury combined (IRR range 1.06-1.25), all causes of unintentional injury combined (IRR range 1.06-1.22) and natural/environmental/animal-related injury (IRR range 1.77-3.06).

Comparison of our results with those from studies undertaken in comparable countries is hampered by differences in study design and methodology. The Swedish and Spanish studies discussed earlier (Li et al., 2008; Ferrando et al., 2005) included both neighbourhood-level and individual-level SES variables. Both studies found that when neighbourhood SES decreased the likelihood of injury increased in persons aged 15-64 years, but when individual SES variables were factored into the analysis the neighbourhood effect was attenuated.

The Welsh study by Lyons et al. (2003), the closest to ours in terms of overall design, reported substantial gradients of risk in adults with the likelihood of injury increasing as deprivation increased for all admissions, self harm, assaults, falls, pedestrian road traffic accidents, all poisoning and all burns. However, their adult age group was broader than ours and included persons aged 15 to 74 years, and the authors do not give results for males and females separately.

Evidence from previous Australian studies on area socioeconomic variation in suicide and suicide attempts support our finding that the occurrence of self harm injury increases with decreasing area SES. Taylor et al. (2005) investigated the relationship between suicide rates and prevalence of mental disorder and suicide attempts (data derived from the 1997 National Survey of Mental Health and Wellbeing) across SES groups based on area of residence at the census collection district level of aggregation using the IRSD. The study found that area SES remained significantly associated with male but not female suicide after controlling for the prevalence of mental disorders and other psychiatric symptoms. The authors recommended that, to be effective, approaches to suicide prevention should address the material circumstances and socioeconomic characteristics of communities as well as the psychological health of vulnerable individuals. A later study by the same research team showed that the SES differentials in suicide have persisted over time, for both males (especially young males) and females, despite a decrease in the suicide rate in Australia (Page et al., 2006).

A possible explanation for our finding that area deprivation increases the risk of machinery-related injury is that adults living in more disadvantaged areas have higher exposure to machinery in their workplaces as they are more likely to be 'blue collar' workers. We could not explore this potential relationship further because the 'activity at the time of injury' variable is poorly completed on the Victorian Admitted Episodes Dataset. Two U.S. studies that investigated the influence of SES and non-fatal injury using occupation level as one of the individual-level SES indicators demonstrated that injury incidence rates were higher for persons in blue collar than white collar occupations (Wagener & Winn 1991; Cubbin et al., 2000).

Older adults (65+years)

Our study found no evidence of an association between living in a lower SES area and injury risk among older adults, in fact females living in the most disadvantaged LGAs were at lower risk for all causes of injury combined (IRR range 0.80-0.86) and all causes of unintentional injury (IRR range 0.83-0.86). This was mainly due to their lower risk of fall-related injury (IRR range 0.83-0.86), the cause of close to 80% of injury hospitalisations among older adults in Victoria. Older people living in the least disadvantaged area (quintile 5) exhibited the highest injury hospitalisation rate for falls, transport and 'other' unintentional injury (the three leading causes of unintentional injury) and for three of the five specific causes (mechanisms) of self-harm. Accidental poisoning was the only cause of unintentional injury where people living in the most disadvantaged area (quintile 1) had the highest admission rate.

The results from the few studies on the socioeconomic pattern of elderly injury in comparable countries to Australia tend to support our findings. Lyons et al (2003) compared hospital admission rates for all causes and specific causes of injury in the Welsh elderly (aged 75+ years) by a measure of economic deprivation and found that only pedestrian injuries and assault-related injuries showed substantial socioeconomic gradient and that falls were little influenced by socioeconomic position.

Similarly, a Swedish study of the effects of neighbourhood on injury risk in the entire Swedish population found no difference in the 1-year prevalence of falls, transport, other external causes of accidental injury and intentional injury among persons aged 65 years and older in the most deprived SES quartile compared to the most affluent (Li et al., 2008). Overall, only very small neighbourhood income effects were evident with older persons in the most deprived neighbourhoods exhibiting slightly higher odds of injury (OR=1.04; CI 1.00-1.08) than their counterparts in the most affluent neighbourhoods (OR=1). However, a protective effect of neighbourhood deprivation was found in the full model when results were adjusted for the demographic and socioeconomic variables and the alcohol/substance abuse variable (Li et al., 2008).

A small number of studies have investigated the influence of area SES on hip fracture risk in the elderly and all have found no association between hospital admission for hip fracture and deprivation. In a study

conducted in metropolitan Stockholm, living in an economically deprived area was shown to confer a small but non-significant protective effect on hip fracture risk (Reimers & Laflamme, 2007). In a U.S. study, Bacon & Hadden (2000) reported there was a linear decrease in hip fracture risk with an increase in income level. Likewise, a study conducted in the Trent health service region in the U.K. found no evidence of an association between hip fracture hospitalisation and area deprivation among older persons (West et al., 2004; Jones et al., 2004).

One explanation given in the literature for the lack of a simple linear association between fall injury risk in older age and SES is that individuals who live to old age may be healthy survivors (Todd et al., undated). Thus, poorer individuals who may have been at greater risk of fall-related injury may have been selectively removed from the age cohort by premature mortality from other diseases. Another possible explanation is that older people in more affluent areas are more exposed to falls risk because the interior and exterior space in and around their homes is larger and they are more active in their leisure time.

Study strengths and limitations

Our study analysed injury hospitalisations. The use of hospital admissions data has been raised as a source of bias in studies investigating the impact of SES on health because particular SES groups may have differential access to hospitals due to availability of hospital care locally, ease of getting to the health facility and affordability issues. However, all Victorians have access to free public hospital inpatient care under the Medicare universal health insurance scheme and our study included all patients admitted to public and private hospitals in Victoria. The Victorian Admitted Episodes Dataset contains administrative data collected by the Victorian Department of Human Services (now Health) using a standard methodology and the processes are regularly audited which guarantees a level of accuracy of the reporting. We excluded 'short stay' admissions (patients treated and discharged on the same day) to reduce the potential impact of the use of hospital emergency departments in preference to GPs by persons on low incomes, the shortage of after-hours GPs in some areas and different admissions policies at the individual hospital level.

We attributed injuries to the area of residence of the patient but they may have occurred in another location with a different level of disadvantage but we do not have access to this information as there is no variable to identify the geographical location of the injury event in the Victorian Admitted Episodes Dataset.

Also, we ascribed the same level of socioeconomic deprivation to all patients living in the same large geographical area (LGA), although this may not necessarily be the case. The use of smaller spatial areas such as statistical local area (SLA) or collector district (CD), the smallest geographical area used by the ABS, may have produced different results, but the boundaries of SLAs changed over our study period and hospital admissions data at the CD level (or accurate patient addresses that can be mapped to CDs) were not available. Hyndman et al. (1995) studied the relationship between SES and selected health-related measures in Western Australia when SES was defined firstly on the basis of postcode and secondly on the basis of the smaller special area of CD. The study found nearly 50% of residents were misclassified into SES groups on the basis of postcode which caused an underestimation of the true relationship between SES and health-related measures (by 58% in the case of increased prevalence of smoking, by 19% for the reduced prevalence of participation in junior sport and by 13% for the increased age standardised mortality rate at ages 0-64 years). They concluded that studies, such as ours, in which SES groups are based on indices assigned to even larger spatial areas such as SLAs are likely to further underestimate the strength of the relationship between SES and health outcomes because of the extent of misclassification of SES status has masked the true relationships.

The IRSD is a summary indicator of more than 40 factors associated with disadvantage. No breakdown is available on the relative contribution made by the various measures included in the statistic. Also, the Victorian Privacy Legislation is currently a barrier to the linkage of ABS census data and health record data so that it is not possible to conduct multilevel studies to investigate the independent contribution of area- and individual- level SES to injury in Victoria.

Conclusion

The findings from this study suggest that broad generalisations about the relationship between injury occurrence and area SES are best avoided and that patterns vary by age group, sex and cause of injury. Overall, the excess risk of injury conferred by the area in which a person lives was shown to be related to at most 20% of the hospital admissions for injury. Some of the differential may be due to individual, rather than area, SES effects. Area SES essentially bore no relationship with elderly injury hospitalisations and fall injury hospitalisations (in fact a protective effect was observed) so resources and intervention strategies do not need to be specifically targeted to the more disadvantaged LGAs when addressing these issues.

In general, we found that there was a much stronger relationship between area SES and injury risk in males than females and in the 15-24 year age group than other age groups. Area-based interventions at the local government level would appear to be appropriate for the injury causes that showed the strongest relationship with area SES: transport injury for car occupants and motorcyclists (except in older adults), machinery-related injury (in working age adults), self-harm (in working age adults) and assaultive injury (in young people).

We also require a deeper understanding of the mechanisms by which area or individual disadvantage mediates the effect on injury rate, as this is not well understood. This knowledge is required for the development of appropriate preventive strategies and countermeasures. Postulated mechanisms include higher physical hazard counts in disadvantaged homes and neighbourhoods, inadequate income for the purchase of required equipment and less access to appropriately targeted information. The lower injury rates in the least disadvantaged SLAs for many injury causes provide us with the benchmarks for preventative action.







Recommendations

- Support in-depth research to investigate the social and environmental factors that may cause or serve to promote injury to car occupants and motorcyclists, machinery-related injury, self-harm and assaultive injury in residents of the more disadvantaged local government areas.
- The Australian Bureau of Statistics (ABS) should consider developing the IRSD to be used at the local government area ward level of population aggregation as this is a more meaningful and useful unit for preventive health action than statistical local area (SLA).
- The Department of Health should work with all public and private hospitals to improve the completeness of the injury data they contribute to the Victorian Admitted Episodes Dataset (VAED) especially the Place of Occurrence and Activity items.
- The Department of Health in co-operation with VISU should put a case for modifying the International Classification of Diseases, Tenth Revision, Australian Modifications (ICD-10-AM) to include two new injury surveillance data items: Locality (suburb/town) where injury event (accident) occurred and Postcode where injury event (accident) occurred, as they are needed for injury prevention and research purposes. Both codes are necessary for determining the LGA where the injury event occurred as it may be different from the injured person's place of residence.

Several messages and recommendations came out of the systematic review "Socioeconomic differences in injury risks: a review of findings and a discussion of potential countermeasures" by Laflamme and colleagues (2009). They are separated into messages for policy makers, researchers and public health advocates and safety planners. Further detail can be found in the full review and policy briefing document at: www.euro.who.int/eprise/main/WHO/Progs/VIP/20090127_2.

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Appendix: Population characteristics of Local Government Areas (LGAs) by SES quintile

Table Average number and proportion of persons residing in Local Government Areas (LGAs) in each IRSD quintile by age and gender, Victoria 2005-7

	0-14 years		15-24 years		25-64 years		65+ years		All ages	
	n	%	n	%	n	%	n	%	n	%
MALES										
quin 1	83,021	16.7	57,262	15.8	212,695	15.6	46,999	15.3	399,977	15.8
quin 2	64,396	12.9	43,575	12.0	168,930	12.4	43,933	14.3	320,833	12.7
quin 3	90,927	18.3	62,498	17.2	236,102	17.3	60,354	19.7	449,881	17.8
quin 4	125,205	25.1	81,766	22.5	321,426	23.6	61,243	20.0	589,641	23.3
quin 5	134,650	27.0	118,207	32.5	422,506	31.0	94,433	30.8	769,797	30.4
VICTORIA	498,198	100.0	363,309	100.0	1,361,659	100.0	306,962	100.0	2,530,129	100.0
FEMALES										
quin 1	79,071	16.7	54,058	15.5	210,820	15.2	55,441	14.5	399,390	15.4
quin 2	61,086	12.9	41,584	11.9	170,824	12.3	53,303	14.0	326,797	12.6
quin 3	86,349	18.3	60,207	17.3	241,742	17.5	76,324	20.0	464,622	18.0
quin 4	118,905	25.1	77,646	22.2	326,712	23.6	73,852	19.4	597,115	23.1
quin 5	127,666	27.0	115,529	33.1	434,180	31.4	122,401	32.1	799,776	30.9
VICTORIA	473,078	100.0	349,024	100.0	1,384,278	100.0	381,320	100.0	2,587,700	100.0
PERSONS										
quin 1	162,092	16.7	111,320	15.6	423,515	15.4	102,440	14.9	799,366	15.6
quin 2	125,482	12.9	85,160	12.0	339,753	12.4	97,236	14.1	647,631	12.7
quin 3	177,276	18.3	122,705	17.2	477,844	17.4	136,678	19.9	914,503	17.9
quin 4	244,110	25.1	159,412	22.4	648,139	23.6	135,095	19.6	1,186,756	23.2
quin 5	262,316	27.0	233,737	32.8	856,686	31.2	216,834	31.5	1,569,572	30.7
VICTORIA	971,276	100.0	712,333	100.0	2,745,937	100.0	688,282	100.0	5,117,828	100.0

Source: ABS catalogue number 3201.0 - Population by Age and Sex, Australian States and Territories, June 2008







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Box 1
Information on Socio-Economic Indexes for Areas (SEIFA) devised by the Australian Bureau of Statistics (ABS)

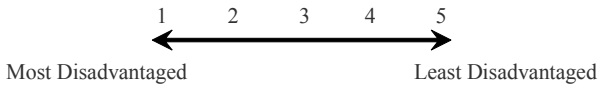
This summary is sourced from the Australian Bureau of Statistics (ABS) Information Paper: An Introduction to Socio-Economic Indexes for Areas (SEIFA) 2039.0 and provides an overview so readers have some understanding of the SEIFA process.

SEIFA stands for Socio-economic Indexes for Areas and the four indexes created by the ABS rank geographic areas across Australia in terms of their socio-economic characteristics. SEIFA indexes are created by the ABS by combining information collected in the five-yearly Census of Population and Housing. Each piece of information is first selected on the basis of a concept of relative socio-economic disadvantage and then turned into a 'variable' which can be used in the index creation process. It is important to remember that the SEIFA is a summary of people in an area and does not apply to an individual person or dwelling, that is the SEIFA indexes represent the general level of socio-economic disadvantage of all the people in the area in which a person lives, not the person themselves.

The Index of Relative Socio-economic Disadvantage (IRSD), the measure of SES used in this edition of Hazard, is one of four different SEIFA indexes. The IRSD is a general socio-economic index that summarises a wide range of information about the economic and social resources of people and households within an area including income, education, employment, rental versus home ownership and other variables that are associated with disadvantage, for example proportion of indigenous persons and single parent families. Because this index focuses on disadvantage, only measures of relative disadvantage are included. This means that, unlike the other three indexes, a high score reflects a relative lack of disadvantage rather than relative advantage, as shown in figure 1.

The distribution of scores is divided into ten equal groups (deciles). The lowest scoring 10% of areas are given a decile number of 1, the second-lowest 10% of areas are given a decile number of 2 and so on, up to the highest 10% of areas which are given a decile number of 10. Relative disadvantage is associated with a low number. The deciles were then converted to quintiles (deciles 1 & 2 became quintile 1, deciles 3 & 4 became quintile 2 etc), resulting in the creation of 5 groups with group 1 containing individuals from the most disadvantaged areas and group 5 containing individuals from the least disadvantaged areas (Figure 1).

Figure 1 IRSD: Interpretation of quintiles



A low IRSD score indicates relatively greater disadvantage in general and a high score indicates a relative lack of disadvantage in general. This index is therefore appropriate for distinguishing between relatively disadvantaged areas and is appropriate for users who are interested in the relative disadvantage of people in an area (lower deciles), and the relative lack of disadvantage of people in an area generally (upper deciles).

Box 2
Case selection: External Cause of Morbidity (Injury) codes in the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modifications (ICD-10-AM)

Cases were extracted from the Victorian Admitted Episodes Dataset (VAED) using the following ICD-10-AM External Causes codes:

UNINTENTIONAL INJURY (ACCIDENTS)

Falls (W00-W19)

Transport (V01-V99)

Hit/struck/crush (W20-W23, W50-W52)

Cutting & piercing (W25-W29, W45-W46)

Poisoning (X40-X49)

Nat/environ/animals (X20-X39, W42-W43, W53-W64)

Machinery (W24, W30-W31)

Fires/burns/scalds (X00-X19)

Choking & suffocation (W75-W84)

Firearms & explosions (W32-W40)

Near drowning (W65-W74)

Other unintentional (W85-W99, W41, W44, W49, X50-X59)

All unintentional injury (V01-X59)

INTENTIONAL SELF-HARM

Poisoning by pharmaceuticals (X60-X64)

Sharp object (X78)

Poisoning by other substances (X65-X69)

Hanging/strangulation (X70)

All other mechanisms (X71-X77, X79-X84)

All self harm (X60-X84)

INTENTIONAL ASSAULTIVE INJURY

Bodily force (Y04)

Sharp object (X99)

Blunt object (Y00)

All other mechanisms (X85-X98, Y01-Y03, Y05-Y09)

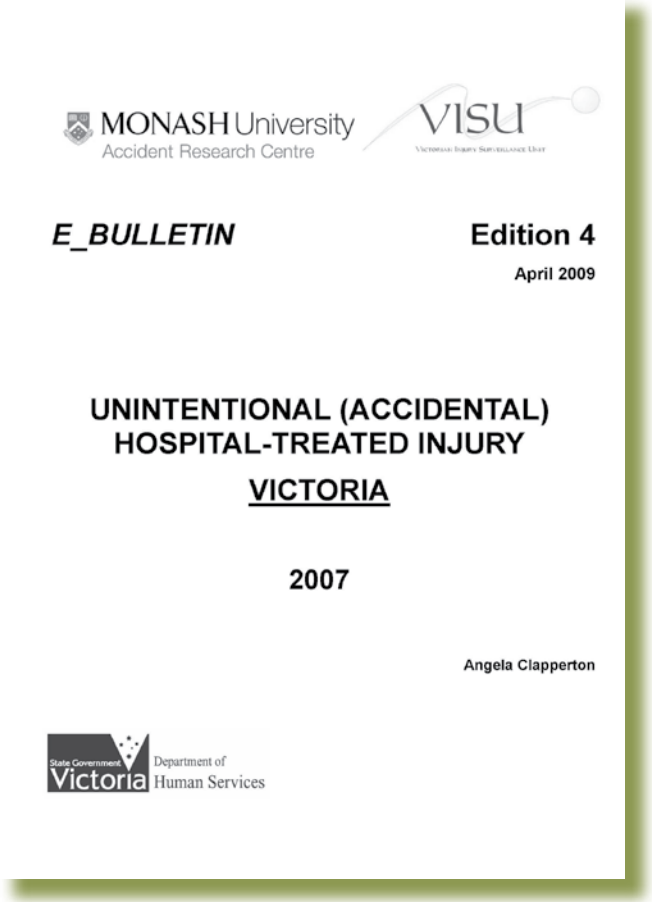
All assault (X85-Y09)

ALL INTENTS (CAUSES) COMBINED (V01-Y09)









Unintentional (accidental) hospital-treated injury in Victoria 2007

This is the fourth of a series of regular E-bulletins that provide an overview of the injury profile for Victoria utilising injury surveillance datasets. This edition provides an overview of unintentional ('accidental') hospital-treated injury that occurred in 2007.

Available free to download at www.monash.edu.au/muarc/VISU/

VISU Information request service

VISU services 250 information requests each year utilising the three injury surveillance databases available to MUARC: the Australian Bureau of Statistics - Death Unit Record File (ABS-DURF); Victorian Admitted Episodes Dataset (VAED) and the Victorian Emergency Minimum Dataset (VEMD).

The most frequently requested topics are: elderly fall injury, playground and play equipment injury, DIY home maintenance injury, home injury, dog bite, sports injury poisoning, nursery furniture and equipment injury, off-road vehicle injury (ATVs and motorcycles) and local community injury profiles (by Local Government Area).

• Who can access VISU injury data?

The VISU data and information request service is open to government and non-government organisations, the higher education and schools sector, industry and business and community members. We are not able to provide a direct service to primary and secondary school students.

• Any charges?

A standard format response is free-of-charge. Additional analysis may be purchased for a cost-recovery fee of $120 per hour (GST exclusive).

• How do I make a request

Data and information requests can be made by telephone (9905 1805) or email: visu.enquire@muarc.monash.edu.au

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Participating hospitals

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The Bendigo Hospital Campus
Box Hill Hospital
Echuca Base Hospital
The Geelong Hospital
Goulburn Valley Base Hospital
Maroondah Hospital
Mildura Base Hospital
The Northern Hospital
Royal Children's Hospital
St Vincents Public Hospital
Wangaratta Base Hospital
Warrnambool & District Base Hospital
Western Hospital - Footscray
Western Hospital - Sunshine
Williamstown Hospital
Wimmera Base Hospital

From November 1995
Dandenong Hospital
From December 1995
Royal Victorian Eye & Ear Hospital
Frankston Hospital

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Latrobe Regional Hospital

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Alfred Hospital
Monash Medical Centre

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Royal Melbourne Hospital

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From December 2000
Rosebud Hospital
From January 2004
Bairnsdale Hospital
Central Gippsland Health Service (Sale)
Hamilton Base Hospital
Royal Women's Hospital
Sandringham & District Hospital
Swan Hill Hospital
West Gippsland Hospital (Warragul)
Wodonga Regional Health Group

From April 2005
Casey Hospital

How to access VISU data:

VISU collects and analyses information on injury problems to underpin the development of prevention strategies and their implementation. VISU analyses are publicly available for teaching, research and prevention purposes. Requests for information should be directed to the VISU Co-ordinator or the Director by contacting them at the VISU office.

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All issues of Hazard and other information and publications of the Monash University Accident Research Centre can be found on our internet home page:

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A Victorian Government initiative

Victoria The Place To Be

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