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VICTORIAN INJURY SURVEILLANCE UNIT

This bumper issue of Hazard aims to provide data and information to underpin action to reduce child injury over the next decade.

Preventing unintentional injury in Victorian children aged 0-14 years: a call to action

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Summary

Child unintentional ('accidental') injuries are preventable as shown by the 55% decreased in the child injury fatality rate over the past decade, mainly due to the large reduction in drowning and road fatalities. By contrast, the serious injury rate only reduced by 21% over the same period. The challenge facing Victoria is to show the same commitment to, and investment in, halving the serious injury rate in children over the next decade, while further reducing fatalities.

There were 103 deaths, 38,553 hospital admissions and 166,229 hospital Emergency Department (ED) presentations for unintentional child injury in Victoria over the 3-year period 2003-5. Boys are more at risk of unintentional injury than girls, accounting for 57% of child injury deaths, 62% of hospital admissions and 59% of hospital ED presentations. Death and hospital admissions rates are highest in children aged 0-4 years.

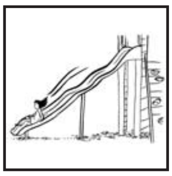
Despite the large decrease in child motor vehicle crash fatalities over the decade to 2005, transport-related injuries still caused over half of the 103 child unintentional injury fatalities that occurred in 2003-5. Other major causes of death were drowning and choking/suffocation. Falls caused almost 48% of injury admissions and 42% of ED presentations. Other common causes of admissions and presentations were hit/stuck/crush, transport, cutting and piercing, poisoning, natural/environmental (animal bites and stings) and fire/burns/scalds.

Five criteria were used to select priorities for prevention: the size and severity of the problem, its preventability, the availability of measurable impacts and outcomes, the potential for co-ordinated response including fit with other national and state strategies/action plans and opportunities for shared funding of preventive initiatives.

More intensive analysis of surveillance data and available information relevant to preventability identified four issues that merited priority status: home injury, on- and off- road bicycling injury, on- and off- road motorcycling injury and playground equipment fall injury. Data on each of these priority issues are examined in depth and the discussion covers known risk factors for injury, the evidence base for the effectiveness of potential prevention strategies and measures, the range of partners that need to be involved in developing and implementing strategies to address the issue and recommended preventive actions.

Sport and transport related injuries should also be addressed as these are high frequency, high severity problems.







Overview

There were 103 deaths, 38,553 hospital admissions and 166,229 hospital Emergency Department (ED) presentations (non-admissions) for unintentional child injury in Victoria over the 3-year period 2003-5 (Table A). Data extraction and analysis methods for all sections are described in Box 1.

Boys were more at risk of injury than girls, accounting for 57% of child injury deaths, 62% of hospital admissions and 59% of hospital ED presentations. The average annual death rate for boys was 4.0/100,000 compared with 3.1/100,000 for girls. The average annual male hospital admission rate was 1,631/100,000 population compared with the female rate of 1,034/100,000.

Young children aged 0-4 years accounted for more than half of all unintentional child injury deaths (53%, n=55) whereas hospital admissions were distributed fairly evenly across the three 5-year age groups. Analysis of rate data showed that 0-4 year olds had the highest hospitalisation rate for unintentional injury (1,412/100,000 population) followed by 10-14 year olds (1,319/100,000) and 5-9 year olds (1,292/100,000). The frequency of hospital ED presentations was higher in children aged 0-4 and 10-14 years (each contributing 35% of cases) than in children aged 5-9 years (29%).

Half of all deaths were the result of transport injuries (n=54); other common causes of death were drowning (n=19) and choking and suffocation (n=10). The road, street and highway (42%, n=43) and the home (28%, n=28) were common locations of fatal injury.

Falls caused almost half of hospital admissions (47%). Other major causes of admissions were hit/stuck/crush most commonly caught, crushed, jammed or pinched between objects (12.5%) and transport (12.8%). Falls were also the major cause of ED presentations accounting for 42% of all ED presentations, followed by hit/struck/crush and cutting and piercing.

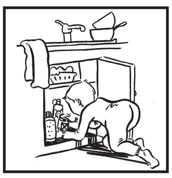
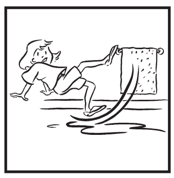
Among both admissions and presenta–tions the upper extremity was the most frequently injured body site, followed by the head/face/neck and lower extremity. Fractures (mostly to the forearm/elbow), open wounds and dislocation/sprains/strains were the most common injuries.

Overview of unintentional injury in children aged 0-14 years, Victoria 2003-5 **Table A**

	DEATHS (n=103)		ADMISSIONS (n=38,553)		PRESENTATIONS (n=166,229)	
	n	%	n	%	n	%
Year						
2003	43	*42*	12,795	*33*	49,405	*30 (33)* (1)
2004	30	*29*	12,589	*33*	55,031 (47,980)(1)	*33 (32)* (1)
2005	30	*29*	13,169	*34*	61,793 (52,174)(1)	*37 (35)* (1)
Gender						
male	59	*57*	24,041	*62*	97,522	*59*
female	44	*43*	14,512	*38*	67,893	*41*
missing/unknown			0	*0*	814	*<1*
Age group						
0-4	55	*53*	12,948	*34*	58,935	*36*
5-9	20	*19*	12,424	*32*	48,507	*29*
10-14	28	*27*	13,181	*34*	58,787	*35*
Major causes of injury						
fall	5	*5*	18,266	*47*	70,102	*42*
hit/struck/crush	1	*1*	4,977	*13*	35,528	*21*
transport	54	*52*	4,929	*13*	7,513	*5*
poisoning	2	*2*	1,886	*5*	2,860	*2*
cutting & piercing	0	*0*	1,853	*5*	12,287	*7*
natural/environmental/animals	1	*1*	1,306	*3*	5,054	*3*
fire/burns/scalds	5	*5*	846	*2*	3,557	*2*
choking and suffocation	10	*10*	320	*<1*	351	*<1*
drowning	19	*18*	104	*<1*	115	*<1*
machinery	1	*1*	97	*<1*	138	*<1*
explosions/firearms	1	*1*	29	*<1*	11	*<1*
other unintentional	4	*4*	3,940	*10*	28,713	*17*
Broad body region injured						
head/face/neck	38	*37*	10,686	*28*	43,488	*26*
trunk	3	*3*	2,273	*6*	4,379	*3*
upper extremity	0	*0*	17,021	*44*	63,172	*38*
lower extremity	0	*0*	5,096	*13*	30,246	*18*
multiple body regions	15	*15*	15	*<1*	2,073	*1*
body region not relevant	39	*38*	2,755	*7*	18,193	*11*
unspecified body region	8	*8*	707	*2*	4,678	*3*
Nature of injury						
fracture	5	*5*	16,980	*44*	29,635	*18*
open wound	3	*3*	7,317	*19*	37,048	*22*
poisoning	6	*6*	1,930	*5*	2,829	*2*
intracranial injury	4	*4*	1,573	*4*	4,024	*2*
foreign body	2	*2*	1,560	*4*	8,439	*5*
superficial injury	0	*0*	1,559	*4*	18,879	*11*
dislocation, sprain & strain	0	*0*	1,018	*3*	31,180	*19*
burns	2	*2*	943	*2*	3,875	*2*
traumatic amputation	0	*0*	535	*1*	131	*<1*
injury to muscle & tendons	0	*0*	423	*1*	4,315	*3*
injury to internal organs	0	*0*	265	*<1*	138	*<1*
injury to nerves and spinal cord	0	*0*	241	*<1*	75	*<1*
eye injury	0	*0*	210	*<1*	2,551	*2*
crushing injury	0	*0*	164	*<1*	1,869	*1*
injury to blood vessels	0	*0*	82	*<1*	390	*<1*
other and unspecified	49	*48*	3,753	*10*	20,851	*13*
Activity (2)						
leisure activity	n/a		2,152	*6*	95,688	*57*
sports and recreation			7,189	*19*	14,814	*9*
education			n/a		5,789	*4*
resting, sleeping, eating			1,254	*3*	5,568	*3*
being nursed or cared for			n/a		3,350	*2*
working (income & other types)			320	*<1*	1,213	*<1*
general travel			n/a			*<1*
other specified activity			7,924	*21*	14,272	*9*
unspecified activity			19,711	*51*	25,535	*15*
Location						
road street highway	43	*42*	1,476	*4*	7,775	*5*
home	28	*27*	7,982	*21*	82,060	*49*
farm	4	*4*	224	*<1*	919	*<1*
school, public buildings	2	*2*	4,988	*13*	23,608	*14*
industrial and construction area	1	*1*	38	*<1*	63	*<1*
residential institution	0	*0*	30	*<1*	241	*<1*
trade or service area	0	*0*	332	*<1*	1,443	*<1*
place for recreation	0	*0*	2,410	*6*	23,636	*14*

Source: ABS (deaths), VAED (hospital admissions), VEMD (ED presentations, non admissions).
Notes: (1) The increase in frequency of ED presentations recorded for 2004 and 2005 is mostly the result of 8 additional rural hospitals contributing to VEMD from January 2004, and Casey Hospital from April 2005. The frequency and proportions recorded in brackets show what the values would have been if cases from the new hospitals were excluded.
(2) ABS deaths data are not coded for activity from 2003

Most hospital-treated unintentional injuries occurred in the home (40-50%), followed by the school and places for sport and recreation.

Yearly trend in child unintentional injury (1996-2005)

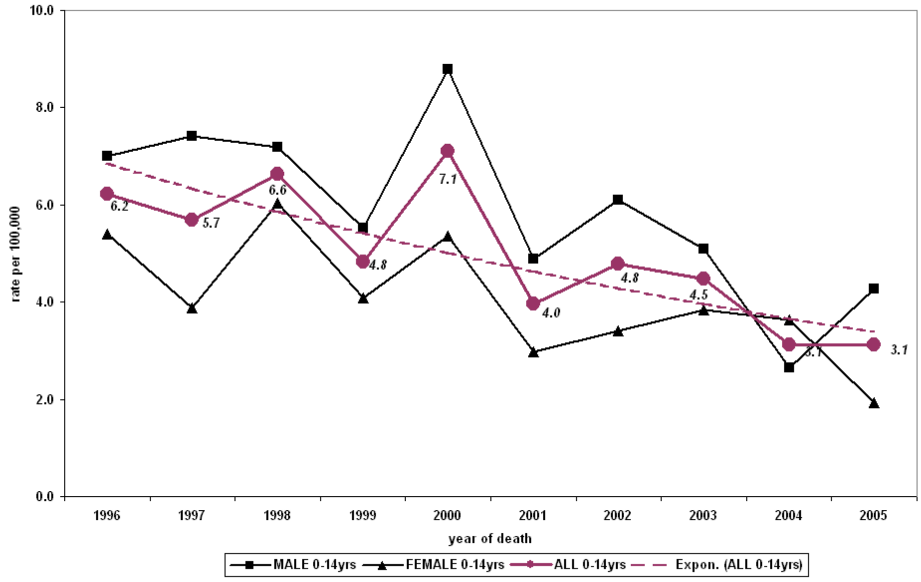
Figures A, B and C respectively show the trend in deaths, hospital admissions and ED presentations for unintentional injury in Victoria over the decade 1996-2005. Data extraction and analysis methods for all trends are described in Box 1.

The injury death rate decreased significantly over the decade from 6.2/100,000 in 1996 to 3.1/100,000 in 2005, representing an estimated annual change of -7.8% (95% confidence interval -13% to -3.2%) and an overall reduction of 55% (-75% to -28%) based on the trend line. (Figure A).

Figure B shows the yearly trend in the hospital admission rate, and the rate excluding same day admissions (heavy lines). The exclusion of same day admissions minimises the influences of differences in individual hospital's admissions policy on the trend line. The child unintentional injury hospital admission rate (excluding same day admissions) decreased significantly over the decade from 804/100,000 in 1996 to 686/100,000 in 2005, representing an estimated annual change of -2.3% (95% confidence interval -3% to -1.6%) and an overall reduction of 21% (-27% to -15%). When same day admissions are not excluded the rate of hospital admissions increased significantly from 1,244/100,000 to 1,374/100,000, representing an estimated annual change of 0.7% (0.3% to 1.1%) and an overall increase of 7% (3% to 12%).

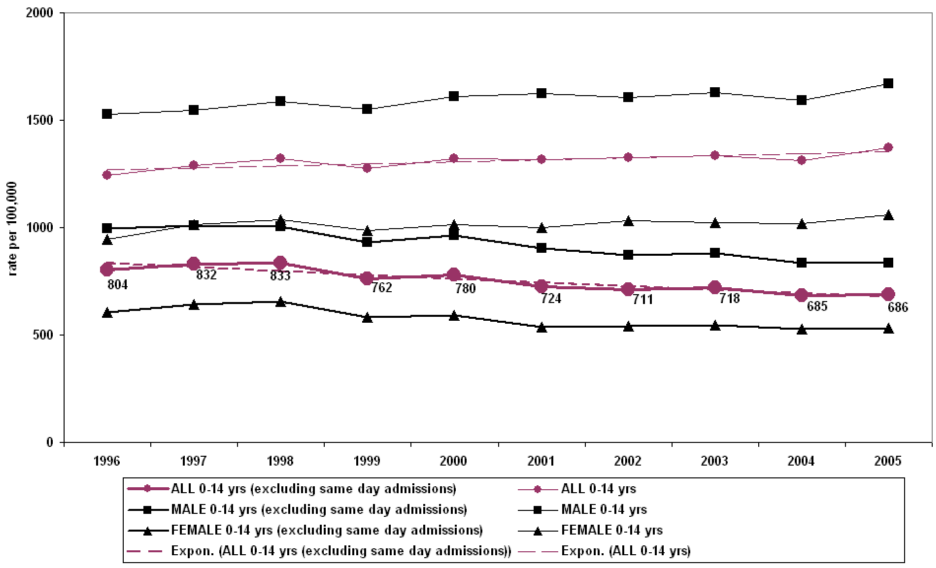
Rates are not estimated for ED presentations because numerator data are not complete. Only hospitals that contributed data to VEMD over the whole decade were included in the analysis of frequency data (24 of the current 38 hospitals contributing to the surveillance system). The frequency of ED presentations increased significantly over the decade from 28,375 in 1996 to 45,231 in 2005, representing an estimated annual change of 5.7% (95% confidence interval 3.4% to 7.7%) and an overall increase of 74% (40% to 110%). (Figure C). The shortage of General Practitioners in outer suburbs and rural areas may be a major contributor to the large increase in ED presentations for injury over the 10-year period but there is no comprehensive GP data system that can be used to further investigate this issue.

Yearly trend in child death rates overall and by gender, Victoria 1996-2005 **Figure A**



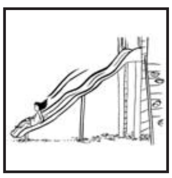
Source: ABS 1996-2005

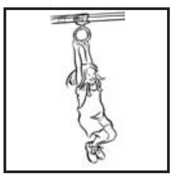
Yearly trend in child hospital admission rates by gender, Victoria 1996-2005 **Figure B**



Source: *VAED 1996-2005*







Distribution of unintentional child injury deaths and hospital admissions by age and gender

Figures D and E respectively show the average annual death and hospital admission rates by age and gender for children aged 0-14 years for the three-year period 2003-5. Figure F shows the frequency of ED presentations by age and gender for children aged 0-14 years.

Over the 3-year period, unintentional injury death rates were highest overall and for males and females in children aged 12-23 months (1 year olds), under 12 months and 36-47 months (3 year-olds). The overall hospital admiss–ions rate peaked in one and two year-olds. Among males, admission rates were higher for the youngest (1-4 year olds) and oldest (11-14 year olds) children. Among females the admission rate peaked at 2 years and decreased consistently as age increased from age 6. The proportion of males among hospital admissions increased markedly after 11 years of age.

Selecting priorities for prevention

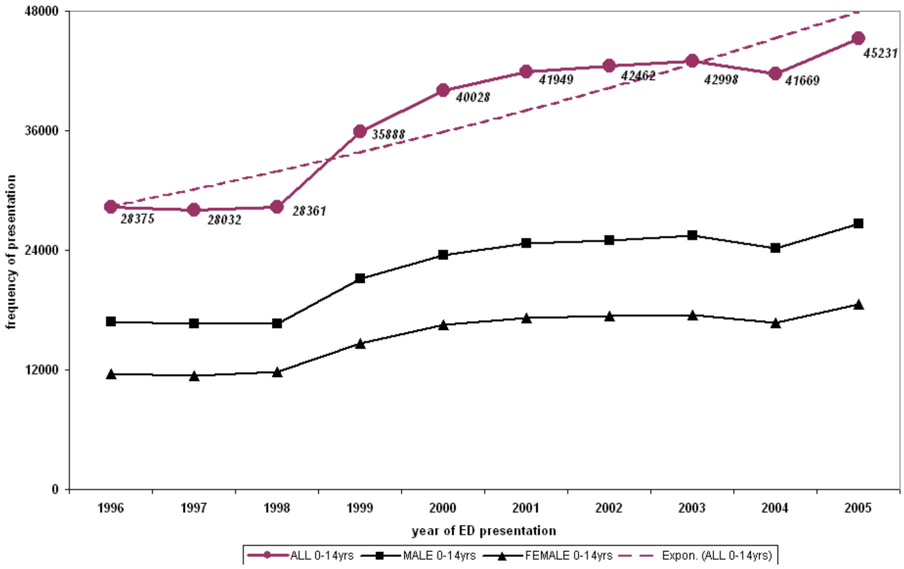
Five criteria were used to select priorities for prevention:

1. Size and severity of problem: comparing frequencies, rates and trends
2. Preventability: availability of proven and promising countermeasures
3. Availability of measurable impacts and outcomes
4. Potential for co-ordinated response including 'fit' with relevant national and state strategies/action plans
5. Opportunities for shared funding of preventive initiatives

More intensive analysis of surveillance data and information relevant to preventability identified four issues that merited priority status:

1. **Preventing home injury** (9 deaths, 2,661 hospital admissions and at least 27,353 ED presentations per annum). Specific issues covered include: fall injuries related to surfaces, structures, furniture and

Yearly trend in the frequency of child hospital ED presentations (non-admissions) overall and by gender, Victoria 1996-2005 — Figure C

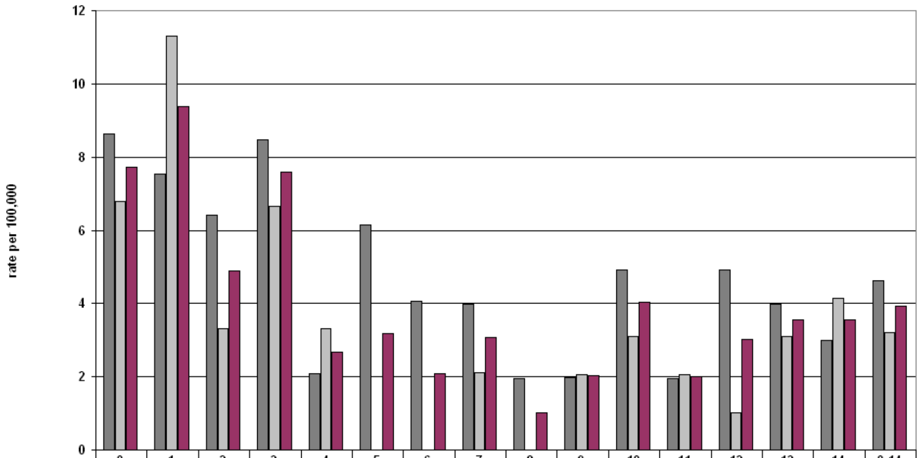


Source: VEMD 1996-2005

Note: (1) Only data from the 24 hospitals that have contributed data to VEMD over the entire 10-year period are used to plot trends.

Note: (2) Data for 2004 exclude 814 cases where the gender of the injured person was unspecified (except the 'all 0-14 yrs' graph line).

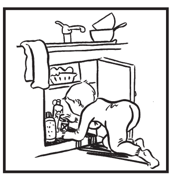
Average annual death rates by age and gender, Victoria 2002-2004 — Figure D



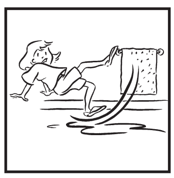
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	0-14
MALE	8.6	7.5	6.4	8.5	2.1	6.2	4.1	4.0	2.0	2.0	4.9	2.0	4.9	4.0	3.0	4.6
FEMALE	6.8	11.3	3.3	6.7	3.3	0.0	0.0	2.1	0.0	2.1	3.1	2.1	1.0	3.1	4.1	3.2
ALL	7.7	9.4	4.9	7.6	2.7	3.2	2.1	3.1	1.0	2.0	4.0	2.0	3.0	3.6	3.6	3.9

year of age

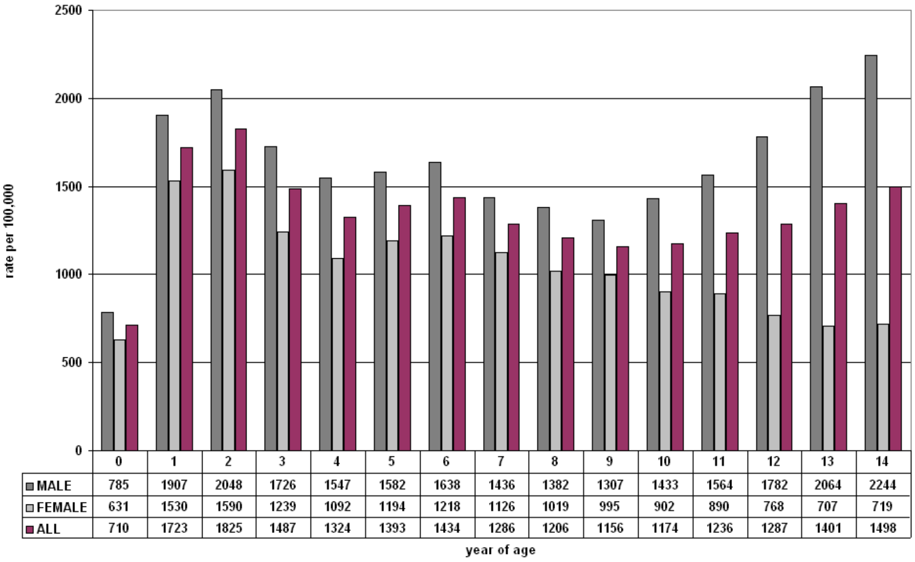
Source: ABS 2003-2005



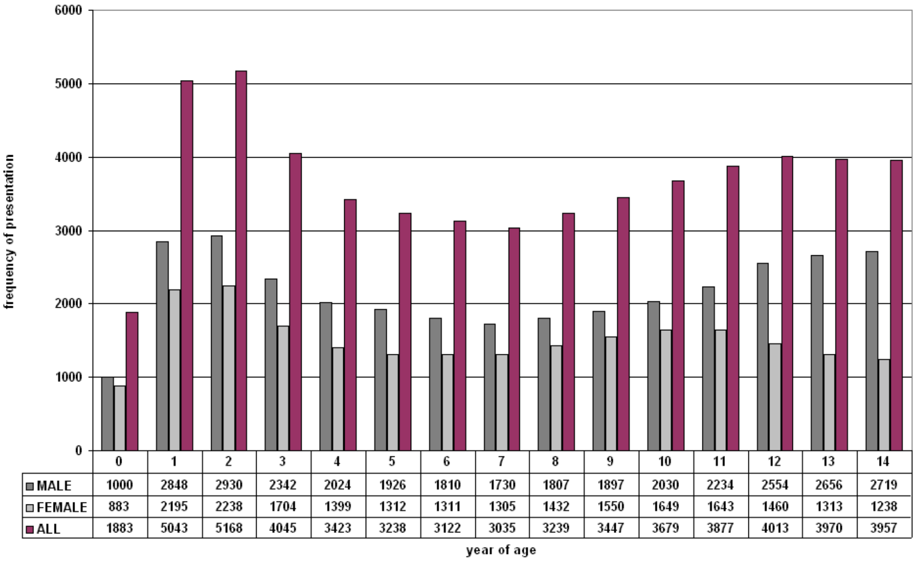
Average annual hospital admission rates by age and gender for children aged 0-14 years, Victoria 2003-2005 — Figure E



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
MALE	785	1907	2048	1726	1547	1582	1638	1436	1382	1307	1433	1564	1782	2064	2244
FEMALE	631	1530	1590	1239	1092	1194	1218	1126	1019	995	902	890	768	707	719
ALL	710	1723	1825	1487	1324	1393	1434	1286	1206	1156	1174	1236	1287	1401	1498

Source: VAED 2003-2005

Average annual frequency of ED presentation by age and gender for children aged 0-14 years, Victoria 2003-2005 — Figure F



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
MALE	1000	2848	2930	2342	2024	1926	1810	1730	1807	1897	2030	2234	2554	2656	2719
FEMALE	883	2195	2238	1704	1399	1312	1311	1305	1432	1550	1649	1643	1460	1313	1238
ALL	1883	5043	5168	4045	3423	3238	3122	3035	3239	3447	3679	3877	4013	3970	3957

Source: VEMD 2003-2005
Note: 2004 data exclude 814 cases where the gender of the injured person was unspecified.

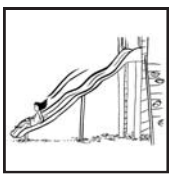
playground equipment, poisoning by drugs, medications and household/farm chemicals, fire/burn/scald injuries, dog bite and hit/struck/crush (finger entrapment injuries).

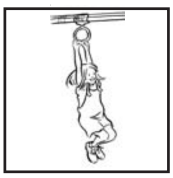
2. **Preventing bicycling injury**: (<1 death, 753 hospital admissions and at least 2,407 ED presentations per annum)
3. **Preventing on- and off-road motor–cycling injury** (<1 death, 302 hospital admissions and at least 601 ED presentations per annum)
4. **Preventing playground equipment fall injury** (1,508 hospital admissions and at least 2,213 ED presentations per annum)

Action to reduce the number of children dying or being seriously injured when passengers in motor vehicles and as pedestrians is already a priority of Victorian road safety sector so was not included in this report. The other issue that merits attention is sports injury, a major cause of injury in adolescents.

In the next sections of this report surveillance data on each of the four identified priority issues are analysed in depth and information provided on the risk factors for injury, the evidence base for the effectiveness of potential prevention strategies and measures, the range of partners that need to be involved in developing and implementing strategies and recommended preventive actions.





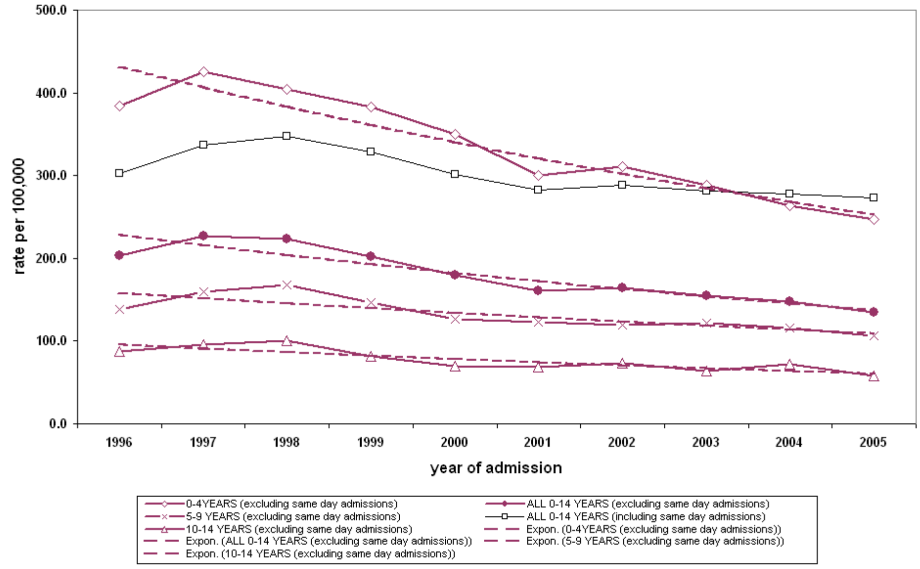


1. Preventing home injury

Annual average: 9 deaths, 2,661 hospital admissions, 27,353 ED presentations (non-admissions)

Each year in Victoria around 30% of fatal injuries and 45% of all hospital-treated child unintentional injuries occur in the home. Younger children (aged 0-4 years) are most at risk. Over the 3-year study period (2003-5) there were 28 deaths, 7,982 hospital admissions and 82,060 ED presentations for child unintentional home injury. Only 51% of cases admitted to hospital are coded for location so the frequency of hospitalisations is most likely an underestimation.

Yearly trend in child home injury hospital admission rate by age group, Victoria 1996-2005 — **Figure 1.1**



Source: VAED 1996-2005

1.1 Trend in child home injury deaths and admissions (1996-2005)

1.1.1 Yearly trend in frequency of child home unintentional injury deaths

Over the decade 1996-2005 there were 91 child unintentional injury deaths in the home, an average of 9 deaths per year. The trendline (not shown) was volatile with a high proportion of deaths occurring in 2000 (26%, n=24).

1.1.2 Yearly trend in child home injury admissions

Figure 1.1 shows the trend in hospital admissions for child home injury by age group over the decade 1996 to 2005. The figure shows rates for all admissions and for admissions excluding same day admissions (heavy lines). The exclusion of same day admissions minimises the influence of hospital policy on the trend line.

Examining the trend in admission rate over the decade (excluding same day admissions):

- The all ages child home injury hospital admission rate decreased significantly from 203/100,000 in 1996 to 134/100,000 in 2005, representing an estimated annual change of -5.5% (95% confidence interval -7.4% to -3.9%) and an overall reduction of 43% (53% to 33%).
- The 0-4 years home injury hospital admission rate decreased significantly from 384/100,000 in 1996 to 247/100,000 in 2005, an estimated annual change of -5.7% (-7.5% to -4.2%) and an overall reduction of 44% (54% to 35%).
- The 5-9 years home injury hospital admission rate decreased significantly from 138/100,000 in 1996 to 107/100,000 in 2005, an estimated annual change of -4.0% (-6.3% to -2.0%) and an overall reduction of 34% (48% to 18%).
- The 10-14 years home injury hospital admission rate decreased significantly from 88/100,000 in 1996 to 58/100,000 in 2005, an estimated annual change of -5.0% (-7.8% to -2.6%) and an overall reduction of 40% (55% to 23%). (Figure 1.1)

1.2 Frequency and pattern of home injuries

1.2.1 Deaths

There were 26 deaths over the 3-year study period. Males were slightly over-represented in fatalities (57%) and children aged 0-4 years most at risk, accounting for 86% of deaths. The major causes of death were drowning (n=10, 36%) and choking/suffocation/strangulation (n=8, 29%). Other causes of death were fire-related burns, dog attack, poisoning, firearm-related and hit/struck/crush.

1.2.2 Hospital-treated injuries

There were 7,982 hospital admissions and 82,060 ED presentations for unintentional home injury over the study period. The frequency and pattern of child home injury is summarised in Table 1.

Gender

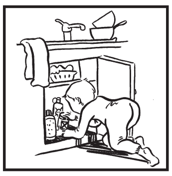
- Males were also over-represented, accounting for 58% of admissions and 57% of ED presentations.

Age

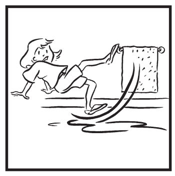
- Very young children (0-4 year-olds) were at higher risk of more serious injury than other age groups accounting for 61% of admissions.

Causes of injury

- The leading causes of injury were: falls (42% of admissions and 41% of ED presentations); hit/struck/crush (14%, 21%); poisoning (14%, 3%); cutting/piercing (8%, 10%); fire/burns/scalds (7%, 3%) and natural/environmental/animals, mostly bites and stings (4%, 4%).



Injury type

- The major types of injury were fractures, open wounds and poisoning for hospital admissions and open wounds, dislocations /sprains/strains, fractures and superficial injuries for ED presentations.

Body site injured

- The upper extremity and head/face/neck were the most common sites of injury, accounting for 63% of admissions and 64% of ED presentations.

Injury severity (Length of stay)

- Eighty-seven per cent of admitted cases were discharged from hospital in less than two days, 12% stayed in hospital from 2-7 days and 1% for 8 days or more.

1.3 Major preventable injury problems

Further analysis of cause of injury data identified a number of specific problems that are amenable to prevention:

- **Fall injury related to surfaces, structures, furniture and playground equipment** (same level slips, falls from stairs/steps, balconies and windows, falls from bed/chairs and other furniture and falls involving playground equipment)
- **Poisoning** by drugs, medications and household/farm chemicals
- **Fire/burn/scald injury**, mainly hot drink and hot water scalds
- **Dog bite injury**
- **Hand and finger entrapment injuries in doors**
- **Injury from fixed architectural glass and glass furniture** (in doors, windows and furniture)
- **Drowning, suffocation/strangulation and driveway runover deaths**

1.3.1 Fall injury related to surfaces, structures, furniture and playground equipment

Annual average: 639 hospital admissions and 3581 ED presentations.

Over the 3-year period 2003-2005 at least 12,661 child hospital-treated fall injury cases related to surfaces (slips only), structures, furniture and playground equipment in the home (n=1,917 admissions and 10,744 ED presentations).

Overview of unintentional home injury in children aged 0-14 years, Victoria 2003-5 **Table 1**

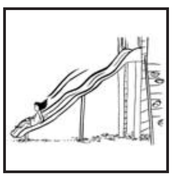
	Hospital admissions (n=7,982)		Hospital ED presentations (n=82,060)		All hospital-treated injuries (n=90,042)	
	N	%	n	%	n	%
Year						
2003	2,697	*34*	25,129	*31*	27,826	*31*
2004	2,665	*33*	27,504	*34*	30,169	*34*
2005	2,620	*33*	29,427	*36*	32,047	*36*
Gender						
Male	4,658	*58*	46,806	*57*	51,464	*57*
Female	3,324	*42*	34,771	*42*	38,095	*42*
missing	0	*0*	483	*1*	483	*1*
Age group						
0-4	4,908	*61*	42,640	*52*	47,548	*53*
5-9	1,942	*24*	22,701	*28*	24,643	*27*
10-14	1,132	*14*	16,719	*20*	17,851	*20*
Cause						
Falls	3,376	*42*	33,612	*41*	36,988	*41*
Hit/struck/crush	1,093	*14*	17,075	*21*	18,168	*20*
Cutting & piercing	621	*8*	8,397	*10*	9,018	*10*
Natural/environmental/animals	304	*4*	3,046	*4*	3,350	*4*
Fire/burns/scalds	539	*7*	2,860	*3*	3,399	*4*
Poisoning	1,095	*14*	2,306	*3*	3,401	*4*
Transport	231	*3*	1,749	*2*	1,980	*2*
Choking & suffocation	107	*1*	277	*0*	384	*0*
Machinery	19	*0*	72	*0*	91	*0*
Near drowning	55	*1*	49	*0*	104	*0*
Other unintentional	542	*7*	12,617	*15*	13,159	*15*
Injury type (1)						
Fracture	2,014	*25*	9,871	*12*	11,885	*13*
Open wound	1,986	*25*	23,622	*29*	25,608	*28*
Poisoning	1,075	*13*	3,198	*4*	4,273	*5*
Intracranial injury	308	*4*	1,909	*2*	2,217	*2*
Superficial injury	278	*3*	9,915	*12*	10,193	*11*
Burns	571	*7*	2,939	*4*	3,510	*4*
Foreign body	283	*4*	5,571	*7*	5,854	*7*
Traumatic amputation	175	*2*	82	*0*	257	*0*
Injury to muscle & tendon	111	*1*	1,491	*2*	1,602	*2*
Dislocation, sprain & strain	134	*2*	11,203	*14*	11,337	*13*
Crushing injury	31	*0*	1,050	*1*	1,081	*1*
Injury to nerves and spinal cord	64	*1*	23	*0*	87	*0*
Other & unspecified	952	*12*	11,186	*14*	12,138	*13*
Body region (1)						
Head/face/neck	2,580	*32*	26,332	*32*	28,912	*32*
Trunk	564	*7*	1874	*2*	2,438	*3*
Upper extremity	2,443	*31*	26,290	*32*	28,733	*32*
Lower extremity	955	*12*	13,003	*16*	13,958	*16*
Multiple regions	6	*0*	763	*1*	769	*1*
Other & unspecified	1,434	*18*	13,798	*17*	15,232	*17*
Length of stay						
<2 days	6,921	*87*	n/a		n/a	
2-7 days	961	*12*	n/a		n/a	
8-30 days	90	*1*	n/a		n/a	
>30 days	10	*0*	n/a		n/a	

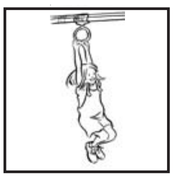
Note: (1) Data on body region and injury type are based on first occurring injury diagnosis code.

- Children aged 0-4 years comprised more than half of hospital admissions (57%) and almost two-thirds of ED presentations (65%). Children aged 5-9 years accounted for a further one-third of admissions and one-quarter of ED presentations.
- Males comprised 54% of cases (55% of admissions; 54% of ED presentations).
- Injuries most commonly occurred to the head/face/neck (43% of admissions; 48% of ED presentations) and the upper limb (43% of admissions; 28% of ED presentations).
- The major types of injuries were fractures (52% of admissions and 20% of presentations), open wounds (20% and 27%), intracranial injuries (8% and 6%) and superficial injuries (4% and 16%).
- Eighty-six percent of admitted children stayed in hospital for less than 2 days, 14% for between 2 and 7 days and 1% for between 8 and 30 days.

The major causes of these fall injury cases were falls from beds, chairs, playground equipment, and other furniture:







- **Falls from beds (*Annual average: 168 hospital admissions and 758 ED presentations*).**

  Falls from beds was the leading cause of the selected home fall injury cases (accounting for 26% of admissions and 21% of ED presentations). Falls from beds most commonly involved children aged 0-4 years (59% of admissions and 69% of ED presentations) and males (53% and 55%). Injuries to the head and face were most common (39% and 45%). The most frequently occurring specified injuries were fractures (55% of admissions and 20% of ED presentations) and open wounds (18% and 24%). Eighty-six percent of admitted children stayed in hospital for less than 2 days, 13% for between 2 and 7 days and 1% for between 8 and 30 days.
- **Falls from chairs (*Annual average: 104 hospital admissions and 728 ED presentations*).**

  Falls from chairs (including high-chairs) accounted for 16% of injury admissions in the selected group of home falls injury cases and 20% of ED presentations. Children aged 0-4 years accounted for more than two-thirds of hospital admiss–ions (67%) and 80% of ED presentations (78%). Males were over-represented in these falls cases (55% and 54%). Injuries to the head and face were most common (39% and 49%). The most frequently occurring injuries from chair falls were fractures (55% of admissions and 19% of ED presentations) and open wounds (18% and 25%). ED presentations data indicate that falls from high chairs caused 8% of chair injury cases. Eighty-nine percent of admitted children stayed in hospital for less than 2 days and 11% for between 2 and 7 days.
- **Falls from playground equipment (*Annual average: 117 hospital admiss–ions and 682 ED presentations*).**

  Falls from playground equipment accounted for 18% of admissions in the selected group of home fall injury cases and 19% of ED presentations. Falls from playground equipment typically involved children aged 5-9 years (52% of admissions and 50% of ED presentations). Males were slightly over-represented in admitted cases (55%) but not ED presentations (50%). Injuries to the upper extremity were most common (65% and 49%). Injuries were mostly fractures (75% of admissions and 36% of ED presentations). Eighty-four percent of admitted children stayed in hospital for less than 2 days, 16% for between 2 and 7 days and 1% for between 8 and 30 days.
- **Falls from other furniture (*Annual average: 86 hospital admissions and 680 ED presentations*).**

  Falls from other furniture accounted for 13% of admissions in the selected group of home fall injury cases and 19% of ED presentations. Analysis of ED presentations case narrative data indicates that tables/benches (61% of ED presentations), change tables (11%), cabinet/bookcases (10%), prams (9%) and cots (8%) were involved in a large proportion of these cases. Children aged 0-4 years accounted for more than 81% of hospital admissions and 85% of ED presentations. Males were over-represented in admitted cases (56%), but not ED presentations (49%). Injuries to the head and face were most common (56% and 71%). The most frequent types of injuries were fractures (44% of admissions and 9% of ED presentations), open wounds (25% and 38%), intracranial injuries (9% and 8%) and superficial injuries (7% and 23%). Eighty-seven percent of admitted children stayed in hospital for less than 2 days and 13% for between 2 and 7 days.

1.3.2 Poisoning by drugs, medications and household/farm chemicals

Annual average: 365 hospital admissions and 769 ED presentations.

Over the period 2003-2005 at least 3,401 children were treated in hospital for poisoning that occurred in the home (n=1,095 admissions and 2,306 ED presentations).

- Children aged 0-4 years accounted for most child poisoning hospital admissions (86%) and ED presentations (88%).
- Males were over-represented in hospital-treated poisoning cases (53% of admissions and 54% of ED presentations).
- Among admitted cases, the major poisoning agents were:
  - nonopioid analgesics, antipyretics and antirheumatics (mostly paracetamol) (14%)
  - antiepileptic, sedative-hypnotic and antiparkinsonism drugs (mostly benzodiazepines) (12%)
  - psychotropic drugs not elsewhere classified (mostly antidepressants) (10%)
  - primarily systemic and haematological agents not elsewhere classified (mostly antiallergic and antiemetic drugs) (7%)
  - drugs primarily affecting the cardio–vascular system (mostly anti–hypertensives) (7%)
  - topical drugs primarily affecting skin and mucous membrane and by ophthalmological, otorhinolaryngo–logical and dental drugs (mostly dental drugs) (5%)
  - drugs primarily affecting the autonomic nervous system (mostly parasympatholytics and spasm–olytics) (5%).
- Analysis of ED presentations case narratives identified 51% of cases where at least one specific agent was mentioned (n=1,171). The most commonly recorded drugs and medications were:
  - analgesics (mostly paracetamol)
  - sedatives/hypnotics (mostly temazepam)
  - cold and flu medications
  - contraceptive agents
  - antibiotics

  The most commonly recorded other agents included:

  - eucalyptus oil
  - pesticides (mainly rodenticides)
  - household cleaning agents (mainly bleach)
  - volatile solvents (mainly methylated spirits and turpentine)
  - soaps and detergents
  - head lice treatments
  - cosmetic agents (mainly nail polish)
- Ninety-five percent of children admitted for poisoning had a length of stay less than 2 days and 5% stayed in hospital for between 2 and 7 days.

1.3.3 Fire/burn/scald injuries, mainly hot drink and hot water scalds

Annual average: 180 hospital admissions and 953 ED presentations.

Over the period 2003-2005 at least 3,399 child hospital-treated fire/burns/scalds cases occurred in the home (n=539 admissions and 2,860 ED presentations).

- Children aged 0-4 years accounted for more than three-quarters of hospital admissions (78%) and two-thirds of ED presentations (68%). The remaining cases were spread fairly evenly between 5-9 year olds (11% of admissions and 17% of ED presentations) and 10-14 year olds (12% of admissions and 15% of ED presentations).
- Males accounted for 58% of fire/burns/scalds hospital-treated injury cases (60% of admissions; 57% of ED presentations).
- Injuries most commonly occur to the upper limb (34% of admissions and 46% of ED presentations), trunk (26% and 13%) and head/face/neck (25% and 10%).
- Contact with hot drinks, foods, fats and cooking oils was the most common cause of admissions (39%), followed by contact with other hot fluids excluding hot tap water (22%), contact with hot household appliances (7%) and contact with hot heating appliances, radiators and pipes (7%).
- Analysis of ED presentations narrative data indicated the following hot substances/objects were most commonly involved in fire/burn/scalds cases:
  - hot water (not tap) (17%)
  - hot drinks (10%)
  - hot heating appliances (7%)
  - stoves/ovens/grillers (5%)
  - hot foods (5%)
  - fire/flames/smoke (4%)
  - irons (3%)
  - hot tap water (3%).
- Almost three-quarters of admitted children stayed in hospital for less than 2 days (73%), 21% for between 2 and 7 days, 6% between 8 and 30 days and 1% for more than 30 days. Children with burns and scalds were more likely to need a longer stay in hospital than other child home injury cases, except dog bite cases.

1.3.4 Hand and finger entrapment injuries in doors

Annual average: 95 hospital admissions and 292 ED presentations.

Over the period 2003-2005 at least 1160 children were treated in hospital for hand and finger entrapment injuries that occurred in doors in the home (n=285 admissions and 875 ED presentations). This excludes at least 268 car door hand/finger entrapment injury cases that occurred in the home driveway/garage.

- Children aged 0-4 years accounted for more than three-quarters of hospital admissions (76%) and 68% of ED presentations.
- Males were slightly over-represented in hospital-treated injuries (53% of admissions and 51% of ED presentations).
- The most common injuries among admissions were open wounds (42%) and traumatic amputations (35%). Non-admitted cases were most commonly crushing injuries (27%), open wounds (25%) and superficial injuries (20%).
- Most children admitted to hospital with door entrapment injuries had a length of stay less than 2 days (98%).

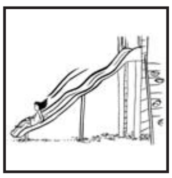
1.3.5 Dog bite injury

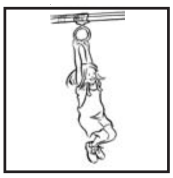
Annual average: 46 hospital admissions and 273 ED presentations.

Over the period 2003-2005 there were at least 958 hospital-treated dog-bite cases that occurred in the home (n=138 admissions and 820 ED presentations). These cases include bites and scratches but exclude falls and trips involving dogs.

- Younger children (aged 0-4 years) were over-represented in dog-bite cases (45% hospital-treated cases, n=71 admissions; n=364 ED presentations), followed by the 5-9 years age group (32%, n=48 admissions; n=262 ED presentations) and the 10-14 years age group (22%, n=19 admissions and n=194 ED presentations).
- Males were more likely to be the victims of dog-bite injury than females (53% of admissions and 57% of ED presentations).
- Injuries most commonly occur to the face (61% of admissions and 49% of ED presentations) and the hand (13% of ED presentations).
- Three-quarters of admitted children had a length of stay less than 2 days, and 25% stayed in hospital for between 2 and 7 days. The severity of dog bite injury cases is indicated by the proportion of cases that require several days in hospital for treatment.







1.3.6 Injuries from fixed architectural glass and glass furniture

Annual average: 46 hospital admissions and 270 ED presentations.

These data summarise the Victorian findings from a more comprehensive MUARC study of fixed architectural glass injuries in the home that will be completed in 2008.

Over the period 2003-2005 at least 948 children were treated in hospital for injuries related to fixed architectural glass and glass furniture that occurred in the home (n=137 admissions and 811 ED presentations). This excludes at least 83 incidents where the child was injured by falling and hitting a window sill (i.e., the glass was not involved in the injury). Note that the VEMD was used to source both admissions and presentations, as there are no codes to select out architectural glass injury cases in the VAED. The number of admissions is therefore underestimated.

- Children aged 0-4 years accounted for 45% of both hospital admissions and ED presentations. The remaining cases were fairly evenly spread between 5-9 year olds (32% of admissions and 28% of ED presentations) and 10-14 years olds (23% of admissions and 27% of ED presentations).
- Males were over-represented in hospital-treated injury cases (61% of admissions; 64% of ED presentations).
- The most common injuries among admissions were open wounds (76%), followed by fractures (4%), superficial injuries (3%), crushing injuries (3%) and intracranial injury (3%). Non-admitted cases were most commonly open wounds (74%) and superficial injuries (13%).
- Among admissions and ED presentations, the face was the most frequently injured body site accounting for 20% of admissions and 18% of ED presentations. Injuries also commonly occurred to the hand (17% and 16%), head (7% and 17%) and forearm (16% and 10%).
- Items frequently involved in these incidents were windows (62% of admissions and 55% of presentations), doors (24% and 19%), tables (9% and 13%) and mirrors (2% and 6%).
- No length of hospital stay data are recorded on the VEMD.

1.3.7 Drowning and choking/ suffocation/strangulation and driveway runovers (fatalities only)

Annual average: 7 deaths (range 4-9)

Drowning (n=10) and choking/suffocation/ strangulation (n=8) accounted for almost two-thirds of child injury deaths occurring in the home in the period 2003-2005.

- Children aged 0-4 years accounted for 89% of these deaths (n=16), 75% of these were children aged less than 24 months old (n=12).
- Females were over-represented in drowning deaths (60%, n=6) and males over-represented in suffocation/strangula–tion deaths (63%, n=5).
- The most common specific causes of these deaths were drowning in bathtubs (n=5) or swimming pools (n=2) and choking or suffocation while in bed (n=2).

At least 2 children died as a result of driveway runovers in the home in the 3 year period 2003-2005.

1.4 Risk factors

A summary of risk factors for child home injury with supporting evidence is provided in a recent Cochrane Review related to child home injury prevention conducted by Kendrick and colleagues (Kendrick et al., 2007). Evidence on risk factors has mainly been drawn from overseas studies so care should be taken when generalising findings to the Australian (Victorian) child population.

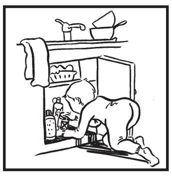
- Younger age (but varies with mechanism of injury)
- Male gender
- Socio-economic disadvantage
- Living in a deprived neighbourhood (independent of characteristics of people living within neighbourhoods)
- Maternal age (younger)
- Living in a single parent and step parent family
- Living in larger families especially with more older than younger siblings
- Maternal educational level (low)
- Ethnic group (but research findings are conflicting)

The risk factors for unintentional injury due to falls are the subject of a recently published systematic review (Khambalia et al 2006). Fourteen studies met the inclusion criteria. In general the major risk factors for the incidence or severity of incidents due to falls in children included: age of child (0-6 years), sex (males), height of the fall (>2 metres), type of surface (non-carpeted floors), mechanism (being dropped, stairway or using a walker), setting (home care versus day care) and socioeconomic status (poverty). Studies varied in quality so findings need to be confirmed.

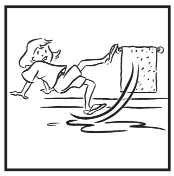
Three Australian studies have specifically investigated socio-economic inequalities for childhood injury. Carey et al (1993) conducted an incidence study of injury deaths among 0-14 year olds in NSW and found a relative risk of 2.6 (95% CI 1.05-6.59) for the lowest two SES quintiles compared with the highest quintile. Similar findings were reported by Jolly et al (1993) who studied 0-14 year old children presenting to the emergency department of several selected hospitals in Brisbane and Melbourne. The relative risk for the lowest versus the highest SES quintiles was found to be 2.97 (95% CI 2.71-3.25).

A more recent Queensland cohort study by Turner and colleagues found evidence of a relationship between prevalence of household environmental hazards and household SES (measured by income, employment and education), although the magnitude and direction of the relationship was hazard-specific (Turner et al., 2006). The study was a cross sectional survey conducted as part of a longitudinal cohort study (the Injury Prevention Study) that started recruiting children from a stratified random sample of Brisbane primary schools in 2000. Data on the presence of 32 injury hazards related to play equipment, the kitchen, living areas and building features and safety management issues were collected by interview and an environmental home audit. Hazards included such things as play equipment fall height greater than 2m, microwave situated below bench height, windows that extend to floor, balcony or veranda above ground with balustrade less than 1m high, maximum hot water temperature 55° C or greater.

Results showed that household income was related to play equipment hazards with children from higher SES groups being more likely to be exposed to risk. By contrast, lower SES indicators (low income, low education and low employment status) were all associated with larger numbers of risk factors in the home, and risk increased as SES decreased. The authors conclude that these results offer an explanation for the SES



differential in the burden of injury and support the implementation of whole-of-population injury prevention programs that aim to modify the home environment (Turner et al., 2006).

Other Australian analytic studies have found: significantly increased risk of bicycling injury among lowest income children; a graded inverse relationship between SES and child pedestrian injury i.e. as SES increases child pedestrian injury decreases (Stevenson et al., 1995); no association between socio-economic status and hospitalisation for child sports-related injury but a 10% higher risk of sports injury-related hospitalisation for rural children compared with their metropolitan counterparts (Lam, 2005); and a greater risk of burns requiring skin grafts among NESB children, related to incorrect first aid (Livingston et al., 2006).

1.5 Potential preventive measures

Home safety education and provision of safety equipment

Home safety education in tandem with the provision of safety equipment has been shown to be effective in increasing a range of safety practices. The systematic Cochrane review of the effectiveness of home safety education and provision of safety equipment by Kendrick and colleagues from Nottingham University included 80 studies, of which 23 (62%) were randomised controlled trials (RCTs) and 12 included in the meta-analysis provided independent participant level data (Kendrick et al., 2007).

Results of the meta-analysis indicate that home safety education (usually provided one-on-one and face-to-face in a clinical setting or the home) was effective in increasing the proportion of families with safe hot water temperature, functional smoke alarms, syrup of ipecac on hand (*Note*: no longer recommended) and poison control centre number accessible, fitted stair gates, socket covers on unused sockets, storing medicines and cleaning products out-of-reach and storing sharp objects out of reach. The meta-analysis demonstrated significant treatment effects for home safety education in terms of safety practices (with odds ratios ranging from 1.3 to 3.7), but not in reducing child injury rates, mainly because the trials were not large enough to measure anything but moderate-to-large injury reductions.

There was a lack of evidence that home safety education was effective in increasing the possession of non-slip bathmats/decals and fire extinguishers, preventing children being left alone in the bath or in keeping hot food and drinks or small objects out of reach or storing matches out of reach but results were affected by the relatively small number of relevant studies/study participants. Analyses of sub-group data from home safety studies that educated parents and carers to have window locks, screens or windows with limited opening indicate that education may be effective in the shorter but not the longer term.

The authors recommend that child healthcare providers should provide home safety education and access to free, low cost or discounted equipment as part of their health promotion programs. Victorian data indicate that to show an effect on injuries, home safety education and equipment provision programs should concentrate on measures that reduce falls and fall injury, hit/struck/crush and cutting/piercing injuries and poisoning as these four causes account for approximately 75% of admissions and presentations.

The review authors also emphasise that home safety education projects should be one component of a broader strategy that includes engineering and design measures that aim to increase the safety of the structures and products in the home and enforcement approaches such as the use of Standards, regulations and legislation, as these measures have also been found to be effective.

Modification of home environment for the reduction of injuries

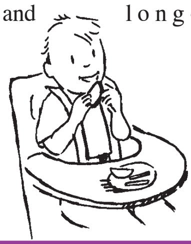
A second Cochrane review (Lyons et al., 2006) only included trials in which injury reduction, falls reduction and the prevalence of home hazards were the primary outcomes of interest (rather than increases in safety practices). Only five of the 19 trials of home modification interventions included in the review aimed to reduce home injuries among children (all were targeted at children aged under 5 years); the remainder targeted the home environment of older people. Meta-analysis of data could not be performed because trials were too dissimilar. None of the trials targeting the child population demonstrated a reduction in injuries that might have been due to the home modifications, however the studies either did not provide data on injury reduction, or the sample size was inadequate or the uptake rate of the home modifications by participants was too low to show an effect.

The review authors conclude that the published trials do not provide high-grade evidence that interventions to modify the home physical environment decrease injury. They point out, however, that this is not the same as saying that such interventions are ineffective and call for large, rigorously designed multi-factorial trials that are strongly focused on improving the uptake of home modifications among participants by involving local people in the design, planning and implementation stages.

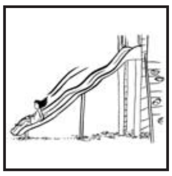
A further randomised controlled trial, ongoing at the time of the review, also failed to demonstrate that increased possession and use of safety equipment in the intervention group translated into lower injury rates (Watson et al., 2004). The trial assessed the effectiveness of health visitor safety advice and provision of free and fitted stair gates, fireguards, smoke alarms, cupboard locks, and window locks to low-income families.

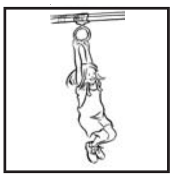
No significant difference between the intervention and control group in the proportion of families in which a child had a medically attended injury was demonstrated even though families in the intervention group were significantly more likely to have a range of safety practices at one and two-years follow-up. The study authors comment that their findings may have been affected by the unexpectedly high prevalence of safety equipment use in the control group, the sizeable proportion of families in the intervention group that did not take up the offer of free and fitted equipment and the choice of the specific items of equipment provided as they may not be related to high-frequency injuries or have a high protective effect.

Again, what we can learn from past research is that future programs should concentrate on providing/fitting home modifications to reduce falls and fall injury, hit/struck/crush and cutting/piercing injuries and poisoning, implementing strategies/measures that engender high and long-lasting compliance.









Home visiting programs aimed at improving a range of maternal and child outcomes including reductions in child injury

Studies of multi-faceted home visiting programs that aimed to improve a range of maternal and child health outcomes including injury reduction were excluded from the review by Kendrick et al. as they did not report possession and use of safety equipment and practices. However, several trials of home visiting programs (mostly targeting at-risk mothers/parents using non-professional home visitors) have shown substantial reductions in childhood injury.

Roberts et al. (1996) conducted a systematic review and meta-analysis to quantify the effectiveness of multifaceted home visiting programs in the prevention of child injury and child abuse. The review covers published trials to April 1996. Six of the eight randomised trials that examined the effect of home visiting on childhood injury reported a lower incidence of injury in the group that received home visits. The pooled odds ratio for injury for the eight trials was 0.74 (CI 0.60-0.92). Results of the nine trials that examined the effect of home visiting on child abuse (suspected, reported or out-of-home placement for child abuse) were conflicting. Meta-analysis was not performed. The review authors were concerned that the presence of the home visitor may have resulted in increased surveillance for child abuse in the visited families, and this may have been a source of bias in outcome reporting of reported child abuse in all nine studies.

A Cochrane Review of the effectiveness of providing home-based support for socially disadvantaged mothers examining a range of child outcomes including accidental (unintentional) or non-accidental (intentional) injury is in progress (Coren et al., 2002 – review protocol).

In Victoria, the Maternal and Child Health Service provides every family with at least one home visit from a maternal and child health nurse following the birth of a child and several one-to-one consultations. This service and special programs aimed at meeting the needs of vulnerable children and families such as *Best Start* (auspiced by the Department of Human Services and the Department of Education), *Safe Start* (auspiced by DHS) and the *Early Childhood Intervention* program (for children with disabilities) have some capacity to provide enhanced home safety education during home visits along with the provision of safety equipment (and assistance with installation if parents/carers do not have the skills to install it), modelled on successful overseas programs.

Structural design/engineering solutions (supported by Standards and regulations)

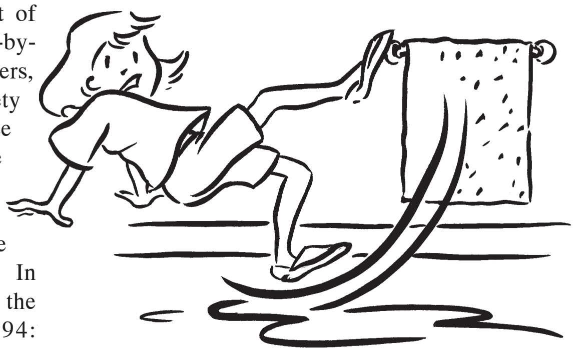
Hazard 59, published in 2005, provides a comprehensive summary of the potential for structural and design solutions to reduce falls in the home, the major cause of home injury (Gunitilaka et al., 2005). Inappropriate or poorly maintained flooring material and paving, poorly designed or constructed stairs and steps (including handrails) and unsafe windows and balconies cause a significant proportion of child fall-related deaths and injuries and are amenable to design/engineering solutions. For full benefit, solutions should be encapsulated in Standards and, if evidence of protective effect is strong, integrated into building regulations. *Hazard* 59 also canvassed a number of potential design solutions to injuries due to finger entrapment in doors, the cause of nearly 400 child injury admissions and ED presentations each year in Victoria.

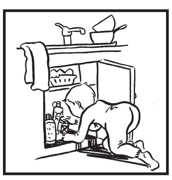
Other recent *Hazard* editions covering unintentional asphyxia in children (Hazard 60), childhood burns and scalds (Hazard 57), home pool drowning (Hazard 55) and cutting and piercing injury (Hazard 52) highlight the potential of safe design, safety barriers (fencing, half doors, screens and guards), lockable storage, use of safety glass and other safety features/products to reduce home injuries in children.

The comprehensive Kidsafe NSW booklet, *Safer Homes for Children: Design and construction guidelines*, provides a set of clear recommendations, based on a room-by-room diagnosis of hazards, on how builders, designers and parents can utilise safety designs, features and products to reduce the everyday risks to children in the home environment. Reference is made to the various Australian Standards and regulations that underpin some of the recommended actions in the booklet. In particular, readers are advised to consult the Australian Standard AS 4226-1994: Guidelines for Safe Housing. They are currently under review, the updated version is scheduled to be published in late 2007. The revised guidelines will be much broader in scope than the current guidelines.

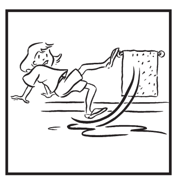
Australia has been a world leader in the use of building regulations to address serious and preventable home injuries. Victoria was one of the first jurisdictions to mandate the installation of smoke alarms in all homes (hard-wired in new/renovated homes), residual current devices (RCD or 'safety switches') in new homes, safety glass in glazed areas vulnerable to human impact (such as doors, door surrounds, low windows and shower screens) in new homes, safety barriers around new and existing home swimming pools, and to require the delivery of hot water in all bathrooms in new built homes (and fully renovated bathrooms in existing homes) to a maximum temperature of 50°C.

The Victorian government has generally implemented these regulatory changes progressively, concentrating on improving the safety performance of new houses first, so the full benefit of regulatory changes made in the 1990s will not be apparent until the stock/condition of houses existing at that time is replaced/substantially renovated. Pool fencing regulations were introduced for new pools and spas in Victoria in 1991, and extended until the regulations covered all domestic pools and spas in 2001. Drowning data for Victoria (obtained from the Coroner through LifeSaving Victoria) show a promising downward trend. Drowning of children aged 0-5 years in domestic swimming pools has decreased significantly over the 10-year period, 1990/1 to 2002/3 (Paine & Cassell, 2003). Later drowning reports published by Life Saving Victoria reveal that two young children have drowned in home swimming pools over the three-year period 2003/4 to 2005/6 (Life Saving Victoria, 2004,





2005, 2006). Most drowning of young children now occurs in bathtubs and farm dams.

In 1994, the Australian Building Code (ABC) was changed to require that all new hot water installations deliver hot water at the outlet of all sanitary fixtures used primarily for personal hygiene purposes at a temperature not exceeding 50°C in new residential buildings (and in domestic bathrooms undergoing substantial renovations) and 43.5°C in early childhood centres, schools and residential care facilities. Victoria incorporated the new section of the ABC into plumbing regulations in 1998. A statistically significant downward trend is evident in the annual admission rate for hot tap water scalds among children aged 0-4 years (and older adults) over the period 1996/7 to 2002/3 with the child hot tap water scald admission rate decreasing by an estimated 12.2% per year on average (Cassell et al., 2004). The decrease has continued to 2004/5, providing preliminary evidence that this regulatory change is producing the desired results.

Similarly encouraging findings are reported from a study of scalds in vulnerable population groups (the very young and old) in NSW (Boufous & Finch 2005). The study reported a downward trend in hospitalised scalds cases among children aged 0-4 years in NSW over the period 1998/9 to 2002/3, with hospital separation rates for hot water scalds decreasing significantly in both boys and girls. The authors conclude that the reduction could be attributable to the introduction of the hot tap water regulations.

Conflicting evidence is reported from a recently published Queensland study of scald injuries (Spallek et al., 2007). The study found that the all-ages hot tap water scald rate was significantly higher after the introduction of regulations in 1998 (170/100,000 population) than before (113/100,000) and the mean hot tap water temperature in homes increased significantly between 1990 and 2002/3. The authors concluded that the Hot Water Burns Like Fire campaign conducted in Queensland has apparently failed. They did not publish the trend in hot water scalds in young children separately even though the parents of young children were the specific targets of the campaign.

In 1991 (AS 1288 -1989) "Glass in Buildings – Selection and Installation" was adopted into the Building Code. The Standard was updated in 2000 and again in 2006. This Standard requires that safety glazing materials, toughened glass, laminated glass or organic glass is used in homes and buildings in situations where glass is likely to be subject to breakage due to wind loading or human impact (doors, door surrounds, windows etc). Annealed glass breaks with relatively low impact into jagged pieces, whereas, toughened glazing materials generally break less readily into small particles that have blunt edges. MUARC is currently undertaking a research project to evaluate the effectiveness of this regulation (ARC Linkage Grant with the Australian Building Codes Board, Victorian Building Commission and Pilkington Australia). A Standard covering the use of safety glass in furniture is under development.

One issue that needs to be addressed to ensure that the full benefit of new home safety regulations is achieved is householder compliance. Responsibility for administering home safety regulations is usually devolved to local government (or private building surveyors) with no additional funding to monitor and enforce compliance. Monitoring and enforcement efforts have been desultory. For example, only 29% of 35 Victorian councils that responded to a 2003 survey on private swimming pool safety enforcement conducted in 2003 reported that they routinely spot-checked/inspected home swimming pools in their municipality and only 34% issued enforcement notices or fines for breaches of the regulations (Paine & Cassell, 2003). The effect of inadequate monitoring of compliance is concerning. Eighteen of the 33 home pool/spa drownings among Victorian children aged 1-4 years between 1992 and 1997 occurred in incompletely fenced or unfenced pools and 14 of the children who gained access to fenced pools did so through faulty or inadequate gates (Blum and Shield, 2000).

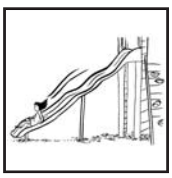
Each year in Victoria about 13,000 children present to ED with fall injury, over 1,000 of whom are admitted. Consideration should therefore be given to developing standards, codes and regulations that reduce falls or the impact forces that occur in fall events such as requiring the installation of slip resistant surfaces in internal wet areas, external pedestrian areas, bath and shower bases in new and renovated homes. The use of impact absorbing floor surfaces inside the home and rubber-based impact absorbing material outside the home in high-risk pedestrian areas and the fall zone of play equipment and cubby houses should be encouraged. The adequacy of current standards, codes and regulations that govern the design and installation of balcony and veranda balustrades, stairs and windows in upper storey/ies of double/multi-storey dwellings should also be reviewed. MUARC is currently conducting a study of the relationship between slips, trips and falls and the design and construction of buildings.

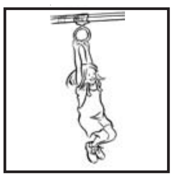
The feasibility of introducing a home safety certificate as a provision of the *Sale of Land Act* 1962 should be investigated, as this would ensure that houses comply with home safety regulations when sold.

1.6 Partnerships for prevention

Partners should include the Victorian Building Commission, Australian Building Codes Board, Standards Australia, Australian Competition and Consumer Commission, Consumer Affairs Victoria, Office of Chief Electrical Inspectors, Plumbing Industry Commission, Department of Human Services (Public Health and The Office for Children); Department of Communities (Local Government) and local council representatives, Department of Infra–structure, Municipal Association of Victoria, Victorian Local Governance Association, Master Builders Association, Housing Industries Association, Australian Institute of Building Surveyors, Institute of Engineers, Fire authorities, Real Estate Institute of Victoria, Archicentre, Royal Australian Institute of Architects, relevant Trade Unions, major property developers and building firms, home insurers, Kidsafe, Royal Children's Hospital Safety Centre, Victorian Safe Communities Network, Parents Vic, representatives of medical colleges (such as







the Australian Colleges of Emergency Medicine, Surgeons and/or Paediatrics) and injury prevention research bodies/researchers.

1.7 Recommendations

The detailed recommendations in *Hazard* editions 55, 57, 59 and 61 (http://www.monash.edu.au/muarc/VISU/hazard/hazard.html) should also be considered, as the recommendations listed here are broad-based.

- Implement and evaluate home safety education with provision of fitted safety equipment in a large trial that measures injury outcomes. The intervention should address the major causes of home injury and compliance issues.
- Extend the inclusion of home safety education in Maternal and Child Health Service home visits and other child health home visiting programs. Evaluate injury outcomes.
- Encourage the use of impact absorbing floor surfaces inside the home and rubber-based impact absorbing material outside the home in high-risk pedestrian areas (at the base of steps and on high-use paths) and the fall zone of play equipment and cubby houses.
- All playground equipment in home backyards should have a fall height of less than 1.5 metres and impact absorbing undersurfacing in the fall zone (tanbark/loosefill to a depth of 20cm or rubber-based bilaminate surfacing).
- Consider the development of building codes and regulations that require the installation of slip resistant surfaces in internal wet areas, external pedestrian areas and slip-resistant bath and shower bases in new and renovated homes.
- Review the adequacy of current standards, codes and regulations governing the design and installation of balcony and veranda balustrades, stairs and steps, and windows in the upper storeys of double- and multi-storey dwellings.
- Monitor compliance with current home safety regulations to provide data to underpin home safety promotion and education programs and enforcement initiatives at the state-wide and local levels.
- Investigate the feasibility of introducing a home safety certificate as a provision of the Sale of Land Act 1962 to ensure that houses comply with applicable home safety regulations when sold.
- Investigate potential mechanisms for enforcement of home safety regulations under the Tenancy Act and/or the Real Estate Act or in future revisions of these Acts.

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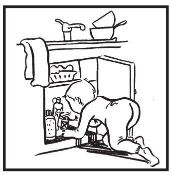




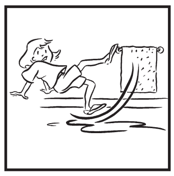

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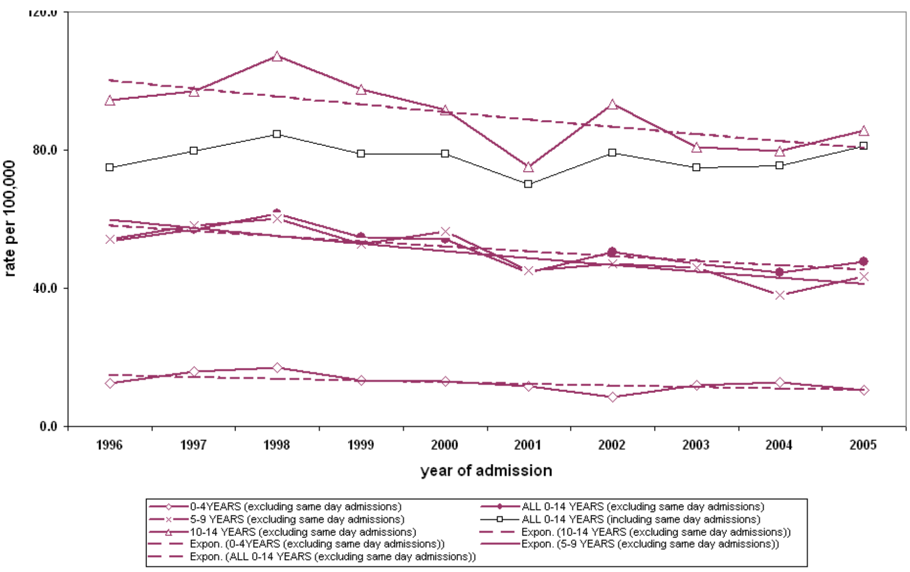
Trend in child bicycling injury hospital admission rate by age group, Victoria 1996-2005 **Figure 2.1**



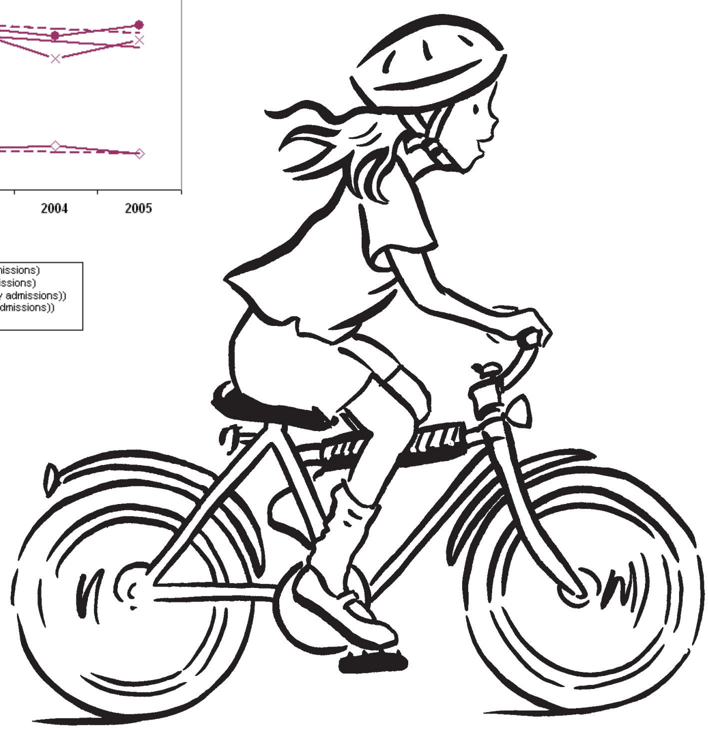
Source: VAED 1996-2005

2. Preventing injuries in bicycling

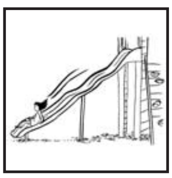
Annual average: <1 death, 753 hospital admissions, 2,407 ED presentations (non-admissions)

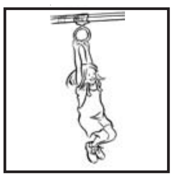
Bicycling injuries accounted for 6% of all child injury admissions and 4% of all child injury ED presentations (non-admissions) in Victoria over the three-year study period 2003-5.

Over the 3-year period there were 2 deaths, 2,272 hospital admissions and 7,222 ED presentations for bicycling-related injury among children aged 0-14 years in Victoria. Both deaths occurred on-road, whereas only 38% of hospital admissions and 36% of non-admitted cases presenting to EDs occurred on-road (Table 2). The vulnerability of children to bicycling injury is related to their small physical size, less well developed cognitive, attentional, perceptual and visual skills and lack of bicycling and road use skills and experience.









2.1 Trend in child bicycling deaths and admissions (1996-2005)

2.1.1 Trend in child bicycling deaths

Due to the low frequency of child bicycling-related fatalities the trend is volatile. There were 20 deaths recorded over the 10-year period 1996-2005. Higher numbers of deaths were recorded for 1997 and 1998, four and five respectively; in other years there were between 1 and 3 deaths, except for 2001 and 2005 when no deaths occurred.

2.1.2 Trend in child bicycling hospital admissions

Figure 2.1 shows the trend in hospital admissions for child bicycling injury by age group over the decade 1996 to 2005. The figure shows rates for all admissions and for admissions excluding same day admissions (heavy lines). The exclusion of same day admissions minimises the influence of hospital policy on the trend line.

Examining the trend in admission rate over the decade (excluding same day admissions):

- The all ages child bicycling injury hospital admission rate decreased significantly from 54/100,000 in 1996 to 48/100,000 in 2005, an estimated annual change of -2.7% (95% confidence interval -4.6% to -0.9%) and an overall reduction of 24% (37% to 8.6%).
- The 0-4 years bicycling injury hospital admission rate decreased from 12.4/100,000 in 1996 to 10.5/100,000 in 2005, an estimated annual change of -3.8% (-8.5% to -0.8%) and an overall reduction of 32% (59% to 8%). This does not represent a statistically significant decrease.
- The 5-9 years bicycling injury hospital admission rate decreased significantly from 54/100,000 in 1996 to 43/100,000 in 2005, an estimated annual change of -4% (-6.1% to -2.1%) and an overall reduction of 34% (47% to 19%).
- The 10-14 years bicycling injury hospital admission rate decreased significantly from 94/100,000 in 1996 to 86/100,000 in 2005, an estimated annual change of -2.3% (-4.5% to -0.2%) and an overall reduction of 21% (37% to 2%). (Figure 2.1)

2.1.2.1 Comparison of trend in on- and off-road bicycling

Figure 2.2 shows the trend in admissions for child bicycling injuries by location for the period 1999-2005. Prior to 1999 hospital admissions data were coded to ICD9 and there is a disjunction between the coding of location in these years compared to later years when coding was upgraded to ICD10. The figure shows rates for all admissions and for admissions excluding same day admissions (heavy lines).

Examining the trend in admission rate over the 7-year period (excluding same day admissions):

- The child all locations bicycling injury admission rate decreased significantly from 55.9/100,000 in 1999 to 47.7/100,000 in 2005, an estimated annual change of -2.6% (95% confidence interval -5.9% to 0.5%) and an overall reduction of 17% (-35% to 3.6%).
- The child off-road injury bicycling admission rate decreased from 28.2/100,000 in 1999 to 27.2/100,000 in 2005, an estimated annual change of -1.9% (-4.9% to 1.1%) and an overall reduction of 12% (-30% to 8%). This does not represent a statistically significant decrease.
- The child on-road injury bicycling admission rate decreased from 25.1/100,000 in 1999 to 19.6/100,000 in 2005, an estimated annual change of -3.6% (-13% to 5.1%) and an overall reduction of 23% (-60% to 42%). This does not represent a statistically significant decrease. (Figure 2.2)

2.2 Frequency and pattern of bicycling injuries

2.2.1 Deaths

There were 2 deaths over the 3-year study period. Both deaths occurred on-road and were caused by collisions with heavy transport vehicles or buses.

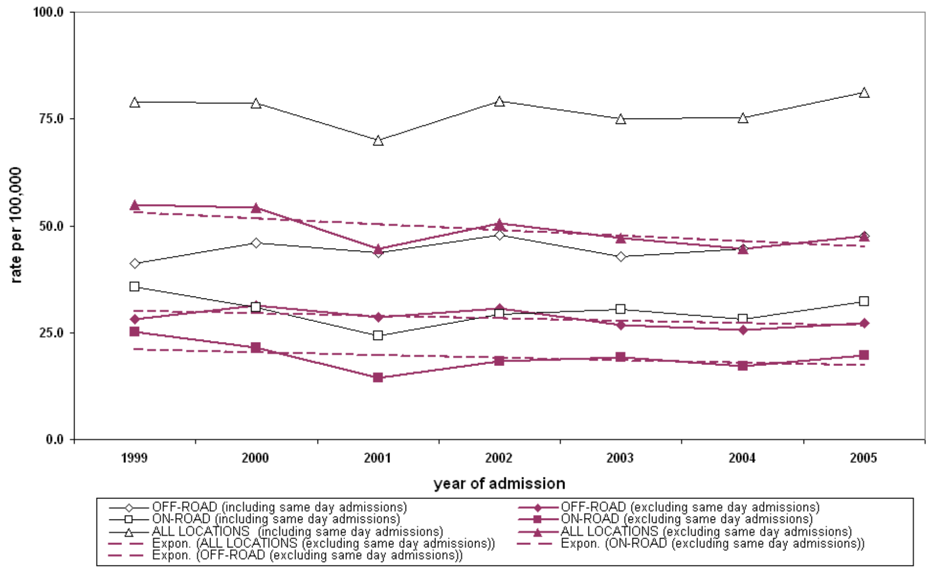
2.2.2 Hospital-treated injuries

The frequency and pattern of hospital-treated bicycling injury over the 3-year study period is summarised in Table 2.

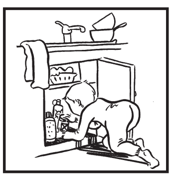
Gender

- Based on frequency data, males appear to be at higher risk of injury than females, accounting for 79% of admissions and 74% of ED presentations. Research indicates, however, that this over-representation may be related to the higher exposure of males to bicycling.

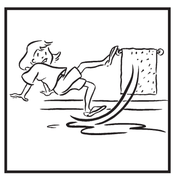
Trend in child bicycling hospital admissions by location, Victoria 1999-2005 **Figure 2.2**



Source: *VAED 1999-2005*



Age

- 60% of hospital admissions and half of ED presentations for bicycling injury were aged 10-14 years. Children aged less than 5 years comprised 10% of hospital admissions and 15% of ED presentations.

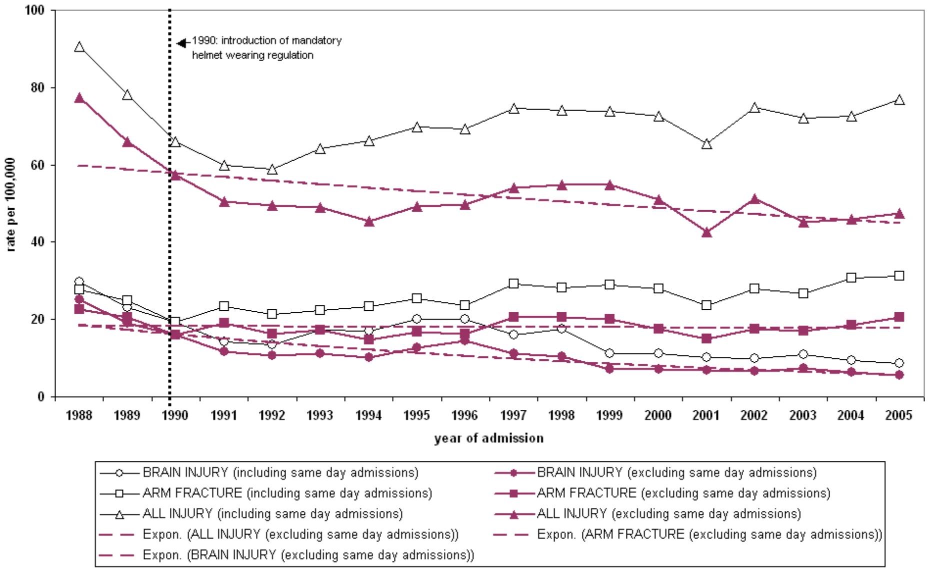
Causes of injury

- Only 6% of hospital admissions and 3% of ED presentations were caused by crashes/collisions with motor vehicles.
- Overall, two-thirds of hospital-treated injury cases were caused by non-collision incidents (predominantly falls).
- Analysis of a 33% sample of case narratives (n=2,356) extracted from ED presentations data showed that the major proportion of children were injured when they fell off the bike and hit the ground (asphalt/bitumen, concrete, dirt, gravel or grass). Few narratives gave information on the factor/s precipitating the fall. Factors mentioned included: loss of balance/control, doing jumps/tricks, going too fast, bike slipped on gravel, hit gutter/pothole, braked too hard.
- Analysis of case narrative data also showed that at least 8% of children were injured when they were impacted or caught by a part of the bicycle, mostly the handlebars or brake lever on the handlebars, wheel spokes, chain and pedal. Injuries also occurred from impacts with the straddle bar and other parts of the frame, saddle and stunt peg.

Injury type

- Among admissions, the most common injury type was fracture (51%), followed by open wounds (22%) and intracranial injury (8%). Among ED presentations, the most frequently occurring injury type was open wound (26%) followed by fracture (23%), sprains/strains (17%) and superficial injury (17%).
- The most common hospital-treated specific injuries were fractured forearm/elbow (n=1,201, 13% of all hospital-treated injuries) and open wounds of the head and face (n=1,161, 12%).

Trend in child bicycling hospital admissions by injury type, Victoria 1988-2005 **Figure 2.3**



Source: VAED 1988-2005

Notes: (1) Cases are from public hospitals only as private hospitals did not contribute to the VAED at the beginning of this period.
(2) Brain injury was defined as per CDC and WHO specifications: ICD 9 codes 800.0-801.9, 803.0-804.9, 850.0-854.1.
ICD10 codes S02.0-S02.1, S02.7-S02.9, S06.0-S06.9. (Harrison & Steenkamp, 2002).
(3) Cases were selected if an injury diagnosis code indicating arm fracture or brain injury was present in any injury diagnosis field.

Body site injured

- Among admissions and ED presentations, the upper extremity was the most frequently injured body site accounting for 44% and 42% of admissions and ED presentations respectively, followed by head/face/neck (31% and 22%) and lower extremity (16% and 21%).

Injury severity (Length of stay)

- Eighty percent of hospital-treated bicycling cases had a length of stay of less than 2 days, 19% stayed in hospital from 2-7 days and 1% for 8 days or more. On-road cases were slightly more likely to require a length of stay of 8 days or more than off-road cases.

2.3 Trend in brain injury

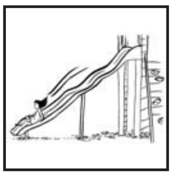
Figure 2.3 shows the trend in all-injury, brain injury and arm fracture for child pedal cyclists aged 0-14 years over the 18-year period January 1988 to December 2005. The figure shows rates for all admissions and for admissions excluding same day admissions (heavy lines).

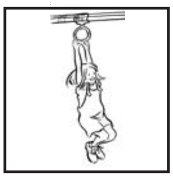
Examining the trend in admission rate over the 16-year period from the beginning of the introduction of mandatory helmet wearing to the most recent year (excluding same day admissions):

- The all injury bicycling hospital admission rate decreased significantly from 77/100,000 in 1990 to 48/100,000 in 2005, an estimated annual change of -1.8% (95% confidence interval -2.9% to -0.6%) and an overall reduction of 25% (-38% to -10%).
- The brain injury hospital admission rate decreased significantly from 25/100,000 in 1990 to 5.5/100,000 in 2005, an estimated annual change of -7.2% (-9.4% to -5.5%) and an overall reduction of 70% (-79% to -60%).
- The arm fracture injury hospital admission rate decreased from 138/100,000 in 1990 to 107/100,000 in 2005, an estimated annual change of -0.4% (-1.6% to 0.9%) and an overall reduction of 5.5% (-23% to 16%). This decrease was not statistically significant. (Figure 2.3)

The observed no significant change in arm fracture (the most common bicycling injury) compared with the significant decrease in brain (intracranial) injury indicates that helmet wearing has had a major beneficial effect.



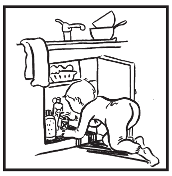




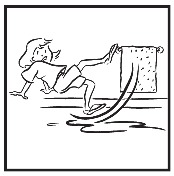
Frequency and pattern of bicycling injuries in children aged 0-14 years, Victoria 2003-5 Table 2

	HOSPITAL ADMISSIONS (n=2,272)						ED PRESENTATIONS (n=7,222)						ALL HOSPITAL-TREATED INJURIES (n=9,494)					
	on-road		off-road		ALL [1]		on-road		off-road		ALL [1]		on-road		off-road		ALL [1]	
	n	%	n	%			n	%	n	%	n	%	n	%	n	%	n	%
Year																		
2003	293	*34*	411	*32*	740	*33*	745	*28*	1,158	*28*	2,043	*28*	1,038	*30*	1,569	*29*	2,783	*29*
2004	271	*31*	428	*33*	738	*32*	938	*36*	1,418	*35*	2,519	*35*	1,209	*35*	1,846	*34*	3,257	*34*
2005	309	*35*	456	*35*	794	*35*	940	*36*	1,530	*37*	2,660	*37*	1,249	*36*	1,986	*37*	3,454	*36*
Gender																		
Male	684	*78*	1,031	*80*	1,804	*79*	1,967	*75*	3,022	*74*	5,353	*74*	2,651	*76*	4,053	*75*	7,157	*75*
Female	189	*22*	264	*20*	468	*21*	629	*24*	1,061	*26*	1,819	*25*	818	*23*	1,325	*25*	2,287	*24*
Missing	0	*0*	0	*0*	0	*0*	27	*1*	23	*1*	50	*1*	27	*1*	23	*0*	50	*1*
Age group																		
0-4	67	*8*	125	*10*	205	*9*	107	*4*	625	*15*	772	*11*	174	*5*	750	*14*	977	*10*
5-9	270	*31*	410	*32*	705	*31*	775	*30*	1,426	*35*	2,368	*33*	1,045	*30*	1,836	*34*	3,073	*32*
10-14	536	*61*	760	*59*	1,362	*60*	1,741	*66*	2,055	*50*	4,082	*57*	2,277	*65*	2,815	*52*	5,444	*57*
Position on Bicycle																		
Driver	244	*28*	843	*65*	1,087	*48*	N/A		N/A		N/A		N/A		N/A		N/A	
Passenger	5	*1*	25	*2*	30	*1*	N/A		N/A		N/A		N/A		N/A		N/A	
Unspecified	624	*71*	427	*33*	1,155	*51*	N/A		N/A		N/A		N/A		N/A		N/A	
Cause																		
Non-collision incident (mostly falls)	187	*21*	942	*73*	1,149	*51*	1,793	*68*	2,963	*72*	5,105	*71*	1,980	*57*	3,905	*72*	6,254	*66*
Collision with fixed or stationary object	14	*2*	66	*5*	80	*4*	169	*6*	305	*7*	495	*7*	183	*5*	371	*7*	575	*6*
Collision with other pedal cycle	5	*1*	5	*0*	10	*0*	8	*0*	21	*1*	30	*0*	13	*0*	26	*0*	40	*0*
Collision with car, pick-up truck or van	122	*14*	6	*0*	128	*6*	181	*7*	28	*1*	215	*3*	303	*9*	34	*1*	343	*4*
Other hit/struck/crush	0	*0*	0	*0*	24	*1*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	24	*0*
Other and unspecified	545	*62*	276	*21*	881	*39*	472	*18*	789	*19*	1,377	*19*	1,017	*29*	1,065	*20*	2,258	*24*
Injury type [2]																		
Fracture	462	*53*	642	*50*	1,149	*51*	604	*23*	927	*23*	1,643	*23*	1,066	*30*	1,569	*29*	2,792	*29*
Open wound	170	*19*	307	*24*	500	*22*	572	*22*	1,159	*28*	1,860	*26*	742	*21*	1,466	*27*	2,360	*25*
Intracranial injury	63	*7*	123	*9*	190	*8*	69	*3*	109	*3*	189	*3*	132	*4*	232	*4*	379	*4*
Superficial injury	48	*5*	56	*4*	108	*5*	481	*18*	643	*16*	1,204	*17*	529	*15*	699	*13*	1,312	*14*
Injury to muscle/tendon	8	*1*	6	*0*	16	*1*	63	*2*	123	*3*	199	*3*	71	*2*	129	*2*	215	*2*
Injury to internal organs	18	*2*	35	*3*	57	*3*	5	*0*	5	*0*	10	*0*	23	*1*	40	*1*	67	*1*
Dislocation, sprain & strain	29	*3*	25	*2*	56	*2*	463	*18*	661	*16*	1,215	*17*	492	*14*	686	*13*	1,271	*13*
Multiple injuries	0	*0*	0	*0*	0	*0*	77	*3*	59	*1*	140	*2*	77	*2*	59	*1*	140	*1*
Other & unspecified	75	*9*	101	*8*	196	*9*	289	*11*	420	*10*	762	*11*	364	*10*	521	*10*	958	*10*
Body region [2]																		
Head/face/neck	240	*27*	435	*34*	704	*31*	500	*19*	1,022	*25*	1,621	*22*	740	*21*	1,457	*27*	2,325	*24*
Trunk	54	*6*	117	*9*	178	*8*	102	*4*	150	*4*	273	*4*	156	*4*	267	*5*	451	*5*
Upper extremity	409	*47*	546	*42*	999	*44*	1,101	*42*	1,703	*41*	3,005	*42*	1,510	*43*	2,249	*42*	4,004	*42*
Lower extremity	148	*17*	190	*15*	358	*16*	565	*22*	860	*21*	1,548	*21*	713	*20*	1,050	*19*	1,906	*20*
Multiple regions	0	*0*	0	*0*	0	*0*	194	*7*	136	*3*	358	*5*	194	*6*	136	*3*	358	*4*
Other & unspecified	22	*3*	7	*1*	33	*1*	161	*6*	235	*6*	417	*6*	183	*5*	242	*4*	450	*5*
Length of stay																		
<2 days	692	*79*	1033	*80*	1,808	*80*	N/A		N/A		N/A		N/A		N/A		N/A	
2-7 days	164	*19*	247	*19*	430	*19*	N/A		N/A		N/A		N/A		N/A		N/A	
8-30 days	17	*2*	14	*1*	33	*1*	N/A		N/A		N/A		N/A		N/A		N/A	
>30 days	0	*0*	1	*0*	1	*0*	N/A		N/A		N/A		N/A		N/A		N/A	

Notes: (1) The column headed 'All' includes 104 admissions and 493 presentations where location was unspecified.
(2) Data on body region and injury type are based on first occurring injury diagnosis code.



2.4 Exposure to risk

The Children's Participation in Cultural and Leisure Activities Survey conducted every 3 years by the Australian Bureau of Statistics, as part of their Monthly Population Survey, collects data on bicycle riding out-of-school hours by children aged 5-14 years. A comparison of published survey data for Victorian children for 2000 (the year of the first survey) and 2006 shows a marginal (2%) increase in the number of children participating in bicycling, from 426,700 to 435,600 participants (239,500 boys and 196,100 girls). The mean hours of exposure to bicycling was 5.8 hours, based on the duration of participation in the last two school weeks prior to interview in 2006. This is the aggregate figure for Australia; exposure data for Victorian children were not published separately. There are no recent Victorian data on helmet wearing by child bicyclists.

In the 2006-7 State budget the Victorian government announced a $57.5 million investment in the *Go for Your Life* program that aims to increase physical activity, reduce sedentary behaviour and increase active transport among Victorians of all ages to address the mortality and morbidity associated with obesity. *Kids-'Go for your life'* includes the *'Stride and Ride'* and *Ride2school* programs which will promote bicycling (as well as walking and other active transport and recreation) to children. At the national level, the *Australian National Cycling Strategy 2005-2010*, endorsed by the Australian Transport Council (a ministerial forum for commonwealth, state and territory road transport and traffic authorities), has been developed to encourage, facilitate and co-ordinate action at national, state and local levels to increase cycling in Australia. While considerable social, health and environmental benefits may flow from increasing participation in cycling, the health benefits may be partially offset by an increased risk of injury unless commensurate investment is made in improving safe riding routes to school, bicycling skills, safe riding, and helmet wearing especially among children and greater investment in bicycling facilities. These programs should be carefully monitored for any serious unwanted effects, particularly any increase in deaths or hospital admissions.

2.5 Risk factors for injury

There are surprisingly few well-conducted studies of risk factors for bicycling deaths and injuries in the published research literature. Several risk factors included here require confirmation in larger studies (marked with asterisk).

- Young age: Age less than 6 years (for serious injury). Older children and youth are more likely to die as a result of bicycling injury than younger children, whereas children aged 14 years and under are more likely to be injured in a bicycle-related crash than older riders.
- Male gender: death/injury rate of males from bicycling injury higher than for females but may be due to greater exposure
- Low SES
- Collision with a motor vehicle (for serious injury)
- Slow riding speed*
- Distance from home greater than 3/4mile/ 1.2km*
- Riding on sidewalk* (but may be related to difficulties negotiating uneven pavement surfaces)
- Time spent riding (more than 3 hours per week) rather than distance travelled i.e., exposure
- Non-use of a helmet: helmets provide an estimated 63-88% reduction in the risk of head, brain and severe brain injury for all ages of bicyclists.

  [Carlin et al., 1995; Rivara et al., 1997; Li & Baker, 1996; Senturia et al., 1997; Thompson et al., 1999 (Cochrane review); Scanlan & MacKay 2001 (Review)]

Other identified contributory factors include the behaviour of children in traffic, driver behaviour and the design and operation of the road transport system and vehicle design (Oxley 2005, unpublished review).

2.6 Potential preventive measures

Helmet wearing

There is strong evidence from a number of well-conducted controlled studies that support the protective effect of helmet wearing. Consistent data indicate that wearing an approved bicycling helmet significantly reduces the risk of head injury in a crash or collision. Two systematic reviews conclude that helmets provide a 63% to 88% reduction in the risk of head, brain and severe brain injury for all ages of bicyclists [Thompson et al., 1999 (Cochrane Review); Scanlan & Mackay, 2001 (Systematic Review)]. A third review used the most conservative estimates of effect size and concluded that helmet wearing reduced the risk of head injury by 45%, brain injury by 33%, facial injury by 27% and fatal injury by 29% [Attewell et al., 2000 (Systematic Review and meta analysis)]. The reduction in brain injury among child bicyclists reported from this study supports previous evidence.

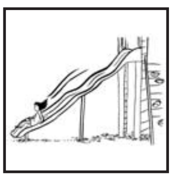
There are no recent comprehensive exposure studies of helmet wearing by child bicyclists in Victoria to investigate whether there has been any decay in the estimated 75% usage rate (for bicyclists of all ages) achieved in the year following the introduction of mandatory helmet wearing regulation in 1990. Anecdotal evidence and non-systematic observations indicate that there may be some deterioration in the wearing of a securely fastened and properly positioned helmet by Victorian child bicyclists.

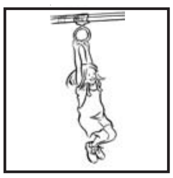
Observation studies conducted in Western Australia showed a 14% decline (from 94% to 80%) in the rate of correct wearing among primary school children between 1993 (one year after the W.A. mandatory helmet legislation) and 1997 and a 24% decline (from 67% to 43%) among secondary school students over the same period (Department of Transport, 1997). In response, a randomised intervention trial of a whole-school intervention to increase the correct wearing of bicycle helmets by grade 5/6 (10-12 year old) primary school students was conducted in 27 Western Australian primary schools (Hall et al., 2004). Over the two years of the study, observed helmet-wearing rates declined by 13% in the control group (from 93% at baseline to 80% at post-test 2) and by 5% in the intervention group (from 89% to 84%). Although the effects of this intervention on observed helmet use were not statistically significant the changes were in the desired direction, and show that school-based activities can arrest the observed decline in helmet use by school children as they approach adolescence. Given the high frequency of facial injuries in bicycling, some authors have suggested that helmet design should be modified to incorporate facial protection (Acton et al, 1995).

Bicycle skills training and safety courses

Bicycle skills training has been suggested as a strategy to prevent bicycle-related injuries because available evidence indicates that child error/faulty riding is the major cause of







hospital-treated child bicycling injury cases. A Queensland prospective study of 813 non-fatal bicycle injury cases conducted in 1991-2 revealed that nearly two-thirds (63%) of incidents, both on- and off- road, were due to 'faulty riding' described as 'riding too fast, larking about, doing wheelies' etc. (Acton et al., 1995).

The evidence for the effectiveness of bicycling skills training and education is mixed.

Two of the three more recently published analytic studies included in a review conducted by the Harbourview Injury Prevention and Research Center (HIPRC) in Washington (http://depts.washington.edu/hiprc) were unable to demonstrate a positive effect of bicycle skills training for changes in observed cycling behaviour or reduction in injuries (Carlin et al., 1998; Macarthur et al., 1998). Only one study, conducted by Savill and colleagues in the U.K., demonstrated improvement in cycling skills, knowledge and helmet use in a group of 12 year-old school children who received training compared with their untrained counterparts (Savill et al., 1996). The 8 school-based bicycle training courses evaluated in this study conformed to the U.K. Transportation Research Laboratory criteria and consisted of 4-8 separate 1-1.5 hour sessions that included training on public roads and playgrounds and off-road practice areas.

Only one of the three studies assessed injury as an outcome. This was a well-designed population-based case control study conducted in Melbourne by Carlin and colleagues at the Royal Children's Hospital. The study demonstrated that *BikeEd* skills training appeared to actually increase injuries is some groups (children whose parents didn't cycle, low SES groups and younger children). The authors suggested that the reasons for the harmful effects were that successful completion of the course generated over-confidence and risk taking in some children and a reduction in supervision by some parents (Carlin et al., 1998).

These study results indicate that bicycle skills training programs are probably necessary but they should be piloted and thoroughly evaluated before widespread implementation. Results of a recent Norwegian bicycling injury survey, involving a stratified sample of 1,200 child residents of Bergen, indicate that deferring children's introduction to cycling to age 6 or 7 rather that 4 or 5 would reduce their risk of injury (Hansen, 2005). The estimated 2-year injury rate (i.e. rate within 2 years of debut which is equal to 12 months of active cycling as Norwegian children do not cycle in colder months) was 17.4% for children who started bicycling at 3-5 years of age and 10.1% for children starting bicycling at age 6-7 years (Hazard ratio=0.78, P<0.0001). The authors suggest that this finding indicates that young children (age less than 6-7 years) have immature psychomotor skills and/or lack the knowledge of how to manage a traffic situation with moving objects.

Increasing cyclist visibility

Lack of visibility to motorists is an important contributory factor to pedestrian and cyclist-motor vehicle crashes [Mayr et al. 2003; Kwan & Mapstone, 2006 (Cochrane Review)]. A systematic review of 39 laboratory-based and road-based simulation trials assessing the effect of visibility aids on drivers' responses to pedestrians and cyclists concluded that fluorescent material in yellow, red and orange colours improve detection and recognition in the daytime and lamps, flashing lights and retroflective materials in red and yellow colours increase night-time detection and recognition (Kwan & Mapstone, 2006, Cochrane Review).

The review found no trials assessing the effect of visibility aids on pedestrian and cyclist-motor vehicle collisions and injuries. A New Zealand case-control study of motorcycle/motorcyclist conspicuity and crash related injury provides some evidence of the potential injury prevention benefits of increasing the visibility of bicycle riders (Wells et al., 2004). The study found that motorcycle drivers wearing any reflective or fluorescent clothing had a 37% lower risk of crash-related injuries than other drivers (OR 0.63, 95% CI 0.42-0.94) and that the use of a white helmet (compared with a black helmet) was associated with a 24% lower risk.

To date, there has only been one evaluation of an intervention to increase cyclist visibility reported in the published literature. The study was focussed on measuring the use of distributed visibility aids rather than evaluating the effectiveness of the interven–tion on reducing crash-related injuries. The cluster randomised controlled trial by Mulvaney and colleagues conducted in Nottingham (England) showed that child pedestrians and bicyclists provided with free visibility aids (a reflective and fluorescent "slap wrap" to be worn on the upper sleeve or trouser leg and a reflective durable self adhesive sticker for a coat or backpack) were significantly more likely to wear the aids at one week and eight weeks after distribution during winter than children in the comparison group (Mulvaney et al., 2006).

The authors conclude that campaigns providing free visibility aids should be encouraged and that stickers on bags were the most effective visibility aid in terms of longer-term compliance. Future research should evaluate whether the use of visibility aids can reduce the risk of child bicycling injury.

Environmental changes

The environmental changes to decrease the likelihood of bicycle-motor vehicle collisions and injuries include: area-wide traffic calming measures to reduce the volume of traffic and slow down traffic such as the establishment of a hierarchical road system, road closures and one-way designations, changes to junctions and changes to the road environment (for example traffic humps, chicanes, small traffic roundabouts, raised bicycle crossings); separation of bicyclists and motorists (the creation of bike lanes and bike paths); and lowering motor vehicle speed limits in built-up areas.

Area wide traffic calming measures

The Cochrane systematic review of the research literature on the effectiveness of area-wide traffic calming for preventing traffic related injuries especially in vulnerable road users (pedestrians and cyclists), published in 2003, found 16 controlled before-after trials (Bunn et al., 2003). The review results indicated that traffic calming in towns and cities may be a promising intervention for reducing the number of road traffic injuries and deaths but that further rigorous evaluations were needed to answer the question conclusively. Very few studies included in the review reported the effect of traffic calming on deaths and injuries in the different categories of road users so it was not possible for the review authors to examine the effectiveness of this strategy for pedestrians, cyclists and motorists separately.

Separation of bicyclists from motorists

Bike lanes and paths aim to separate motor vehicle and bicycle traffic and reduce the likelihood of crashes. Bike lanes are portions of the roadway designated for the use of bicycles. They help to organise the flow of

traffic and reduce the chance of motorists straying into the path of bicyclists. Bike paths are physically separated rights of way for the exclusive use of bicyclists and pedestrians.

One of the basic strategies for injury prevention is to separate, in time or space, the hazard and that which is to be protected. Separation of cyclists and motorists utilising bike lanes and paths conforms to this strategy but there has been sparse good quality evaluation research that demonstrates the real-world effectiveness of these measures (HIPRC, 2001). There is some evidence that the establishment of cycle lanes in urban areas has led to an increase (by 10%) of bicycle crashes, the result of fewer crashes on road links but more crashes at intersections (cited in Oxley et al., 2004). Given the cost of building bike lanes and paths, controlled trials of their injury prevention effects are not feasible. The authors of the HIPRC review therefore recommend a cohort design study where groups of riders exposed and non-exposed to a bicycle lane/path are followed up and their respective crash incidence rates compared taking account of exposure i.e. distance travelled (HIPRC, 2001).

Lower vehicle speed limits

Victoria introduced a state-wide default speed limit of 50km/h in built-up areas (except where otherwise signed) on Jan 22, 2001 with the aim of reducing the incidence and severity of crashes involving unprotected road users (pedestrians and bicyclists). Results of the quasi- experimental controlled before- and after- evaluation indicate that the change in the default speed limit was associated with a sustained 12% reduction in all types of casualty crashes and a sustained and statistically significant reduction in fatal and serious injury crashes involving pedestrians of between 25 and 40% (Hoareau et al., 2006). Casualty crashes involving bicyclists could not be separately studied due to small numbers (Personal communication, Effie Hoareau).

New South Wales introduced the 50km/hr speed limit in built-up areas earlier than Victoria beginning with a 3-month trial in selected local government areas (LGAs) in late 1997. Following the success of the trial, a number of urban and rural LGAs adopted the reduced speed limit in built-up areas in 1998. The controlled before and after evaluation found a substantial (33%) reduction in reported bicycle crashes (including non-injury crashes) in the two years after the introduction of the 50km/h speed limit, but the reduction did not reach statistical significance due to insufficient power (NSW RTA, 2000).

The results from these local evaluations and evidence from evaluations undertaken in overseas countries that have introduced 50k/h or lower urban speed limits (NSW RTA, 2000) provide preliminary evidence that lowering urban speed limits reduces crash-related injuries among cyclists but larger studies are required to confirm the effectiveness of this strategy.

Improved bicycle design

Another way of reducing bicycling injury is to improve the design of the bicycle. This aspect has not been well studied. VISU case narratives are not sufficiently detailed to be able to provide a reliable estimate of the contribution to injury of design, failure or malfunction of bicycle parts. In a 1994 study the National Injury Surveillance Unit (NISU) in Adelaide analysed 1083 ED presentations for bicycling injuries associated with failure or malfunction of bicycle parts. Cases were extracted from the (now defunct) Injury Surveillance Information System which collected data from 50 Australian hospital ED departments. Approximately three-quarters of cases were children aged 0-14 years.

Analysis of a 22% random sample of case descriptions identified that the parts most commonly implicated in injurious bicycling crashes were: chains and gears (34%, chains coming off or breaking causing loss of control), brakes (31%, mostly involving incorrect application of brakes by child riders causing the rider to fall forward off the bike and brakes locking up), wheels (wheels falling off, most frequently the front wheel), handlebars (6%, breakage, loosening of assemblies, handle grips falling off) and pedals/cranks (3%, structural failures). In-depth studies are needed to investigate the precise mechanisms of these injuries and the relative contribution made by design inadequacies, product failure and lack of maintenance.

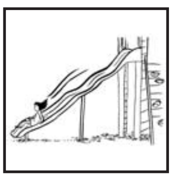
There is a significant body of case reports and a few case series in the research literature that highlight the morbidity (mostly abdominal and pelvic organ injuries) caused by direct impact handlebar injuries (Nadler et al., 2005; Winston et al., 2001). Our analysis of case narratives of ED presentations revealed that there were at least 200 cases of handlebar impact injuries among child bicyclists in Victoria over the 3 years of our study most commonly to the head/face/neck, abdomen and pelvis/groin/pubic region.

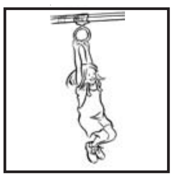
Based on a case series from a paediatric trauma centre, Winston and colleagues estimated there were over 1,000 children hospitalised each year in the United States for serious truncal injuries caused by handlebar impact following relatively minor non-vehicle involved bicycle crashes (Winston et al., 1998; Winston et al., 2001). In-depth on-site crash investigations revealed that the most common injury scenario involved the child losing control and falling after the bike met an obstruction (kerb, bump, pothole) that resulted in the distal end of the bar impacting the ground, forcing the proximal end into the child's abdomen (Winston et al., 1998). A multidisciplinary team of researchers subsequently used the information from the crash investigations to develop a prototype retractable handlebar consisting of a spring-mass-damper system designed to retract and absorb the majority of energy (~50%) at impact (Arbogast et al., 2001). The invention has been patented (US patent 6; 840,135 B1, Jan 11 2005). This design has the potential to reduce the severity of abdominal injuries experienced by young cyclists and serves as an example of a methodology to translate injury research findings into product re-design.

Other single case reports and case series in the literature highlight non-traumatic (overuse) injuries most commonly to the knee, neck/shoulder, hands, buttocks and perineum. A recent literature review by Dettori & Norvell (2006) estimated the prevalence of overuse injuries to be as high as 85% in the bicycling population. The authors identified ulnar and median nerve palsy of the hand in long distance cyclists (bicyclist palsy) and erectile dysfunction in male cyclists caused by saddle pressure as the two categories of injuries that may have the greatest impact on disability.

Suggested countermeasures to bicyclist hand palsy include glove wearing, frequent changing of hand position when riding long distances and changing riding position. A systematic review of published literature in peer reviewed journals on the association between bicycle riding and erectile dysfunction (ED) conducted in 2005 by Huang and colleagues







concluded that bicycle riding more than 3 hours per week was an independent risk factor for moderate to severe ED (RR=1.72) and the prevalence of moderate to severe ED in bicyclists was 4.2% and 4.0% vs. aged matched runners 1.1% (P< or = 0.018) and swimmers 2% (P=0.05). The authors recommend that male cyclists use a noseless and gel-filled seat, change their posture to a more upright/declining position and tilt the saddle/seat downward. These suggested countermeasures are untested.

Improved vehicle design

Current design of the frontal structures of passenger cars and larger vehicles significantly increase the severity of bicycling injury in the event of a collision. Vehicles with high bumpers, blunt force profiles and fitted bull bars put bicyclists at increased risk of serious injury. These design features need to be addressed (Oxley, 2005).

2.7 Partnerships for prevention

A number of authorities/organisations should be involved in developing and delivering prevention initiatives to reduce bicycling injury including: Department of Communities (Sport and Recreation and Local Government); Department of Human Services (Public Health and The Office for Children); Department of Justice (Victoria Police), Roads Corporation Victoria, VicRoads and the Transport Accident Commission, Consumer Affairs Victoria, Department of Education, Department of Infrastructure, Bicycle Victoria, BMX Victoria, Bicycle Industries Australia Ltd., VicHealth, Kidsafe, Royal Children's Hospital Safety Centre, Victorian Safe Communities Network, representatives of medical organisations (such as the Australian Colleges of Emergency Medicine, Surgeons, Paediatrics, General Practice) and injury prevention researchers/research bodies.

2.8 Recommendations

- Devise and evaluate off-road bicycle rider proficiency and safety training courses offered in the community setting that focus on on-bike training to develop and practise basic cycling skills and techniques including braking, steering, cornering, negotiating obstacles (including pot holes, cracks, mounds and poles) on different surfaces and traversing gutters, prior to children's introduction to on-road bicycling.
- Support evidence-based training programs and other initiatives to teach bicycling skills and safe cycling in traffic at the primary and secondary school levels.
- Provide safe and accessible bike routes and entries to schools.
- Teach children bike maintenance skills and how to conduct bicycle safety checks.
- Develop and disseminate clear guidance and information to cyclists about sharing paths and the road.
- Develop a process for child bicyclists to report bicycling hazards and safety concerns to local government.
- All schools should enforce compulsory helmet use by students commuting to school by bicycle.
- Develop resources to communicate the effectiveness of helmet wearing for the prevention of brain and other head injuries to school children at primary and secondary levels.
- Helmet manufacturers should continue to improve helmet design to reduce factors causing non-compliance to wear regulations such as poor fit and comfort, poor air circulation and 'un-cool' appearance. Modifying design to include facial protection should also be considered.
- Schools should negotiate with schoolbag manufacturers to include a reflective strip in school backpacks.
- Promote measures to increase the visibility of child cyclists: the fitting of flashing lights to front and rear of bicycles and a red reflector at rear, and the wearing of a brightly coloured top or fluorescent vest or bands when cycling.
- Advise parents to delay children's introduction to bicycling to age 6 or 7, and to provide learners with the appropriately sized bicycle with two hand brakes and a correctly fitted helmet that conforms to the Australian standard.
- Consider a road safety regulation that sets a lower age limit for on-road bicycle riding.
- Support traffic calming measures including reduced speed limits that support safer cycling.
- Monitor progress of research being conducted by the Children's Hospital Philadelphia to re-design handlebars to reduce handlebar impact injuries and encourage adoption of new design if shown to be effective.

Research

- Improve quality of surveillance data recorded on the Victorian Emergency Minimum Dataset.
- Investigate risk factors for off-road bicycling injury.
- Conduct a comprehensive observation study of child bicycling safety (that includes on- and off-road cyclists) to collect data on correct helmet wearing, use of functional bicycle lamps and reflectors, and rider conspicuity, and use results to formulate and evaluate a targeted bicycle safety promotion and enforcement campaign.
- Conduct further evaluations to determine the effectiveness of interventions to decrease bicycle injuries including skills and safety training, measures to increase visibility of cyclists (lights, reflectors, fluorescent clothing/bands etc.), environmental modifications designed to separate cyclists from motor vehicle traffic and traffic calming initiatives.
- Develop age-specific bicycling guidelines for children and youth and suggest appropriate environments for them to cycle in at different ages and stages.
- Investigate bicycle and motor vehicle design changes that have the potential to reduce bicycling injury.

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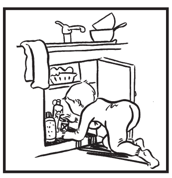




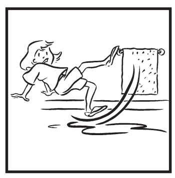

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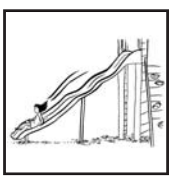
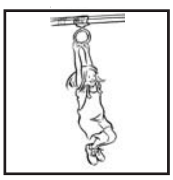




3. Preventing injuries in motorcycling

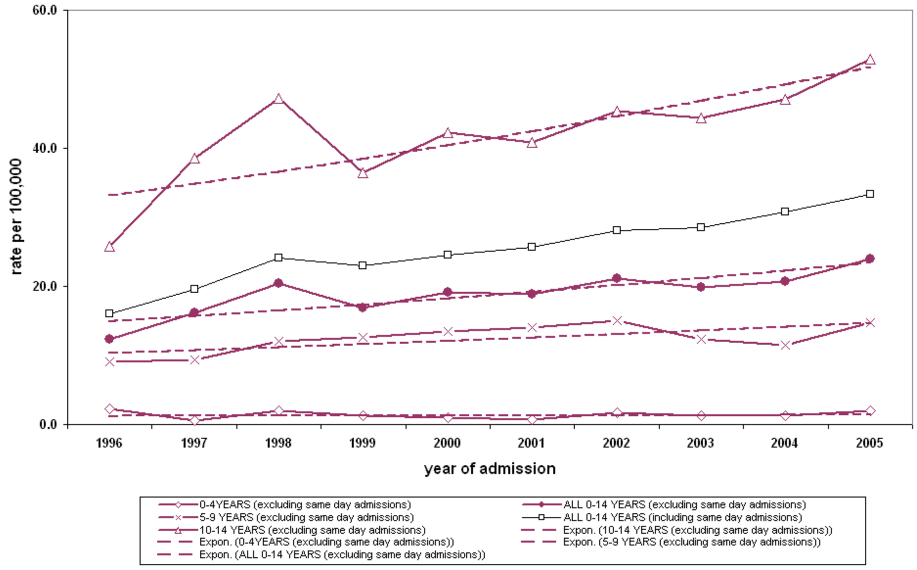
Annual average: <1 death, 302 hospital admissions, 601 ED presentations (non-admissions)

Motorcycling injuries accounted for 2% of all child injury admissions and at least 1% of all child injury ED presentations (non-admissions) in Victoria over the three-year period 2003-5.

Over the 3-year study period there was one motorcycling injury death, 907 hospital admissions and 1,804 ED presentations (non-admissions). The death occurred off-road and was the result of a collision with a fixed object. More than three-quarters of hospital-treated injury cases occurred off-road (Table 3).

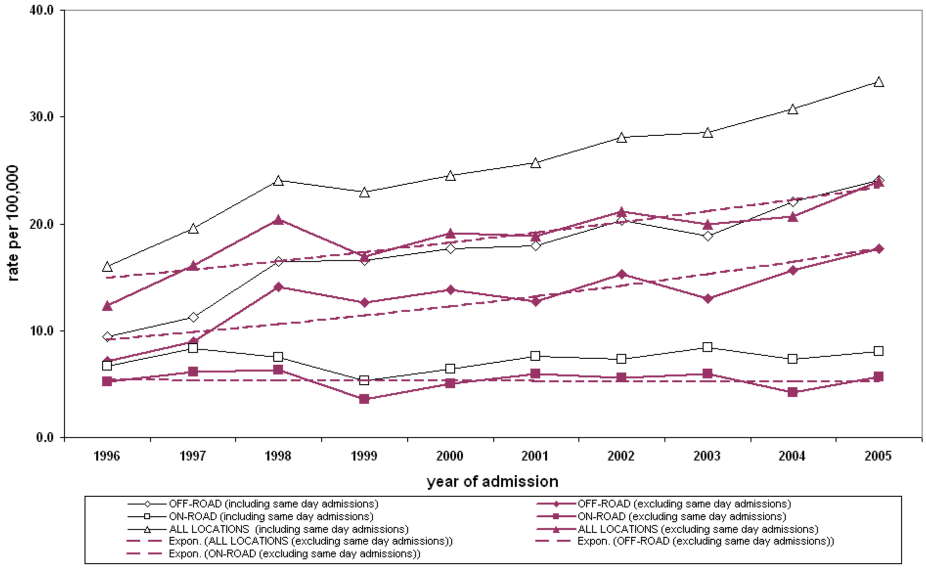
Over the study period, 26% of Victorian children and adolescents aged 0-14 years lived in rural areas (defined for this study as all areas excluding Greater Melbourne and Greater Geelong), yet rural residents accounted for 51% of on-road and 49% of off-road motorcycling hospital admissions, and 34% of on-road and 56% of off-road motorcycling ED presentations. These figures suggest that rural youth are over-represented in motorcycling injury cases, although exposure to motorcycle riding is probably higher in rural than urban areas.

Trend in child motorcycling injury hospital admissions by age group, Victoria 1996-2005 **Figure 3.1**

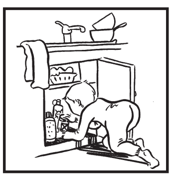


Source: VAED 1996-2005

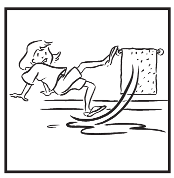
Trend in child motorcycling hospital admissions by location, Victoria 1996-2005 **Figure 3.2**



Source: VAED 1996-2005



3.1 Trend in motorcycling deaths and admissions (1996-2005)

3.1.1 Trend in child motorcycling deaths

Over the 10-year period 1996 to 2005, 9 child motorcyclists died in Victoria. Due to very small numbers there is no clear trend. No deaths occurred in 1996, 1997, 2003 and 2004 and in all other years either 1 or 2 deaths were recorded.

3.1.2 Trend in child motorcycling hospital admissions

Figure 3.1 shows the trend in hospital admissions for child motorcycling injury by age group over the decade 1996 to 2005. The figure shows rates for all admissions and for admissions excluding same day admissions (heavy lines). The exclusion of same day admissions minimises the influence of hospital policy on the trend line.

Examining the trend in admission rate over the decade (excluding same day admissions):

- The all ages child motorcycling injury hospital admission rate increased significantly from 12/100,000 in 1996 to 24/100,000 in 2005, an estimated annual change of 5.1% (95% confidence interval 2.4% to 7.6%) and an overall increase of 65% (27% to 108%).
- The 0-4 years motorcycling injury hospital admission rate decreased from 2.2/100,000 in 1996 to 2.0/100,000 in 2005, an estimated annual change of -0.9% (-10% to 8.9%) and an overall reduction of 8.3% (-68% to 135%). This decrease was not statistically significant.
- The 5-9 years motorcycling injury hospital admission rate increased significantly from 9.1/100,000 in 1996 to 14.8/100,000 in 2005, an estimated annual change of 4.1% (0.7% to 7.4%) and an overall increase of 49% (6.7% to 104%).
- The 10-14 years motorcyling injury hospital admission rate increased significantly from 26/100,000 in 1996 to 53/100,000 in 2005, an estimated annual change of 4.6% (1.3% to 7.7%) and an overall increase of 57% (13% to 110%). (Figure 3.1)

3.1.2.1 Comparison of trend in on- and off-road motorcycling

Figure 3.2 shows the trend in admissions for child motorcycling injuries by location for the years 1996-2005. The figure shows rates for all admissions and for admissions excluding same day admissions (heavy lines).

Examining the trend in admission rate over the decade (excluding same day admissions):

- The child all location motorcycling injury admission rate increased significantly from 12/100,000 in 1996 to 24/100,000 in 2005, an estimated annual change of 5.1% (95% confidence interval 2.4% to 7.6%) and an overall increase of 65% (27% to 108%).
- The child off-road motorcycling injury admission rate increased significantly from 7.1/100,000 in 1996 to 17.6/100,000 in 2005, an estimated annual change of 7.1% (3.0% to 10.8%) and an overall increase of 98% (34% to 178%).
- The child on-road motorcycling injury admission increased from 5.2/100,000 in 1996 to 5.6/100,000 in 2005, an estimated annual change of 0.2% (-4.1% to 4.5%) and an overall increase of 2.2% (-34% to 56%). This increase was not statistically significant. Figure 3.2)

3.2 Frequency and pattern of motorcycling injuries

3.2.1 Deaths

There was 1 death over the 3-year study period. The death occurred off-road and was the result of a collision with a fixed object.

3.2.2 Hospital-treated injuries

Table 3 summarises the data on hospital admissions and presentations for on- and off-road motorcycling injury in children aged 0-14 years. Cases that occurred in 'other and unspecified locations' are included in the column headed 'ALL' (6%, n=55 hospital admissions and 10%, n= 179 ED presentations).

Age and gender

- Males accounted for 82% of hospital-treated injury cases.
- The peak age group for hospital-treated motorcycling injury was 10-14 year olds (71%), followed by 5-9 year-olds (25%). Children aged 0-4 years accounted for 4% of injury cases.

Causes of injury

- Overall, half of hospital-treated injury cases were caused by non-collision incidents (predominantly falls) and 10% by collision with fixed or stationary objects.
- Only 5% of hospital admissions and 1% of ED presentations were caused by crashes/collisions with motor vehicles.

Injury type

- The most common hospital-treated injury was fracture (37% overall, 58% of hospital admissions), followed by dislocation/sprains/strains (15% overall), open wounds (14%) and superficial injuries (10%). The proportion of on- and off-road cases admitted to hospital with intracranial injury was similar (9%). Burns (mostly from the motorcycle exhaust) accounted for 4% of hospital-treated injuries overall and 2% of admissions.

Injury site

- Overall, nearly three-quarters of the hospital-treated injuries were either to the upper (38%) or lower extremity (36%). A higher proportion of admitted cases, than non-admitted cases, were for head/face/neck injuries (20% versus 10%).
- The most common hospital-admitted specific injuries were: fracture of the forearm/elbow (23%), knee/lower leg fracture (16%) and intracranial injury (9%). The most common non-admitted injuries were fracture of the wrist (7%), open wound of the knee/lower leg (6%) and forearm/elbow fracture (6%).

Injury severity (length of hospital stay)

- Two-thirds of admitted cases had a length of stay of less than two days and 29% stayed 2-7 days.
- Very severe injury cases (defined in our study as those requiring eight or more days hospital stay) accounted for 4% of admissions. The proportion of on-road and off-road cases that fell into the very severe category was the same (4%).

Position on motorcycle

- The position of the injured person on the motorcycle was unspecified for 35% of hospital-treated injury cases. Lack of specificity was highest for admitted cases

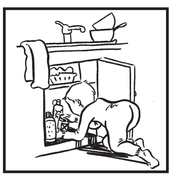
Overview of motorcyclist injuries in children aged 0-14 years, Victoria 2003-5 — Table 3

	HOSPITAL ADMISSIONS (n=907)						ED PRESENTATIONS (n=1,804)						ALL HOSPITAL-TREATED INJURIES (n=2,711)					
	on-road		off-road		ALL*		on-road		off-road		ALL*		on-road		off-road		ALL*	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Year																		
2003	81	*36*	181	*29*	279	*31*	65	*36*	335	*23*	448	*25*	146	*36*	516	*25*	727	*27*
2004	70	*31*	212	*34*	304	*34*	60	*33*	501	*35*	624	*35*	130	*32*	713	*34*	928	*34*
2005	77	*34*	231	*37*	324	*36*	57	*31*	607	*42*	732	*41*	134	*33*	838	*41*	1,056	*39*
Gender																		
Male	196	*86*	542	*87*	781	*86*	135	*74*	1,166	*81*	1,445	*80*	331	*81*	1,708	*83*	2,226	*82*
Female	32	*14*	82	*13*	126	*14*	45	*25*	255	*18*	335	*19*	77	*19*	337	*16*	461	*17*
Missing	0	*0*	0	*0*	0	*0*	2	*1*	22	*2*	24	*1*	2	*0*	22	*1*	24	*1*
Age group																		
0-4	7	*3*	12	*2*	21	*2*	9	*5*	75	*5*	92	*5*	16	*4*	87	*4*	113	*4*
5-9	40	*18*	152	*24*	207	*23*	39	*21*	384	*27*	472	*26*	79	*19*	536	*26*	679	*25*
10-14	181	*79*	460	*74*	679	*75*	134	*74*	984	*68*	1,240	*69*	315	*77*	1,444	*70*	1,919	*71*
Position on Motorcycle																		
Driver	44	*19*	449	*72*	493	*54*	89	*49*	913	*63*	1,106	*61*	133	*32*	1,362	*66*	1,599	*59*
Passenger	8	*4*	27	*4*	35	*4*	42	*23*	74	*5*	131	*7*	50	*12*	101	*5*	166	*6*
Unspecified	176	*77*	148	*24*	379	*42*	51	*28*	456	*32*	567	*31*	227	*55*	604	*29*	946	*35*
Cause																		
Non-collision incident (includes falls)	38	*17*	392	*63*	434	*48*	91	*50*	746	*52*	919	*51*	129	*31*	1,138	*55*	1,353	*50*
Collision with fixed or stationary object	12	*5*	91	*15*	103	*11*	9	*5*	137	*9*	158	*9*	21	*5*	228	*11*	261	*10*
Collision with 2/3 wheeled motor vehicle	3	*1*	31	*5*	34	*4*	1	*0*	4	*0*	5	*0*	4	*1*	35	*2*	39	*1*
Collision with car, pick-up truck or van	10	*4*	3	*0*	13	*1*	6	*3*	6	*0*	12	*1*	16	*4*	9	*0*	25	*1*
Burn from exhaust	N/A		N/A		N/A		2	*1*	57	*4*	68	*4*	N/A		N/A		N/A	
Other and unspecified	165	*72*	107	*17*	323	*36*	73	*40*	493	*34*	642	*36*	238	*58*	600	*29*	965	*36*
Injury type*																		
Fracture	140	*61*	353	*57*	522	*58*	46	*25*	393	*27*	486	*27*	186	*45*	746	*36*	1,008	*37*
Open wound	30	*13*	89	*14*	124	*14*	27	*15*	197	*14*	247	*14*	57	*14*	286	*14*	371	*14*
Intracranial injury	20	*9*	56	*9*	80	*9*	1	*1*	37	*3*	43	*2*	21	*5*	93	*4*	123	*5*
Superficial injury	9	*4*	23	*4*	33	*4*	28	*15*	194	*13*	249	*14*	37	*9*	217	*10*	282	*10*
Burns	3	*1*	14	*2*	21	*2*	4	*2*	71	*5*	86	*5*	7	*2*	85	*4*	107	*4*
Injury to internal organs	4	*2*	14	*2*	19	*2*	0	*0*	1	*0*	1	*0*	4	*1*	15	*1*	20	*1*
Dislocation, sprain & strain	2	*1*	15	*2*	18	*2*	39	*21*	297	*21*	377	*21*	41	*10*	312	*15*	395	*15*
Other & unspecified	20	*9*	60	*10*	90	*10*	37	*20*	253	*18*	315	*17*	57	*14*	313	*15*	405	*15*
Body region*																		
Head/face/neck	41	*18*	135	*22*	185	*20*	23	*13*	136	*9*	179	*10*	64	*16*	271	*13*	364	*13*
Trunk	7	*3*	39	*6*	50	*6*	9	*5*	59	*4*	75	*4*	16	*4*	98	*5*	125	*5*
Upper extremity	95	*42*	214	*34*	329	*36*	63	*35*	574	*40*	703	*39*	158	*39*	788	*38*	1,032	*38*
Lower extremity	78	*34*	232	*37*	330	*36*	66	*36*	522	*36*	658	*36*	144	*35*	754	*36*	988	*36*
Multiple regions	1	*0*	1	*0*	2	*0*	12	*7*	89	*6*	110	*6*	13	*3*	90	*4*	112	*4*
Other & unspecified	6	*3*	3	*0*	11	*1*	9	*5*	63	*4*	79	*4*	15	*4*	66	*3*	90	*3*
Length of stay																		
<2 days	152	*67*	422	*68*	608	*67*	N/A		N/A		N/A		N/A		N/A		N/A	
2-7 days	67	*29*	177	*28*	262	*29*	N/A		N/A		N/A		N/A		N/A		N/A	
8-30 days	9	*4*	25	*4*	37	*4*	N/A		N/A		N/A		N/A		N/A		N/A	
>30 days	0	*0*	0	*0*	0	*0*	N/A		N/A		N/A		N/A		N/A		N/A	

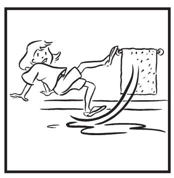
Notes: (1) The column headed 'All' includes 55 admissions and 179 presentations where location was unspecified.
(2) Data on body region and injury type are based on first occurring injury diagnosis code, 43% (n=388) of admissions had at least two injury diagnosis codes

that occurred on-road (77% of cases). This high figure is not surprising, as the rider would have been breaking the law if identified as driving on-road and may not have volunteered this information to medical staff. Overall at least 59% of injured motorcyclists were driving the vehicle at the time of their injury and 6% were pillion passengers.

As the minimum age for a motorcycle learner permit in Victoria is 18 years, all injured on-road motorcycle drivers aged 0-14 years (n= 360 at least) were driving illegally on our road system and injured off-road motorcycle drivers would also be riding illegally if their injuries occurred anywhere other than on private property including privately owned motorcycle sports complexes and sanctioned events on public property. Junior



motorcyclists competing in Motorcycling Australia competition events must hold a junior competition licence. Motorcycling Australia has developed a revised licensing scheme for junior competitive riders which, when fully implemented on July 1, 2007, will require riders aged 7 to under 16 years to have undertaken a minimum 5-hours coaching by an accredited Motorcycle Sport Coach plus the required module for the power of the motorcycle, and, to maintain their licence, a minimum of 5-hours coaching per year until they reach the age of 16.

3.3 Exposure to risk

There are no participation and exposure (time at risk) data for child (0-14 years) motorbike riding in Australia and Victoria. The ABS Children's Participation in Cultural and Leisure Activities Survey, conducted every three years, collects data on child (defined as aged 5-14) participation in organised sports and selected active and passive leisure activities that do not include motorbike riding. In a recent report, the Victorian Department of Sustainability and Environment estimated that 37,000 unregistered trailbikes ride illegally on public land but provided no estimate of how many of these are ridden by children (DSE, 2005). Published Federal Chamber of Automotive Industries (FCAI) sales figures for Australia show that off-road motorbike sales have outstripped road bike sales every year from 2000 to 2004. In 2004, off-road bike sales accounted for 36% (32,000) of the 89,000 motorcycles sales in Australia and minibikes, designed for riders aged 5-12 years, accounted for 12% (approx 11,000) of motorcycle sales (FCAI, 2004).

It is likely that the injury toll from off-road motorcycling will continue to grow unless steps are taken to deal with the issue.

3.4 Injury risk factors

On-road motorcycling

Case-control and cohort studies of varying quality have identified several risk factors for on-road (traffic) motorcycle crashes and related injury:

- younger age (age 15-19 years/age under 25 years)
- unlicensed riding
- riding an unregistered or unfamiliar/ borrowed motorcycle
- alcohol consumption in the previous 12 hours /BAC>.00 and BAC>.05
- not wearing a helmet
- wearing inconspicuous riding gear (non-wearing of reflective/fluorescent clothing and wearing a black helmet)
- no daytime headlight operation
- carrying a pillion passenger
- riding a motorcycle with engine capacity of 750cc and above compared to one of 260cc or below (after adjusting for licence status)
- riding on non-work related trips compared with work-related trips
- low socio-economic status for younger drivers

  (Haworth et al., 1997; Liu et al., 2003; Wells et al., 2004; Mullin et al., 2000; Zambon & Hasselberg, 2006a; Zambon & Hasselberg 2006b).

Several studies have reported that riding experience protects against motorcycling injury but a more recent population based case-control study by Mullin et al. (2000) found no evidence of a protective effect after results were adjusted for age and other potential confounders. In the Mullin study, the only measure of experience found to be protective was familiarity with the motorcycle. Drivers who had driven their current motorcycle 10,000kms or more had a 48% reduced risk compared to those who had driven their motorcycle less than 1000 km (Mullin et al., 2000).

Off-road motorcycling

There is sparse additional information on contributory factors to injury in the narrative data recorded for each case on the Victorian Emergency Minimum Dataset. Most descriptions simply state 'fell off motorbike' and give no further information on the circumstances and the specific mechanisms of injury. A search of the published literature found no analytic studies investigating the risk factors for off-road motorcycling crashes/ injuries.

A number of potential risk factors were identified in a Victorian study conducted by Monash University Accident Research Centre in 1994 (Haworth et al., 1994). The study followed up 174 seriously injured on- and off-road riders and pillion passengers aged under 21 years, of whom 160 were admitted to hospital and 25 were killed. Most of the motorcyclists under licensing age were injured in off-road crashes. The in-depth investigation of the 99 off-road cases identified the following putative risk factors that require confirmation in analytic/cohort studies:

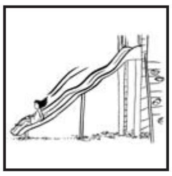
- young age (riding under licensing age);
- body weight of rider (rider weighing less than 50 kg riding a motorcycle with an engine capacity of more than 100cc);
- lack of formal motorcycling training;
- lack of familiarity with the motorcycle being ridden (in 20% of cases riders were riding the crash vehicle for the first or second time); and
- non-wearing of a helmet.

3.5 Potential preventive measures

The modest body of research on the development and evaluation of counter–measures to motorcycling injury is concentrated on on-road riding. There is strong support (from five well-conducted studies) that helmets reduce the risk of head injuries by 72% (Liu et al. 2003, Cochrane Review). Preliminary evidence from New Zealand and Quebec supports the effective–ness of a Graduated Licensing Scheme for novice motorcyclists that encompasses the control of several of the established risk factors for on-road crashes outlined above (time of day restrictions; non-carrying of pillion passengers; zero Blood Alcohol Concentration (BAC) limit etc.) (Mayhew & Simpson, 2001).

Two thorny issues have to be dealt with in any strategy to reduce child motorcycling injury. First, should there be an age restrictions placed on motorcycle riding by children? Second, how should illegal off-road riding by children on forest roads and tracks and local roads be curtailed? In response to the rising child motorcycling death and injury toll in the United States, the well-respected American Academy of Pediatrics (AAP) has taken a controversial stance. The AAP policy statement on this issue, first released in 2002 and confirmed in 2004, advises parents not to allow children aged less than 16 years to ride off-road motorcycles, and recommends that all U.S. States pass legislation prohibiting the use of 2- and 4-wheeled off-road vehicles by children younger than 16 year (AAP, 2006). The AAP Committee on Injury and Poison Prevention concluded that children aged less than 16 years have immature judgement and







motor skills, which put them at high risk of injury in off-road motorcycling.

The AAP also advises parents to discourage young drivers from on-road riding of any motorcycle, even when they are eligible to be licensed to do so, because motorcycles are inherently more dangerous than passenger cars (AAP, 2006). Victorian data indicate that on-road motorcycle riders are approximately 30 times more likely to be killed or seriously injured per kilometre travelled than other vehicle occupants (Diamantopoulou et al., 1996).

A less restrictive approach to reducing child motorcycling injury could include a package of safety measures that covers the following:

- age restrictions for off-road motorcycle riding;
- restriction of riding to approved trails/ sports complexes;
- special licensing and motorcycle registration for off-road riders aged under 18 years;
- mandatory training (the development, standardisation and evaluation of skills and risk awareness training courses delivered by accredited instructors);
- provision of evaluated training packages including internet-based training;
- development and evaluation of a mentoring scheme for novice riders by experienced riders delivered through off-road motorcycle organisations and clubs;
- mandatory wearing of an approved helmet with eye protection (safety visor/face shields) and protective reflective clothing; and
- encouragement of regular maintenance of off-road motorcycles.

A design solution (for example a heat-resistant sleeve) should also be developed to address the issue of burn injury from the motorcycle exhaust. Exhaust burns (mostly to the calf) caused 4% of ED presentations for child motorcycling injury, mostly sustained when the rider fell off and was caught under the bike with the exhaust pressed against the inner leg.

3.6 Partnerships for prevention

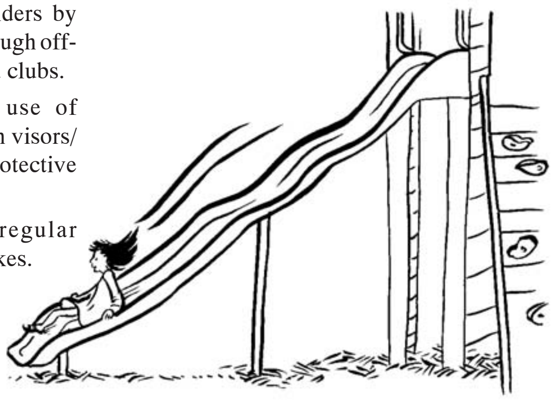
One agency should be appointed by government to take the lead role in prevention but others should partner in strategy development and preventive actions. Departments with some responsibility for addressing the issue of child motorcycling injury include the Department of Sustainability and Environment, Department of Communities (Sport and Recreation and Local Government); Department of Human Services (Public Health and The Office for Children); Department of Justice (Victoria Police), VicRoads and the Transport Accident Commission, Consumer Affairs Victoria. Any committee established to provide leadership in preventive policy and program development should include peak sports organisations such as Motorcycling Victoria and any other bodies with an interest in junior off-road motorcycling, the Federal Chamber of Automotive Industries, the Victorian Motorcycle Dealers Association, motorcycling manufacturers and representatives of medical organisations (such as the Australian Colleges of Emergency Medicine, Surgeons and/or Paediatrics) and research bodies.

3.7 Recommendations

- Appointment by the Victorian government of one government department/agency to take the lead and co-ordination role for off-road motorcycling safety and establishment of a consultative body to advise on state-wide and local injury prevention and control measures.
- Consideration of age restrictions for riding an off-road motorcycle and the development of special licensing, vehicle registration and personal injury insurance scheme.
- Development, standardisation and evaluation of motorcycle rider skills and risk awareness training courses and packages, including internet-based training.
- Development and evaluation of a mentoring scheme for novice riders by experienced riders, delivered through off-road motorcycle peak bodies and clubs.
- Regulations to mandate the use of Standards-approved helmets with visors/ face shields and the wearing of protective and conspicuous clothing.
- Initiatives to encourage regular maintenance of off-road motorbikes.
- Development and implementation of a design solution to address burns from the exhaust pipe.

Research

- Improvements to police reported VicRoads data should be investigated so that recorded data reflect the true size of the on-road child motorcyclist injury problem.
- Improvements to the utility of current hospital-based injury surveillance databases for monitoring and surveillance of child off-road motorcycle injury for injury prevention and research purposes, especially the use of location code and quality of narrative data.
- Investigation of child on- and off-road motorcycling fatalities in Victoria utilising data from the National Coroners Information System (NCIS).
- Investigation of off-road motorcycling injury risk and protective factors.
- Conduct of an exposure study to collect participation and time-at-risk data to allow the determination of the risk of injury in off-road motorcycling.
- Investigations to determine the minimum age at which children have the physical and cognitive skills to safely ride a motorcycle off-road, and the minimum rider: motorcycle weight ratio for safe manipulation of the various styles and sizes of off-road motorcycles marketed for children.



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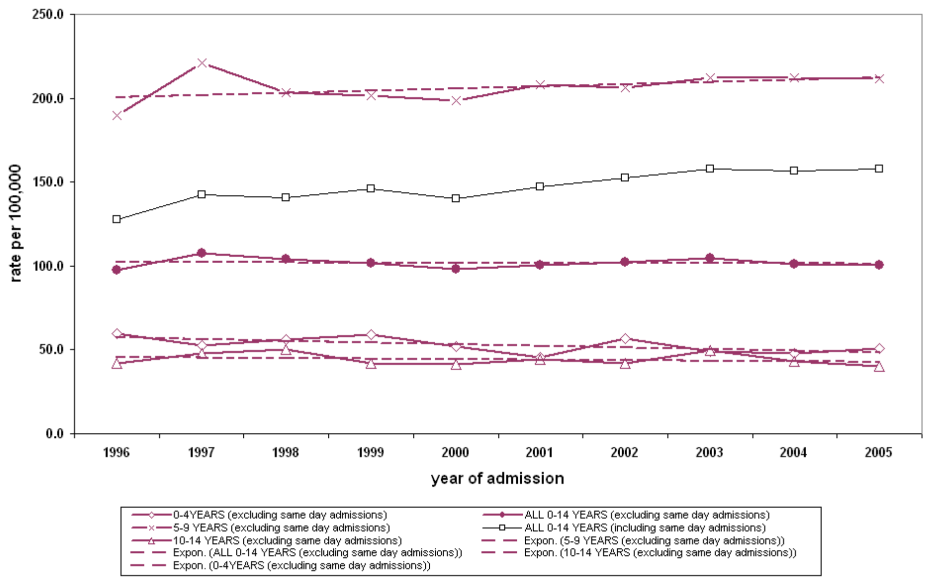
Trend in child play equipment fall injury hospital admission rates by age group, Victoria 1996-2005 **Figure 4.1**



Source: VAED 1996-2005

4. Preventing playground equipment fall injury

Annual average: 1,508 hospital admissions, 2,213 ED presentations (non-admissions)

Falls from playground equipment accounted for 12% of all child injury admissions and at least 4% of all child injury ED presentations (non-admissions) in Victoria over the three-year period 2003-5.

In total there were 11,162 playground equipment fall injuries recorded on hospital injury surveillance datasets over the 3-year study period (4,524 hospital admissions and 6,638 Emergency Department presentations, non-admissions). These figures are under–estimates because of a number of data quality and completeness issues pertaining to both the Victorian Admitted Episodes Dataset (VAED) and the Victorian Emergency Minimum Dataset (VEMD) (See Hazard 61, Box 2).

Playground equipment injury prevention initiatives in Victoria have mostly been focussed on improving the safety of equipment in local government controlled playgrounds. Less consistent attention has been paid to the safety of playground equipment installed in pre-schools and schools (particularly in relation to meeting the undersurfacing depth requirements in the Australian Standard) and almost no attention to the safety of playground equipment installed in home backyards.

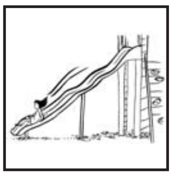
4.1 Trend in playground equipment fall hospital admissions (1996-2005)

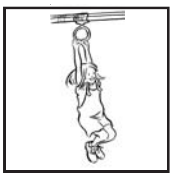
Figure 4.1 shows the trend in hospital admissions for play equipment fall injury by age group over the decade 1996 to 2005.

Examining the trend in admission rate over the decade (excluding same day admissions):

- Although the all ages child play equipment fall injury hospital admission rate increased slightly from 97/100,000 in 1996 to 100/100,000 in 2005, the trend line shows this was actually an overall







reduction of 1.2% (95% confidence interval -9.3% to 7.6%) and an estimated annual change of -0.1% (-1.0% to 0.7%). This reduction was not statistically significant.

- The 0-4 years play equipment fall injury hospital admission rate decreased significantly from 60/100,000 in 1996 to 51/100,000 in 2005, an estimated annual change of -1.8% (-3.8% to 0%) and an overall reduction of 17% (-32% to 0.3%).
- The 5-9 years play equipment fall injury hospital admission rate increased from 190/100,000 in 1996 to 212/100,000 in 2005, an estimated annual change of 0.6% (-0.4% to 1.6%) and an overall increase of 6.2% (-4.3 to 18%). This increase was not statistically significant.
- The 10-14 years play equipment fall injury hospital admission rate decreased from 42/100,000 in 1996 to 40/100,000 in 2005, an estimated annual change of -0.7% (-2.9% to 1.5%) and an overall reduction of 6.7% (-25% to 16%). This reduction was not statistically significant. (Figure 4.1)

4.2 Frequency and pattern of playground equipment fall injuries

Table 4 summarises the frequency and pattern of hospital admissions and ED presentations (non-admissions) for play equipment fall injuries including the equipment on which the injury occurred. The table provides information on play equipment fall injuries that occur in the home and school/day care setting separately as it is proposed that these settings should be the focus of preventive action over the next 5-year period. The columns headed 'all settings' gives the total number of play equipment fall injuries that occurred in places for recreation and sport (mostly under the control of local government) and 'unspecified' settings.

Gender and age

- Males were slightly over-represented in hospital admissions (53% of cases) but, overall, males comprised 50% of cases and females 49% (in the remaining cases gender was not specified).
- The peak age group for hospital-treated fall injury was 5-9 year olds (63% overall). Children in the 5-9 year age group were more than twice as likely to be injured on play equipment in schools/public buildings than in the home environment whereas play equipment fall injuries among 0-4 year-olds were nearly three times more likely to occur at home than in school/public buildings.

Equipment involved

- Fall injuries most commonly occurred on climbing frames/monkey bars (36%), followed by trampolines (22%), slides (12%), and swings (6%). Ranking on frequency was consistent for admissions and ED presentations (non-admissions). Climbing frames/monkey bar fall injury cases comprised 42% of hospital admissions.
- Sixty-two percent of all climbing frame/monkey bars fall injuries occurred in the school/public building setting compared with 6% in the home setting. By contrast, 67% of all trampoline injuries occurred in the home setting compared with 1% in the school setting. Slide- and flying fox-related fall injuries were more likely to occur in school than home whereas swing-related fall injuries were more likely to happen in the home environment than the school environment.

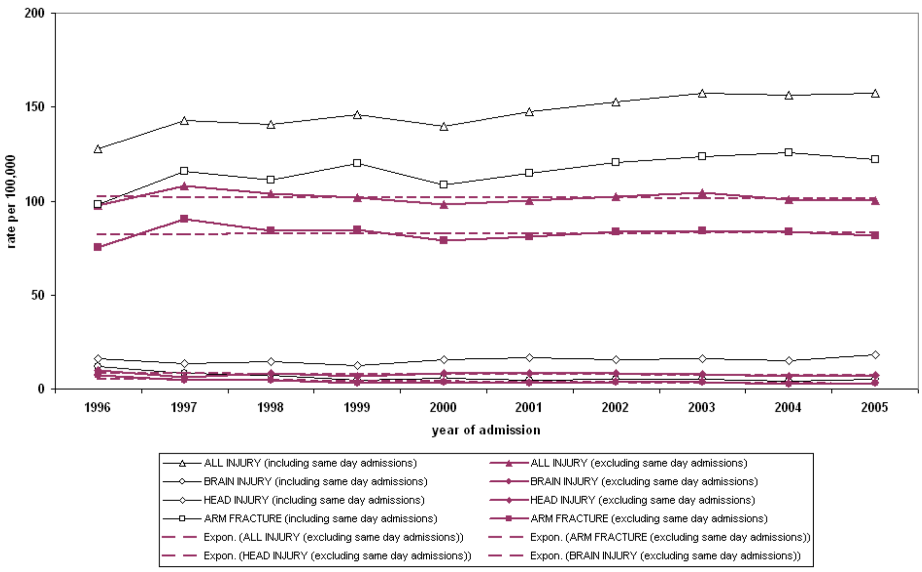
Injury location

- Although location was unspecified in a significant number of hospital-treated injuries (particularly admissions), at least 36% of all hospital-treated injuries occurred in schools and 21% occurred in homes.

Injury sites and types

- The upper extremity was the most frequently injured body site accounting for 67% of injury cases overall (80% of admissions and 59% of ED presentations), followed by the head/face/neck (15%) and lower extremity (10%).
- Fracture was the most common injury accounting for 61% of injuries overall (85% of admissions and 45% of ED presentations), followed by dislocation/sprain/strain (13%) and open wound (10%).
- Forty percent of all playground equipment fall-related fracture cases occurred in the school setting compared with 15% in the home setting.
- The most frequently occurring specific injury was forearm/elbow fracture accounting for 36% of all play equipment

Trend in child play equipment falls hospital admissions by injury type, Victoria 1996-2005 **Figure 4.2**



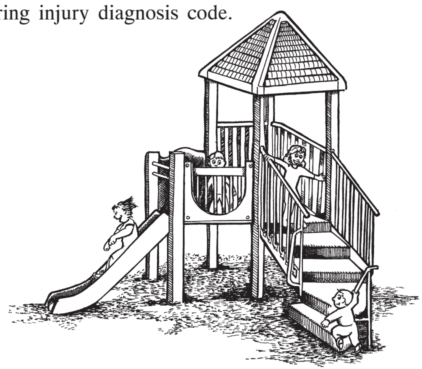
Source: VAED 1996-2005

Notes: (1) Brain injury was defined as per CDC and WHO specifications: ICD 9 codes 800.0-801.9, 803.0-804.9, 850.0-854.1. ICD10 codes S02.0-S02.1, S02.7-S02.9, S06.0-S06.9. (Harrison & Steenkamp, 2002).
(2) Cases were selected if an injury diagnosis code indicating arm fracture, head injury or brain injury was present in any injury diagnosis field.

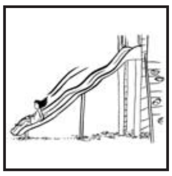
Overview of playground fall injuries in children aged 0-14 years, Victoria 2003-5 — Table 4

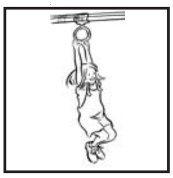
	HOSPITAL ADMISSIONS (n=4,524)						ED PRESENTATIONS (n=6,638)						ALL HOSPITAL-TREATED INJURIES (n=11,162)					
	School and public buildings		Home		All		School and public buildings		Home		All		School and public buildings		Home		All	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Year																		
2003	501	*32*	131	*37*	1,512	*33*	681	*28*	580	*28*	1,859	*28*	1,182	*29*	711	*30*	3,371	*30*
2004	539	*34*	104	*30*	1,501	*33*	857	*35*	695	*34*	2,240	*34*	1,396	*34*	799	*33*	3,741	*34*
2005	536	*34*	117	*33*	1,511	*33*	933	*38*	770	*38*	2,539	*38*	1,469	*36*	887	*37*	4,050	*36*
Gender																		
Male	833	*53*	192	*55*	2,413	*53*	1,104	*45*	1,024	*50*	3,182	*48*	1,937	*48*	1,216	*51*	5,595	*50*
Female	743	*47*	160	*45*	2,111	*47*	1,347	*55*	997	*49*	3,404	*51*	2,090	*52*	1,157	*48*	5,515	*49*
Missing	0	*0*	0	*0*	0	*0*	20	*1*	24	*1*	52	*1*	20	*0*	24	*1*	52	*0*
Age group																		
0-4	105	*7*	111	*32*	777	*17*	169	*7*	682	*33*	1,531	*23*	274	*7*	793	*33*	2,308	*21*
5-9	1,238	*79*	182	*52*	3,051	*67*	1,886	*76*	1,017	*50*	4,028	*61*	3,124	*77*	1,199	*50*	7,079	*63*
10-14	233	*15*	59	*17*	696	*15*	416	*17*	346	*17*	1,079	*16*	649	*16*	405	*17*	1,775	*16*
Equipment type																		
monkey bars	986	*63*	23	*7*	1,884	*42*	1,491	*60*	116	*6*	2,125	*32*	2,477	*61*	139	*6*	4,009	*36*
Trampoline	13	*1*	219	*62*	817	*18*	25	*1*	1,384	*68*	1,627	*25*	38	*1*	1,603	*67*	2,444	*22*
Slide	151	*10*	33	*9*	501	*11*	235	*10*	193	*9*	850	*13*	386	*10*	226	*9*	1,351	*12*
Swing	27	*2*	34	*10*	297	*7*	41	*2*	223	*11*	468	*7*	68	*2*	257	*11*	765	*7*
flying fox	114	*7*	2	*1*	293	*6*	163	*7*	18	*1*	355	*5*	277	*7*	20	*1*	648	*6*
tree house	6	*0*	19	*5*	45	*1*	0	*0*	13	*1*	16	*0*	6	*0*	32	*1*	61	*1*
see-saw	1	*0*	0	*0*	24	*1*	4	*0*	9	*0*	34	*1*	5	*0*	9	*0*	58	*1*
Other	90	*6*	18	*5*	234	*5*	11	*0*	0	*0*	14	*0*	101	*2*	18	*1*	248	*2*
unspecified	188	*12*	4	*1*	429	*9*	501	*20*	89	*4*	1,149	*17*	689	*17*	93	*4*	1,578	*14*
Injury type (1)																		
Fracture	1,389	*88*	263	*75*	3,862	*85*	1,347	*55*	744	*36*	2,988	*45*	2,736	*68*	1,007	*42*	6,850	*61*
Open wound	59	*4*	32	*9*	211	*5*	129	*5*	279	*14*	653	*10*	188	*5*	311	*13*	864	*8*
Intracranial injury	41	*3*	14	*4*	102	*2*	55	*2*	71	*3*	179	*3*	96	*2*	85	*4*	281	*3*
Superficial injury	6	*0*	4	*1*	26	*1*	169	*7*	182	*9*	536	*8*	175	*4*	186	*8*	562	*5*
Injury to internal organs	6	*0*	2	*1*	23	*1*	3	*0*	3	*0*	7	*0*	9	*0*	5	*0*	30	*0*
Dislocation, sprain & strain	16	*1*	6	*2*	75	*2*	505	*20*	458	*22*	1,400	*21*	521	*13*	464	*19*	1,475	*13*
Other & unspecified	59	*4*	31	*9*	225	*5*	263	*11*	308	*15*	875	*13*	322	*8*	339	*14*	1,100	*10*
Body region (1)																		
Head/face/ Neck	137	*9*	75	*21*	504	*11*	273	*11*	486	*24*	1,181	*18*	410	*10*	561	*23*	1,685	*15*
Trunk	36	*2*	11	*3*	93	*2*	101	*4*	73	*4*	274	*4*	137	*3*	84	*4*	367	*3*
Upper extremity	1,328	*84*	229	*65*	3,618	*80*	1,799	*73*	1,003	*49*	3,888	*59*	3,127	*77*	1,232	*51*	7,506	*67*
Lower extremity	72	*5*	36	*10*	294	*6*	178	*7*	337	*16*	790	*12*	250	*6*	373	*16*	1,084	*10*
Multiple regions	0	*0*	0	*0*	1	*0*	20	*1*	13	*1*	54	*1*	20	*0*	13	*1*	55	*0*
Other & unspecified	3	*0*	1	*0*	14	*0*	100	*4*	133	*7*	451	*7*	103	*3*	134	*6*	465	*4*
Length of stay																		
<2 days	1,354	*86*	295	*84*	3,831	*85*	N/A		N/A		N/A		N/A		N/A		N/A	
2-7 days	210	*13*	54	*15*	663	*15*	N/A		N/A		N/A		N/A		N/A		N/A	
8-30 days	11	*1*	3	*1*	28	*1*	N/A		N/A		N/A		N/A		N/A		N/A	
>30 days	1	*0*	0	*0*	2	*0*	N/A		N/A		N/A		N/A		N/A		N/A	

Note: Data on body region and injury type are based on first occurring injury diagnosis code.









fall injuries (57% of admissions and 22% of presentations, annual average 1,116 hospital admitted and ED treated playground fall forearm/elbow fractures for the period 2003-05).

Injury severity (length of stay)

- Most admitted cases (85%) were discharged in less than 2 days. The most common procedures experienced by this group of child patients were closed reductions of fracture of the radius (36%) or reduction of fracture of shaft of radius and ulna (13%). Fifteen per cent had a length of stay of stay of 2-7 and 1% stayed in hospital eight or more days.

4.3 Trend in head injury

An additional analysis was undertaken to explore whether there has been a downturn in brain/head injury over the past decade.

Figure 4.2 shows the trend in all-injury, arm fracture, brain injury and head injury for child play equipment fall injuries over the decade 1996 to 2005. The figure shows rates for all admissions and for admissions excluding same day admissions (heavy lines).

Examining the trend in play equipment fall admission rates over the decade (excluding same day admissions):

- Although the all ages child play equipment fall injury hospital admission rate increased slightly from 97/100,000 in 1996 to 100/100,000 in 2005, the trend line shows this was actually an overall reduction of 1.2% (95% confidence interval -9.3% to 7.6%) and an estimated annual change of -0.1% (-1.0% to 0.7%). This reduction was not statistically significant.
- The brain injury hospital admission rate decreased significantly from 7.5/100,000 in 1996 to 3.1/100,000 in 2005, an estimated annual change of -6.8% (-13.3% to -0.8%) and an overall reduction of 51% (-76% to -7.9%).
- The head injury hospital admission rate decreased from 9.9/100,000 in 1996 to 7.3/100,000 in 2005, an estimated annual change of -1.3% (-4.9% to 2.2%) and an overall reduction of 13% (-11% to 15%). This decrease was not statistically significant.
- The arm fracture injury hospital admission rate increased from 75/100,000 in 1996 to 82/100,000 in 2005, an estimated annual change of less than 1% (-1.2% to 1.4%) and an overall increase of 1.2% (-11% to 15%). This increase was not statistically significant. (Figure 4.2)

The observed no significant change in arm fracture (the most common playground fall injury) or head injury compared with the decrease in brain (intracranial) injury indicates that changes to playground equipment height and undersurfacing have been effective in reducing serious brain injury but have had no significant effect on arm fracture or less serious head injury rates.

4.4 Risk factors

Analytic studies conducted in Victoria and elsewhere have shown strong associations between playground fall injury (and arm fracture) and the following factors:

Equipment-related risk factors

- the height of the equipment (Chalmers et al., 1996; Mott et al., 1997; Mowat et al., 1998; Macarthur et al., 2000; Laforest et al., 2001; Sherker et al., 2005);
- the height of the fall (Macarthur et al., 2000; Sherker et al., 2005); and
- inadequate hand/guardrails (Mowat et al., 1998).

Surface-related risk factors

- surface impact attenuation (Laforest et al., 2001; Sherker et al., 2005);
- the use of inappropriate (non-impact absorbing) surface material (Chalmers et al., 1996; Mowat et al., 1998; Laforest et al., 2001);
- surfacing not meeting recommended standards (Mowat et al., 1998); and
- inappropriate undersurfacing substrate material (soil rather than sand under tanbark) (Sherker et al., 2005).

4.5 Prevention measures

Reduce the height of play equipment

The weight of evidence from analytical studies clearly shows that falling from playground equipment heights greater than 1.5m significantly increases a child's risk of injury (Chalmers et al., 1996; Mott et al., 1997; Macarthur et al., 2000; Sherker et al., 2005). The most recent of these studies, a case-control study of playground equipment-related arm fractures that occurred In Victorian schools, found that children who fell from heights greater than 1.5 m were 2.4 times more likely to sustain arm fracture than children who fell from heights of 1.5m or less ($p<0.01$).

Notwithstanding this research evidence, in the revised Australian Standard *(AS 4685.1-2004: Playground equipment - General safety requirements and test methods)* the maximum free fall height requirement is set at 2.5m (the same level as in the previous Standard) but the Standard includes a reduced maximum of 2.3m for upper body equipment. Upper body equipment is defined in the Standard as *equipment from which suspension is intended using the hands without foot support, such as monkey bars/horizontal ladders.* For supervised early childhood equipment the maximum fall height requirement was reduced to 1.5m but increases to 2.2m for upper body equipment.

The new Australian playground equipment Standard will most likely have little or no effect on the incidence of arm fracture because 86% of playground equipment-related arm fractures occur in children aged over 5 years and research indicates there is no significant reduction in arm fracture risk if the fall height is over 2m (Sherker et al., 2005). Parents and schools purchasing play equipment should consider these research results when buying equipment, especially climbing apparatus/ monkey bars. In school (and council) playgrounds, landscaping (mounding and excavation) has the potential to reduce the

free fall height from climbing apparatus and slides but is not a practicable solution for the home backyard.

One other design issue that may contribute to falls from monkey bars/climbing apparatus by young children is the diameter of the rungs. The larger the diameter the harder it is for children to maintain grip. The rung diameter on play equipment designed for younger school children (5-7 year-olds) should be no greater than the diameter recommended for *five percentile* 5 years-olds (32 mm), the 'minimum user' of the equipment. (On safety design principles, equipment should be designed for the minimum user.) In a recent field study conducted in a Victorian primary school playground, researchers noted that the rungs on the junior play apparatus including the monkey bars were chunkier (diameter 38mm) than the rungs on the full-sized equipment in the same playground (Cassell et al., 2005). In addition, play equipment manufacturers should consider using a sleeve over rungs made of material that assists grip or other design solutions to reduce falls due to loss of grip.

Install and maintain impact absorbing undersurfacing

Schools (and local councils) in Victoria mostly use loose fill (tanbark) undersurfacing in playgrounds because of the comparatively high up-front cost of installing rubber-based alternatives. Anecdotal evidence indicates that recommended undersurfacing is rarely used under play equipment in home backyards.

The Australian Standard recommends that the loosefill under and in the fall area of play equipment should be maintained to a minimum depth of 20cm. Sherker et al. (2005) reported from their case control study of the risk factors for play equipment-related arm fracture that less than 5% of the 402 school playgrounds in which arm fractures occurred complied with the depth recommended in the Standard at the time of the injurious fall. In fall zones where children landed, tanbark depth ranged from 0-27cm, with an average depth of only 11cm.

In a further study, the *in situ* performance of tanbark was monitored in three playgrounds over time to determine a schedule for surface maintenance to minimise injury risk (Sherker et al., 2005). Predictive modelling showed that, without maintenance, there was an unacceptably high risk of serious head injury for 1m falls after approximately 100 days of 'normal' deterioration in the depth of undersurfacing in playgrounds. Based on this finding, the authors recommended that replenishment of playground tanbark should occur at 3-month intervals (Sherker et al., 2005). Anecdotal evidence indicates that government schools and pre-schools find it very difficult to meet the cost of this maintenance schedule and this financial barrier to compliance needs to be addressed.

Overall, rubber-based bilaminate playground surfacing materials have superior impact attenuation properties than tanbark and do not deteriorate, but the initial cost outlay is apparently prohibitive for schools and local councils (Sherker et al., 2004). Using a mix of surfaces is a less expensive option with rubber-based surfaces used in high traffic areas (underneath swings and at the landing area of slides) and loose fill in lower traffic areas. A comparative cost study should be done to determine if and when the initial outlay on rubber-based bilaminate undersurfacing matches the cost of installation and maintenance of tanbark to a compliant level, to enable informed financial decision-making. At this stage, it is unknown whether or not there is an increased risk of 'planting' the outstretched arm on a rubber surface, with less chance of some lateral movement, compared with tanbark, and possibly less energy attenuation.

Reduce injuries that occur in home backyards

At least 20% of hospital-treated playground equipment fall injuries occur in home backyards, yet there has been no published research on the safety of home play equipment and sparse attention paid to reducing injuries in the home setting. Very few of the playspace safety resources are targeted to parents installing equipment in their backyards. The U.S. Consumer Product Safety Commission's publication, *Outdoor Home Playground Safety Handbook*, is a useful guide that highlights what parents need to know about planning, constructing and maintaining an outdoor home playground and includes a home playground safety checklist (CPSC, 2005). The information in the handbook could form the basis of a similar resource for Australian parents but would need to be adapted. *Kidsafe* NSW (Playground Advisory Unit) produces a range of useful safety resources for sale but most are targeted to local government, schools and early childhood services.

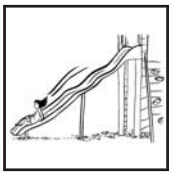
A concerted awareness raising and education campaign is required to inform parents about the injury risk, recent injury prevention research findings and the relevance of the provisions of the new playground safety Standards to their decision-making on the purchase, selection, siting, installation (including undersurfacing) and maintenance of outdoor playground equipment in their home backyard. Play equipment manu–facturers and retailers should be involved in safety education but independent advice should be available. All educational resources/campaigns should emphasise the need for active supervision of young children when they are playing on outdoor playground equipment.

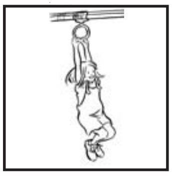
Reduce fall injury related to trampolines

Trampoline falls cause at least 800 hospital-treated child injuries each year in Victoria, at least two-thirds of which occur in home backyards. In response to the rising number of serious trampoline-related injuries to children in the U.S. in the 1990s, especially head and neck injuries, the American Academy of Pediatrics (AAP) called for the restriction of trampoline use to supervised training programs and recommended that trampolines should not be used at home, in routine physical education classes and have no place in outdoor playgrounds (AAP, 1999). The response of the Australian injury prevention sector was more measured and has focussed on revising the Australian Standard for trampolines to include measurable safety aspects designed to reduce the risk of injury.

The revised and improved Standard (AS 4983 – 2006: *Trampolines- Safety aspects*) was released in October 2006. All recreational trampolines that are offered for sale on the Australian market must now be supplied with frame padding or a soft-edge system and it is also recommended that existing trampolines that were purchased prior to the release of the Standard be retrofitted with a frame padding system that complies with AS 4989 (Eager, 2006-7). The new Standard also mandates a minimum level of consumer safety information including safety warnings on the trampoline packaging and instructions on installation and maintenance and safe use including the need for active adult supervision (see full list in H*azard* 61, 2005). An effective







method of reducing fall height is to install the trampoline in a pit so that the trampoline mat is level with the surrounding ground, which should not be constructed of concrete or other hard material. Trampolines that have safety net 'walls' to minimise the risk of children falling off the equipment to the ground —one of the most common mechanisms of injury— are now on the market.

Hospital admissions rates (excluding same day admissions) for playground equipment injury show a fairly stable trend over the ten-year period 1996 to 2005, although a slight downturn is evident in the latest two year of data (2004 & 2005). The full impact of the revised mandatory standards for playground equipment and trampolines (and related design changes) on child injury rates should become apparent over the next five years.

4.6 Partnerships for prevention

Partners should include Department of Human Services (Public Health and The Office for Children); Department of Education, Department of Communities (Local Government) and local council representatives, Consumer Affairs Victoria, Municipal Association of Victoria, Victorian Local Government Association, School Principals' Associations, Victorian Council of School Organisations (VICCS), Jardines and other insurers, Playground and Recreation Association of Victoria (PRAV), Kidsafe, Royal Children's Hospital Safety Centre, Victorian Safe Communities Network, Parents Vic, playspace designers and landscapers, play equipment manufacturers, importers and retailers, representatives of medical organisations (such as the Australian Colleges of Emergency Medicine, Surgeons and/or Paediatrics) and injury prevention research bodies/researchers.

4.7 Recommendations

Injury prevention

- When planning playgrounds and purchasing playground equipment, especially climbing apparatus/monkey bars, consumers (government and private) should consider research evidence that consistently shows that the critical free fall height for arm fractures from playground equipment is 1.5m.
- Innovative landscaping solutions (mounding and excavation) that reduce the free fall height from slides and climbing apparatus should be implemented in school and public playgrounds.
- Parents purchasing any type of play–ground equipment for backyard installa–tion must be educated, preferably at point-of-sale, about the relevance of all safety requirements in the Australian Standards to the home setting, with regard to recommended fall heights, site selection, undersurfacing, ongoing maintenance, safe use and supervision.
- Authorities responsible for public/school/pre-school playgrounds must address the financial barriers to the installation and maintenance of Standards-compliant impact absorbing surfacing, whether rubber-based, loosefill or a combination of the two.
- Play equipment manufacturers should implement design solutions that reduce the risk of falls from monkey bars/climbing equipment due to loss of grip, such as the use of smaller-diameter rungs and materials that increase grip.
- Wrist guards should be worn while using trampolines, particularly in the absence of safety netting.

Research and data system improvements

- A comparative cost study should be commissioned to determine if and when the initial outlay on rubber-based bilaminate undersurfacing (full coverage of fall zones or in high traffic areas only) matches the cost of installation and maintenance of tanbark to a compliant level, to enable local government and school authorities to make an informed choice of surfacing type.
- Improve hospital-based injury sur–veillance data systems so they provide more detail on the circumstances and contributory factors to play equipment related injury.
- Undertake exposure studies of children's use of play equipment to assist in determining the relative risk of equipment types.
- A study should be commissioned to modify current designs of wrist guards to provide protection against wrist and arm fracture while maintaining their ability to grip playground equipment. This study should also investigate arm fracture protection in other high risk situations for fall onto the outstretched arm that involve the need for unimpaired grip, such as bicycling, scooter-riding, horse riding and in some sports such as hockey.

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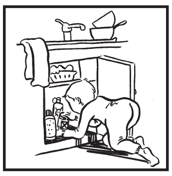




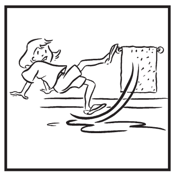

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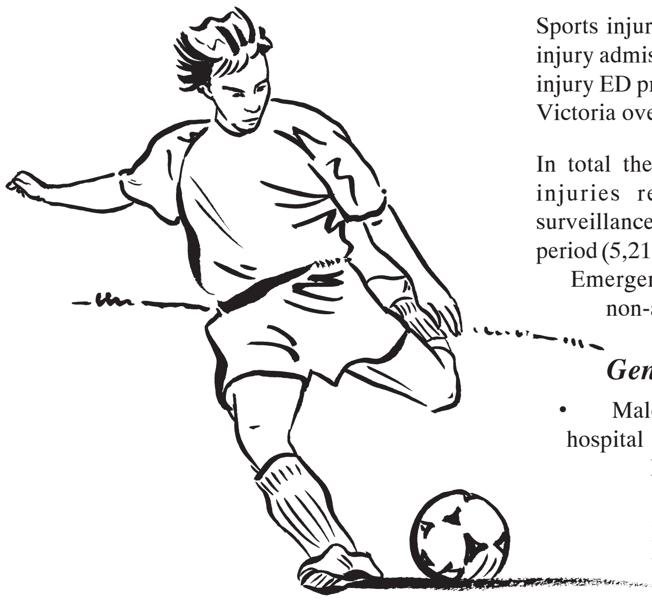


5. Other child injury issues

Sport and transport related injuries, including motor vehicles, pedestrians and 'other transport' (mainly horse riding) are other high frequency, high severity injury issues that should be included in any child injury prevention strategy/action plan.

Prevention of sports injury requires the development of a strong partnership between the health and sports sectors. Prevention of horse riding injuries should also be addressed by this partnership. There is probably scope for the health and education sectors to adopt a greater partnership role with the road safety sector on initiatives to reduce motor vehicle related and pedestrian injuries.

5.1 Sports injury (excluding bicyclists, motorcyclists and play equipment falls)

Annual average 1,739 admissions and 4,733 ED presentations

Sports injury accounts for 14% of all child injury admissions and at least 9% of all child injury ED presentations (non-admissions) in Victoria over the three-year period 2003-5.

In total there were at least 19,414 sports injuries recorded on hospital injury surveillance datasets over the 3-year study period (5,216 hospital admissions and 14,198 Emergency Department presentations, non-admissions).

Gender and age

- Males were over-represented in both hospital admissions (72% of cases) and ED presentations (66%).
- The peak age group for hospital-treated sports injury was 10-14 year olds (76% of hospital admissions and 83% of ED presentations).

Sports involved

- Sports injuries most commonly occurred in Australian Football (21% of admissions and 21% of ED presentations), basketball (8% and 11%) and soccer (9% and 6%). Other sports that accounted for a significant number of hospital admissions were skateboarding (8%), equestrian activities (7%) and inline skating (5%). Netball (5%) and cricket (3%) injuries were prominent among ED presentations.

Injury sites and types

- The upper extremity was the most frequently injured body site accounting for 54% of injury cases overall (57% of admissions and 53% of ED presentations), followed by the lower extremity (24%, 17% of admissions and 26% of ED presentations) and the head/face/neck (14%, 22% of admissions and 12% of ED presentations).
- Fracture was the most common injury accounting for 39% of hospital-treated sports injury cases overall (67% of admissions and 29% of ED presentations), followed by dislocation/sprain/strain (29% overall, 6% of admissions and 36% of ED presentations).

Injury severity (length of stay)

- Most admitted cases (84%) were discharged in less than 2 days, 15% stayed in hospital for between 2 and 7 days and 1% for 8 or more days.

5.2 Transport related injury (excluding bicyclists and motorcyclists)

Annual average 17 deaths, 607 admissions and 1,063 ED presentations

Transport injury accounted for 50% of all child injury deaths, 5% of all child injury admissions and at least 2% of all child injury ED presentations (non-admissions) in Victoria over the three-year period 2003-5.

In total there were 51 deaths and 5,009 transport injuries recorded on hospital injury surveillance datasets over the 3-year study period (1,821 hospital admissions and 3,188 Emergency Department presentations, non-admissions).

Gender and age

- Males were over-represented in deaths (53%), but not in hospital admissions (46% of cases) and ED presentations (44%).
- 0 to 4 year olds accounted for 37% of deaths, 10-14 year olds for 35% and 5-9 year olds for 27%. 10-14 year olds accounted for more than half of hospital admissions and 49% of ED presentations,

followed by 5-9 year olds (30% of hospital admissions and 29% of ED presentations).

Causes

- Car occupants accounted for almost half of these transport injuries (49%, 35% of admissions and 56% of ED presentations), followed by 'other transport', mainly horse-related (32% overall, 33% of admissions and 31% of ED presentations) and pedestrians (16%, 23% of admissions and 13% of ED presentations).

Injury sites and types

- Among admissions, the most common injury type was fracture (41%), followed by superficial injuries (13%) and open wounds (8%). Among ED presentations, the most frequently occurring injury type was superficial injury (25%) followed by sprains/strains (22%) and fracture (11%).
- Among admissions and ED presentations the head/face/neck was the most frequently injured body site (37% and 26%), followed by the upper extremity (27% and 24%) and lower extremity (18% and 16%).

Injury severity (length of stay)

- Seventy percent of admitted cases were discharged in less than 2 days, 25% stayed in hospital for between 2 and 7 days and 5% for 8 or more days.

BOX 1 Data extraction and statistical methods.

DATA EXTRACTION

Overall

Cases were selected if the child was aged 0-14 years and the injury was classified as unintentional.

Home injury cases

Deaths (ABS-DURF)

- Cases were selected for analysis if the 4th character of the ICD-10 external cause code was .0 'Home'.

Hospital admissions (VAED)

- Cases were selected for analysis utilising ICD-10-AM location of injury code Y92.0 'Home'.

Hospital ED presentations (non-admissions)

- Cases were selected if the location of injury was coded as 4 'Home'.
- As there were large groups of cases coded under the location variable as 'other specified' and 'unspecified', a check of each case narrative was made for information on place of occurrence. If the narrative indicated the injury occurred in a home the case was selected.

Bicycle and motorcycle injury cases

Deaths (ABS-DURF) and hospital admissions (VAED)

- Cases were selected for analysis utilising ICD-10 (deaths) and ICD-10-AM (admissions) external cause of injury codes V10-V19, 'Pedal cyclist injured in transport accident' or V20-V29, 'Motorcycle rider injured in transport accident'. Within these codes, subcategories were selected that separated non-traffic from traffic cases.
- Extracted cases were aggregated and assigned to three groups: off-road ('non-traffic'), on-road ('traffic') and other and unspecified (cases in which injuries were sustained whilst boarding or alighting the bicycle/motorcycle and all cases coded to 'unspecified').

Hospital ED presentations (non-admissions)

- Cases were selected if the cause of injury was coded as 6 ('pedal cyclist rider/passenger') or as 3 ('motorcycle driver') or 4 ('motorcycle passenger').
- Cases were then assigned as on-road or off-road using the location (place of occurrence of injury) variable. All cases in which the location of the injury event was coded to 'road, street or highway' were assigned to the 'on-road' category. Cases with other locations ('place for recreation', 'athletics and sports area', 'farm' etc) were assigned to the 'off-road' category.
- As there were large groups of cases coded under the location variable as 'other specified' and 'unspecified', a check of each case narrative was made for information on place of occurrence. If information on location was given, the case was re-assigned accordingly.

In addition, a text search was made of all other case narratives on the VEMD for the study years to identify other relevant cases that had been coded to another cause of injury (e.g. fall or hit/struck/crush).

Play equipment fall injury cases

Deaths (ABS-DURF)

- There were no deaths coded to the ICD-10 external cause of injury code W09 'Fall involving playground equipment' over the study period.

Hospital admissions (VAED)

- Cases were selected for analysis utilising ICD-10 external cause of injury code W09 'Fall involving playground equipment'.

Hospital ED presentations (non-admissions)

- A text search for items of playground equipment was made of all case narratives on the VEMD for the study years. Cases were then selected if the cause code or narrative indicated the injury was the result of a fall.

STATISTICAL METHODS

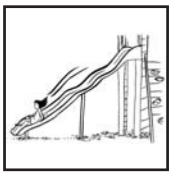
Rates

Rates were calculated by dividing the appropriate number of injury deaths, admissions or ED presentations by the age group specific population, derived from the Australian Bureau of Statistics (ABS) estimated resident population figures for June 30 of the relevant year.

Trend analysis

Trends were determined using a log-linear regression model of the rate data assuming a Poisson distribution of injuries. The statistics relating to the trend curves, slope and intercept, estimated annual percentage change, estimated overall change, 95% confidence intervals around these estimated changes and the p-value, were calculated using the regression model in SAS® 9.1.3 . A trend was considered to be statistically significant if the p-value of the slope of the regression model was less than 0.05.







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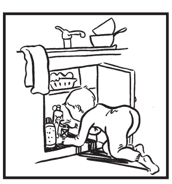




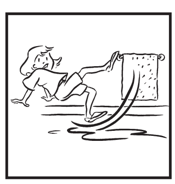

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General Acknowledgements

Participating hospitals

From October 1995
Austin & Repatriation Medical Centre
Ballarat Base Hospital
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
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Western Hospital - Sunshine
Williamstown Hospital
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From January 1997
Royal Melbourne Hospital

From January 1999
Werribee Mercy Hospital

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

National Injury Surveillance Unit

The advice and technical back-up provided by NISU is of fundamental importance to VISU.

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.

Contact VISU at:

MUARC - Accident Research Centre
Building 70
Monash University
Victoria, 3800

Phone:

Enquiries	(03) 9905 1805
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Fax	(03) 9905 1809

Email: visu.enquire@muarc.monash.edu.au

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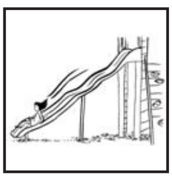
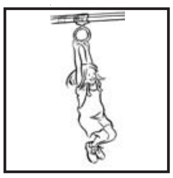
Coronial Services

Access to coronial data and links with the development of the Coronial Services statistical database are valued by VISU.







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Victoria The Place To Be

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