HAZARD

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The focus of this issue is ladder injury, a major cause of consumer product-related fatal and hospital-treated injury in Victoria.

Consumer product-related injury (3): Injury related to the use of ladders

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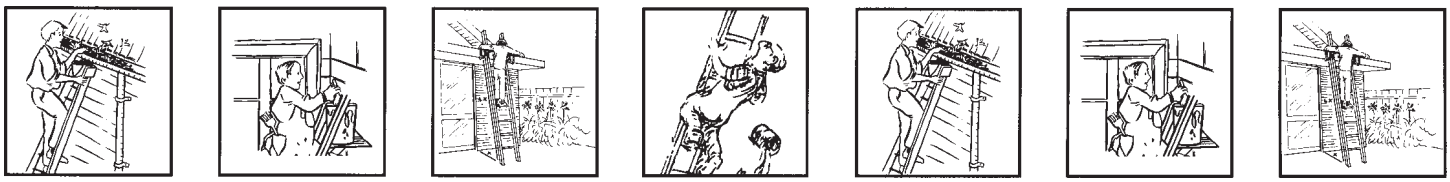
Summary

- Ladder use was related to at least 12 deaths and 5,004 hospital treated injuries over the two-year period covered by this study (2002/3-2003/4). Most ladder-related injuries occurred in the home.
- All 12 ladder-related deaths and 93% (n=4661) of the hospital-treated injury cases (admissions and E.D. presentations) were caused by falls.
- The all-person hospital admission rate for ladder fall injuries increased by 40% over the decade 1994-2004 from 15.8 admissions per 100000 in the period 1994/7 to 22.2 admissions per 100000 in the period 2001/4.
- All ladder fall fatalities were male and males comprised 81% of hospital-treated ladder fall injury cases, probably reflecting higher exposure to ladder use among males compared with females.
- Ladder fall fatalities and injury cases peaked in middle-aged and older men. Persons aged 60 years and older were more likely than their younger counterparts to be admitted to hospital for ladder fall injuries. Forty-three percent of hospital admissions for ladder falls were aged 60 years and older compared with only 25% of E.D. presentations (non-admissions).
- Most ladder fall fatalities occurred in the home, and involved men aged in their 60s-80s undertaking home maintenance (repairs, painting, cleaning out gutters) or gardening tasks (pruning, picking fruit). Because of their age and state of health many of the deceased should not have been working from a ladder at height. Several cases involved unsafe ladders/scaffolding or unsafe ladder use practices.
- Available data indicate that around 70% of hospital-treated ladder fall injuries occurred in the home, compared with around 20% in the work place.
- Common mechanisms of ladder fall injuries in the home and the workplace were ladder slideout and sideways tilting, user slip or misstep, user loss of balance and ladder fault/malfunction.

The strict work at height regulations recently introduced into Victorian workplaces stand in stark contrast to the lack of controls and preventive action on falls while working at height (mostly from a ladder) in the home environment, where the majority of fatal and serious fall from height injuries occur.

Vehicle jack injuries
A short report see page 16



A multifaceted approach is needed to reduce ladder-related injuries that occur in the home including: innovations in ladder accessories (eg. attachment points on houses); design solutions to reduce the overall need to use ladders for cleaning and maintenance tasks performed at heights (eg. the broader adoption of self-cleaning glass, re-designed guttering and the use of roof gutter guards); design measures to minimise sliding or tipping risks and slipping on rungs or steps; social measures to reduce ladder use by older persons for home maintenance tasks; and community education and training on safe ladder use for home maintenance tasks.

Introduction

This is the third consecutive edition of *Hazard* focused on groups of consumer products that make significant contributions to hospital-treated injury in Victoria. In *Hazards* 61 and 62 we highlighted playground equipment injury in children and mobility scooter injuries in older adults respectively.

As stated previously, current injury surveillance data collections cannot identify the level of involvement of the product in the injury because of the limited amount of data collected on each case. Products may be involved in injury causation at a number of levels: physical failure (design or manufacturing faults and lack of maintenance); inadequate design (for normal use, for use by target age or ability groups, for foreseeable mishandling or misuse and for protection of bystanders); inadequate instructions/ safety warnings; and in ways not influenced by any shortcomings of the product due to misuse beyond the influence of the supplier and unforseen human and environmental factors (ACA, 1989).

The level of evidence required to prove a causal relationship between product and injury can only come through in-depth analytical research studies.

Ladders provide convenient access to heights for the performance of maintenance duties in the home and workplace but their use is associated with an injury risk, mainly due to falls from height. The aim of this study was to analyse the latest available injury surveillance data on ladder-related fatalities and hospital-treated injuries to investigate the size, pattern, contributory factors and circumstances of injury for prevention and research purposes.

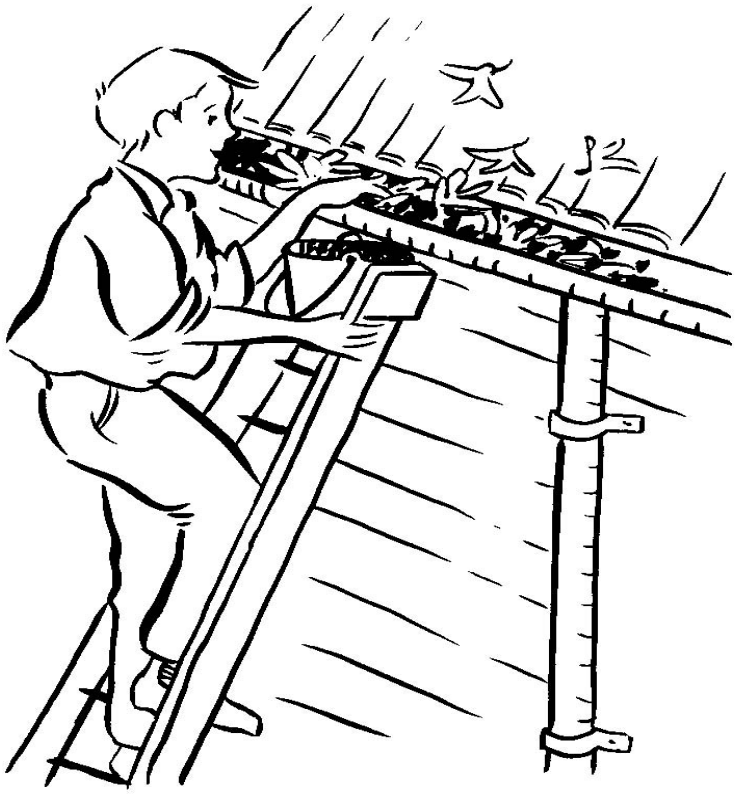
Method

Ladder fall deaths in 2002 and 2003 were extracted from the Australian Bureau of Statistics Death Unit Record file (ABS-DURF) held by VISU, and obtained from the National Coroners Information System (NCIS).

Hospital-treated ladder injury cases for the period July 2002 to June 2004 were extracted from two datasets held by VISU: the VAED which records all Victorian public and private hospital admissions; and the VEMD which included presentations data from 28 of the 35 Victorian public hospital emergency departments for 2002/3 and all 37 hospitals with 24-hour Emergency Departments from the beginning of 2004.

Deaths were excluded from the VAED to avoid double counting fatalities on the ABS-DURF (and NCIS). Deaths and admissions were excluded from the VEMD to avoid double counting of fatalities and hospital admissions on ABS-DURF and the VAED, respectively.

The method for extracting data is described in more detail in Box 1 and relevant data issues with respect to completeness and quality are discussed within the report and in Box 2.



Results

All ladder-related injury

Over the two-year study period (2002 and 2003 for fatalities and 2002/3-2003/4 for hospital-treated injury), there were at least 12 ladder-related deaths (all the result of falls) and a further 5,004 hospital-treated ladder injury cases. These figures are underestimates because of a number of coding and other shortcomings of the datasets from which data were extracted (see Box 2).

All of the 12 ladder fall deaths recorded on ABS-DURF in the two-year period 2002-3 were male and two-thirds were aged 60 years and older. The alternative source of injury fatality data is the NCIS. A word search for 'ladder' in reports on the NCIS (Victorian cases only) found 21 fatalities involving ladders (all falls) six of which were attributed by the Coroner to natural causes (coronary artery atherosclerosis, ischaemic heart disease and heart attack) rather than to the ladder fall injuries. Of the 15 remaining records there were three unwitnessed cases where the fall may have been from scaffolding or a roof rather than from the ladder in use at the time of death (Table 1).

Eighty-one per cent of hospital treated ladder injury cases were male (n=4,053) and 32% of all cases were aged 60 years and older (n= 1,608) (Table 1). Over three-quarters (78%) of the hospital treated injury cases (n=4,661) were caused by falls. In the next section the fall and non-fall ladder injury cases are analysed separately.

Frequency, gender and age of all hospital-treated ladder injury cases, July 2002-June 2004 (n=5,004) **Table 1**

	Hospital admissions (n=2,231)		Hospital ED presentations (non-admissions) (n=2,773)		All cases (n=5,004)
	Falls VAED *n*	Non-falls VEMD *n*	Falls VEMD *n*	Non-falls VEMD *n*	*n* (%)
Frequency	2197	34	2464	309	5004(100)
Gender (n=4988)					
Male	1776	30	2001	246	4053(81)
Female	421	4	449	61	935(19)
Age (n=5001)					
0-14	47	4	98	24	173(4)
15-29	142	2	335	67	546(11)
30-44	371	17	667	108	1163(23)
45-59	698	7	740	69	1514(30)
60-74	659	0	505	33	1197(24)
75+	280	4	116	8	408(8)
Mean age	*54.8*	*39.6*	*46.6*	*39.3*	

Source: VAED (admissions) and VEMD (non-admissions)

Ladder-related fall injury

Ladder fall deaths (n=12-15; 6-8 per year)

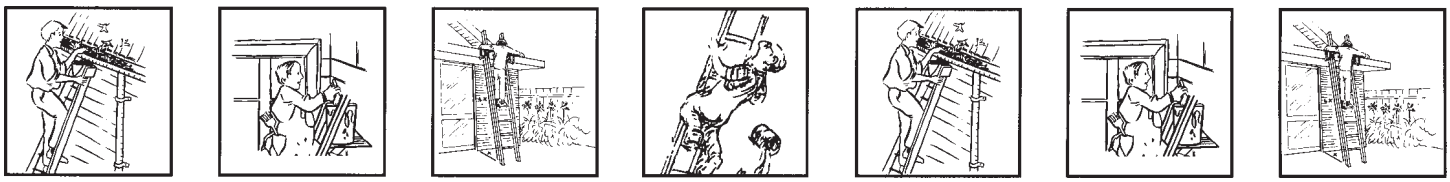
During 2002 and 2003, there were 12 ladder fall deaths recorded on ABS-DURF and 15 cases recorded on NCIS from reports to the Victorian Coroners Office. The difference in case numbers is the result of differences in the period in which the death is registered and uncertainty about the circumstances of the fall (some unwitnessed fall deaths recorded on NCIS may have been from the roof or other high structure rather than from the ladder in use at the time of death). The lack of detail on ABS-DURF makes it impossible to fully reconcile cases.

Most fatalities recorded on both systems were the result of head trauma. All were male. The 12 decedents recorded on the ABS-DURF were aged between 37 and 83 years, with a mean age of 65.3 years, two-thirds of whom were aged 60 years and older (n=8). Both data systems show that three fatalities occurred when the decedent was working for an income, the remainder (except one case recorded on NCIS) occurred in the decedent's home.

The NCIS narratives provide more detail on the circumstances of the ladder falls (Table 2). At least two of the three work-related cases involved unsafe ladder practices according to coronial findings. All fatal ladder injury cases that occurred in the home involved males aged in their 60s, 70s and 80s undertaking home maintenance (repairs, painting, cleaning out gutters) or gardening tasks (pruning, picking fruit). Because of their age and state of health many of the decedents should not have been working from a ladder at height. Several cases involved unsafe ladders/ scaffolding or unsafe ladder use practices.

Hospital-treated ladder fall injuries (n=4,661; yearly average 2,330)

Falls are the major cause of hospital-treated ladder injury. In total there were 4,661 ladder fall injury cases recorded on hospital injury surveillance databases over the two-year period July 2002 to June 2004: 2,197 hospital admissions recorded on the VAED; and 2,464



Details of ladder-related fatalities recorded on the NCIS (n=15 cases)

Table 2

Demographics	Circumstances of ladder-related death
Male aged in his 30s, working for an income (painting)	*The deceased, a self-employed painter, was contracted to paint fascia of building. He and his workmate constructed scaffolding and ladder structure to reach required height of 7.8m. Deceased was painting from ladder placed on scaffolding when workmate heard yell and witnessed scaffolding collapsing and deceased sliding down wall, then tip and fall head first to the ground. He lost consciousness and suffered cardiac arrest. Worksafe inspectors later determined that scaffolding had not been constructed correctly and did not comply with Australian Standards.*
Male aged in 40s, working for an income (carpentry repairs)	*The deceased was a self-employed carpenter, contracted to replace section of weatherboards and other maintenance on a two-storey residence. When the homeowner returned home, he found the deceased on the ground seriously injured. He either fell from the extendable ladder or the roof.*
Male aged in 40s, working for an income (painting)	*The deceased, a sub-contracted painter, was contracted to paint the fascia of a house under construction. After he failed to return home from work, family and police attended the construction site and found him on the ground with fatal injuries and a ladder lying underneath him. It appears that he was attempting to reach the mezzanine level by ladder and the ladder may have slipped due to sawdust on the concrete floor.*
Male, aged in his 70s, helping out at his son's place of business (structural alterations)	*The deceased was assisting at his son's place of business removing a flue from the ceiling. He had successfully lowered flue from the roof using a rope and was observed measuring hole in roof. The witness left the room and when he returned he found the deceased lying on the ground after apparently falling from the ladder.*
Male aged in his 60s, home maintenance	*The deceased was found lying on the floor by his wife. Workmen, who were at the house earlier, told her that they had seen him climbing a ladder. A CT scan revealed a fracture of the skull and extensive subdural bleeding. The deceased had a history of insulin-related fits and complained of feeling unwell on the day of his death.*
Male aged in his 60s, home maintenance (fixing shade cloth)	*The deceased was helping his son put up shadecloth on his front verandah. When descending from the ladder from the roof he fell (possibly slipped) and landed on a tiled surface. He was transported to hospital unconscious and died from the head injuries he received in the fall.*
Male, aged in his 60s, home maintenance (working on roof)	*The deceased was located lying on the paving in the rear yard of his home, with a 4-5 metre ladder lying beside him in a position that indicated he had been working on the roof, which was four metres off the ground. He had suffered head injuries and a broken leg and died in hospital post-surgery. He had a history of falls.*
Male, aged in his 70s, pruning trees	*The deceased had been out pruning trees and was located lying on the ground with the ladder underneath him. He died after being conveyed to hospital by ambulance.*
Male, aged in 70s, home maintenance	*The deceased was found on his back on the concrete garage floor next to a workbench with a metal edging. In close proximity was a 1.1 metre twisted and broken metal ladder. It appeared that the deceased had fallen from the ladder and hit his head on the metal edge of the bench. He died later in hospital.*
Male, aged in his 80s, home maintenance (painting)	*The deceased fell from ladder while painting his garage door. He was on the second rung when he felt unwell and fell backwards lacerating his scalp. He had 10 sutures for the scalp wound. Neurological exam and CT scan were normal but he died later in hospital.*
Male aged in his 80s, activity not detailed	*The deceased fell from the second rung of a ladder, hitting his head on concrete. He did not lose consciousness or seek immediate medical assistance. Later that same evening, he was in intense pain and felt dizzy and vomited when being driven to hospital. After being assessed by doctor he lapsed into unconsciousness, a CT scan revealing a right subdural haematoma and subarachnoid haemorrhage. He later died.*
Male aged in his 80s, home maintenance (cleaning roof gutters)	*The deceased fell from ladder suffering serious head injuries. Police inspected the ladder and reported it was made of timber, was in a rickety condition and had fallen apart.*
Male, aged in his 70s, home maintenance (repairing roof)	*The deceased was repairing his roof. His wife found him lying on the concrete path below the roofline unconscious and bleeding.*
Male, aged in his 70s, picking olives	*The deceased, picking olives with his friend using two ladders tied to the tree from either side, fell from his ladder and struck his head on a paved path in his garden. He had undergone a procedure (to clear a blocked artery) 9 days prior to the accident and had been told not to over-exert himself for two weeks.*

Source: National Coroners Information System. Cases reported to the Victorian Coroners Office, published with the permission of the VCO.

Emergency Department presentations recorded on the VEMD. The VAED only identifies ladder falls, whereas the VEMD potentially can capture data on all causes of ladder injury in the case narrative. Available VEMD data (which are not complete) indicate that falls cause 97% of ladder injury admissions and 89% of E.D. presentations for ladder injury.

Yearly trend

Figure 1 shows the trend in hospital admissions for fall injury from ladders over the decade July 1994 to June 2004. To reduce the effect of year-to-year fluctuations, this analysis compares the 3-year average admission rates at the start of the decade to the 3-year average at the end:

- The all-person admission rate for ladder falls increased by 40% over the decade from 15.8 admissions per 100,000 in the period 1994/7 to 22.2 admissions per 100,000 in the period 2001/4.
- The male admission rate increased by 39% from 26.2/100,000 in the period 1994/7 to 36.3/100,000 in the period 2001/4.
- The female admission rate increased by 48% from 5.7/100,000 in the period 1994/7 to 8.4/100,000 in the period 2001/4.

Age and gender

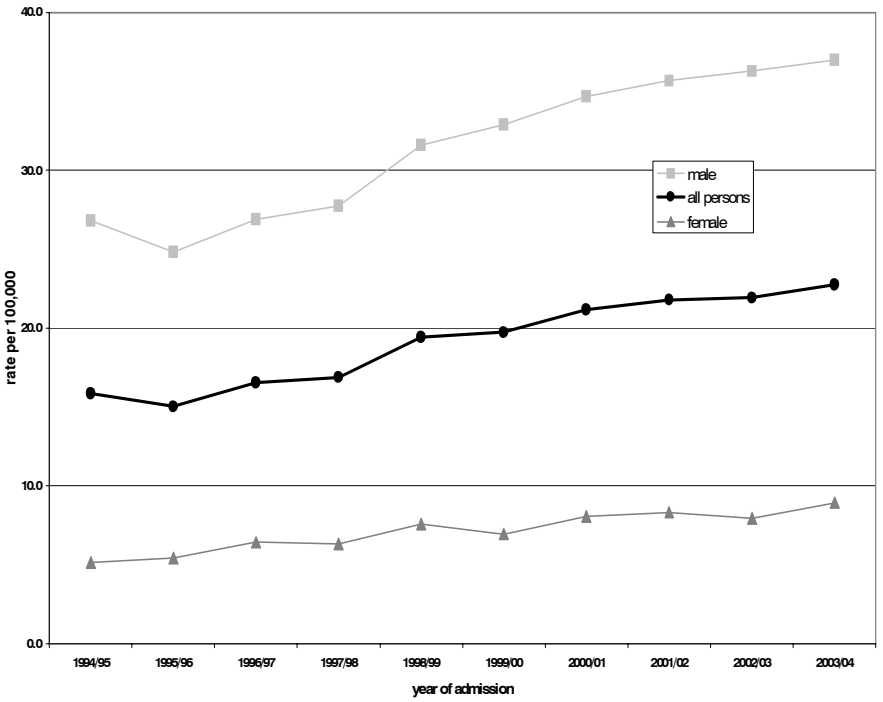
Figure 2 shows the average annual rate of ladder fall injury admissions by age and gender for the two-year period July 2002 to June 2004. The hospital admission rates increased almost exponentially up to the age of 74. Male hospital admission rates were higher than female rates in all age groups except 0-4 year olds, with the highest rates occurring in males aged 65 to74 years.

Pattern of injury

Table 1 summarises the frequency and pattern of hospital admissions and E.D. presentations for ladder fall injuries.

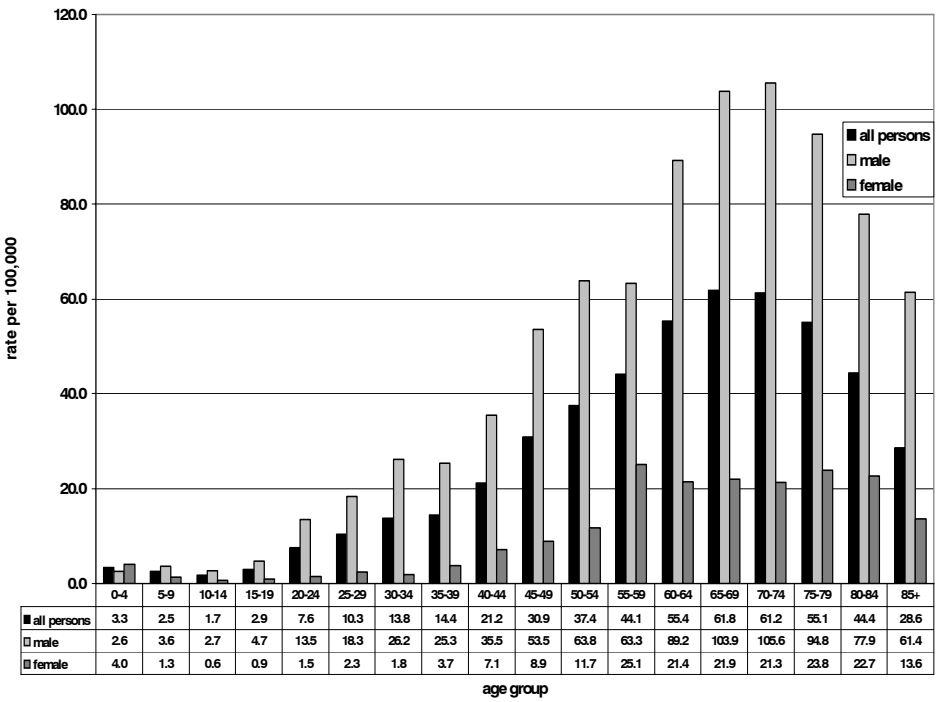
- Males account for 81% of both admissions and E.D. presentations, probably reflecting their higher exposure to ladder use.

Yearly trend in ladder fall injury admission rates by gender July 1994-June 2004 **Figure 1**



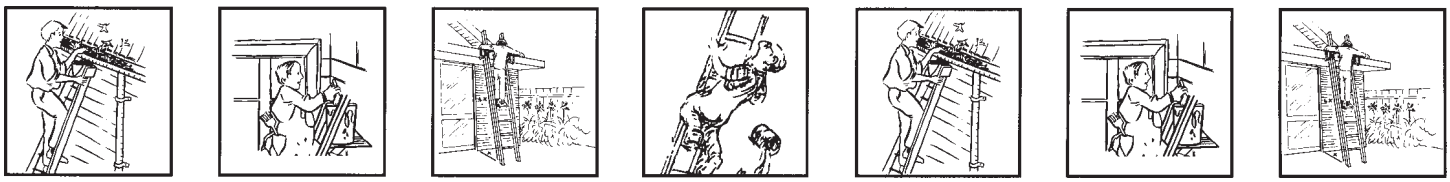
Source: VAED (admissions)

Average annual rate of ladder fall injury admission by age and gender July 2002-June 2004 **Figure 2**



	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
all persons	3.3	2.5	1.7	2.9	7.6	10.3	13.8	14.4	21.2	30.9	37.4	44.1	55.4	61.8	61.2	55.1	44.4	28.6
male	2.6	3.6	2.7	4.7	13.5	18.3	26.2	25.3	35.5	53.5	63.8	63.3	89.2	103.9	105.6	94.8	77.9	61.4
female	4.0	1.3	0.6	0.9	1.5	2.3	1.8	3.7	7.1	8.9	11.7	25.1	21.4	21.9	21.3	23.8	22.7	13.6

Source: VAED (admissions)



Frequency and pattern of hospital-treated ladder fall injury, July 2002-June 2004 Table 3

	Ladder fall admissions (*n*=2,197)		Ladder fall ED presentations (non-admissions) (*n*=2,464)		All Ladder fall hospital-treated injuries (*n*=4,661)	
	Frequency	***Proportion***	**Frequency**	***Proportion***	**Frequency**	***Proportion***
Gender						
Male	1,776	*80.8*	2,001	*81.2*	3,777	*81.0*
Female	421	*19.2*	449	*18.2*	870	*18.7*
Missing	0	*0*	14	*<1*	14	*<1*
Age						
0-14 years	47	*2.1*	98	*4*	145	*3.1*
15-29 years	142	*6.5*	335	*13.6*	477	*10.2*
30-44 years	371	*16.9*	667	*27.1*	1,038	*22.3*
45-59 years	698	*31.8*	740	*30.0*	1,438	*30.9*
60-74 years	659	*29.9*	505	*20.5*	1,164	*25.0*
75+ years	280	*12.7*	116	*4.7*	396	*8.5*
Missing	0	*0*	3	*<1*	3	*<1*
Mean age of injured persons	*54.8 years*		*46.6 years*		*50.5 years*	
Body site injured						
Head/face/neck	322	*14.6*	307	*12.5*	629	*13.5*
Trunk	569	*25.9*	416	*16.9*	985	*21.1*
Upper extremity	652	*29.7*	783	*31.8*	1,435	*30.8*
Lower extremity	622	*28.3*	705	*28.6*	1,327	*28.5*
Other specified body region	29	*<1*	210	*8.5*	239	*5.1*
Unspecified body region	13	*<1*	43	*1.7*	56	*1.2*
Nature of injury						
Fracture	1,365	*62.1*	700	*28.4*	2,065	*44.3*
Open wound	144	*6.6*	316	*12.8*	460	*9.9*
Intracranial injury	138	*6.3*	43	*1.7*	181	*3.9*
Dislocation, sprain & strain	109	*4.9*	696	*28.2*	805	*17.3*
Superficial injury	91	*4.1*	236	*9.6*	327	*7.0*
Injury to internal organ	44	*2.0*	3	*<1*	47	*1.0*
Injury to muscle & tendon	28	*1.3*	152	*6.2*	180	*3.9*
Injury to nerves & spinal cord	21	*1.0*	5	*<1*	26	*<1*
Other specified injury	64	*2.9*	209	*8.5*	273	*5.9*
Unspecified injury	193	*8.8*	104	*4.2*	297	*6.4*
Activity [1]	(*n*=1,278)					
Other types work- unpaid	549	*43.0*	360	*14.6*		
Working for income	333	*26.1*	467	*19.0*		
Leisure	4	*<1*	859	*34.9*		
Other specified	392	*30.7*	447	*18.1*		
Unspecified activity	N/A		331	*13.4*		
Location [2]	(*n*=1,153)					
Home	956	*82.9*	1,638	*66.5*		
Industrial & construction area	78	*6.8*	149	*6.0*		
Trade & service area	37	*3.2*	246	*10.0*		
School, public building	21	*1.8*	13	*<1*		
Farm	15	*1.3*	21	*<1*		
Residential institution	10	*<1*	5	*<1*		
Other specified places	36	*3.1*	171	*6.9*		
Unspecified places	N/A		221	*9.0*		
Length of stay						
Less than 2 days	1,012	*46.1*	N/A	*N/A*	N/A	*N/A*
2-7 days	827	*37.6*	N/A	*N/A*	N/A	*N/A*
8-30 days	324	*14.7*	N/A	*N/A*	N/A	*N/A*
31+ days	34	*1.5*	N/A	*N/A*	N/A	*N/A*

Source: VAED (admissions) and VEMD (non-admissions)

Notes: (1) In more than 40% of admitted cases the activity when injured was not specified. Analysis of activity for admissions excludes cases coded to 'unspecified activity'.

(2) In almost half of admitted cases the location was not specified. Analysis of location for admissions excludes cases coded to 'unspecified location'.

(3) The 'leisure' code on the VEMD is used as a default code in some hospital systems. It is likely that a large part of the 34% of cases coded to 'leisure' should have been coded to 'Other types of work-unpaid', which covers home maintenance and gardening.

- Persons aged 60 years and older were more likely to be admitted to hospital than their younger counterparts. Forty-three percent of hospital admissions for ladder fall injuries were in this age group compared to 25% of E.D. presentations (non-admissions). The mean age of admitted persons was 55 years compared with 47 years for non-admitted persons.

- The pattern of injury across body sites was similar among admitted and non-admitted hospital-treated cases with injuries to the upper and lower extremity predominating (60%). Trunk injuries formed a higher proportion of admissions than E.D. presentations (26% v. 17%).

- Fracture was the most common injury, accounting for 62% of admissions and 28% of E.D. presentations (non-admissions). Dislocations, sprains and strains were more frequent among E.D. presentations (28%) than admissions (5%).

- Most ladder fall injuries occurred in the home – four-fifths of admitted cases and two-thirds of E.D. presentations. (These figures include a small proportion of cases that were engaged in paid work in other person's homes e.g. tradesmen and cleaners.)

Ladder fall injury by setting

For this analysis, ladder fall injury admissions and E.D. presentations were grouped according to the injury setting (home, workplace and 'other and unspecified' settings). Over three times as many persons were injured in ladder falls in their own or another person's home (n=2,549[1]) than in their place of work (n=800). A further 1,312 ladder fall cases were injured in 'other and unspecified settings'.

Table 3 summarises and compares the pattern of hospital admissions and E.D. presentations for ladder fall injuries by setting.

- Males comprised a higher proportion of persons injured while doing paid work (92% of both admissions and E.D. presentations) than persons injured in the home (76% and 78%) or in other and unspecified settings (82% for both groups).

- Persons injured in ladder falls in their workplace were on average younger (mean age admitted persons 43 years and non-admitted persons 38 years) than persons injured in the home (mean ages 61 years and 49 years) or in 'other and unspecified settings' (mean ages 53 years and 44 years).

- The pattern of injury in relation to body site injured was similar across the three settings, except that injuries to the trunk region were more common and upper extremity injuries less common among admitted cases that occurred in the home compared with other settings.

- There was little difference in the type of injury by setting. The most common injury among admissions was fracture, accounting for between 58% and 62% of all injury admissions for ladder falls. Fractures and dislocations/sprain/strain consistently accounted for around 56% of E.D. presentations across the three locations.

- Persons injured at home had the longest mean length of stay in hospital (5.2 days) compared with persons injured in their workplace and in other and unspecified settings (both 3.8 days). Persons injured in the home were generally older and therefore more vulnerable to injury.

Note: [1] Cases that occurred in the home but activity was working for income were excluded (n=45).

Ladder falls in the home (n=2,549 hospital-treated injuries, average annual frequency n=1,275)

Over the two-year period July 2002-June 2004 there were 935 admissions and 1,614 E.D. presentations to Victorian hospitals for ladder fall injuries that occurred in the home (Table 4).

Gender and age

Males were overrepresented in home ladder fall injury cases (77%, n=1,970 hospital-treated injuries). Admitted persons were, on average, much older than non-admitted persons (mean age 60 years for admissions compared with 50 years for non-admissions).

Activity

The specific activity the person was engaged in at the time of injury was poorly coded in both datasets. Examination of useful VEMD narratives identified that ladder fall injuries occurred during the following outdoor and indoor activities:

- outdoor activities- cleaning gutters, painting, engaging in other maintenance of the home and gardening including pruning.
- indoor activities- painting, changing light bulbs, hanging pictures, cleaning and plastering.

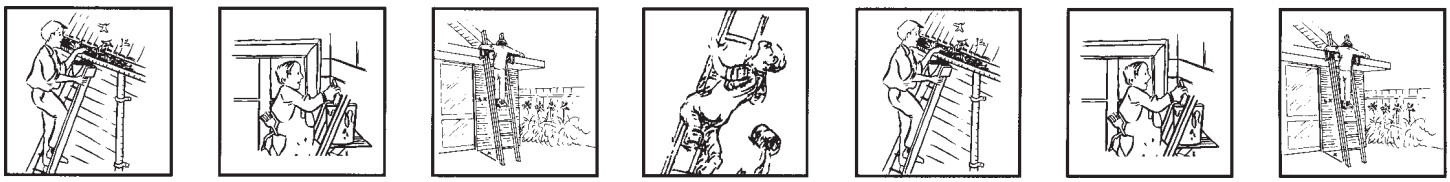
Injury type and body site

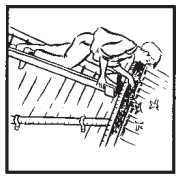
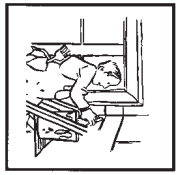
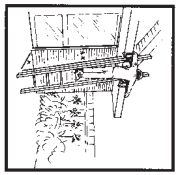
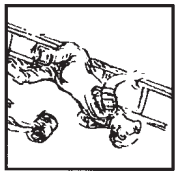
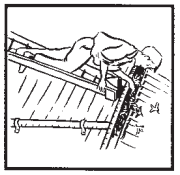
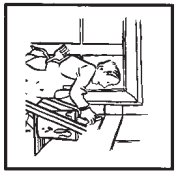
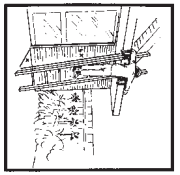
The most commonly occurring hospital-treated injuries were:

- upper extremity fracture (17%, n=427);
- lower extremity fracture (14%, n=350);
- fracture to the trunk region (10%, n=257);
- lower extemity dislocations, sprains and strains (7%, n=183); and
- upper extemity dislocations, sprains and strains (7%, n=168).

Detailed circumstances of injury

Examination of available narrative data identified some common mechanisms of injury for home ladder falls including ladder slide out (where the top of the



Breakdown of hospital-treated ladder fall injury by setting, July 2002-June 2004

Table 4

	Ladder falls in the home [1]				Ladder falls in the workplace				Ladder falls in other and unspecified settings			
	Admissions (*n* =935)		Presentations, non-admissions (*n* =1,614)		Admissions (*n* =333)		Presentations, non-admissions (*n* =467)		Admissions (*n* =929)		Presentations, non-admissions (*n* =383)	
Gender												
Male	712	*76.1*	1,258	*77.9*	305	*91.6*	430	*92.1*	759	*81.7*	313	*81.7*
Female	223	*23.9*	342	*21.2*	28	*8.4*	37	*7.9*	170	*18.3*	70	*18.3*
Missing	0	*0*	14	*<1*	0	*0*	0	*0*	0	*0*	0	*0*
Age group												
0-14 years	16	*1.6*	67	*4.1*	0	*0*	1	*<1*	31	*3.4*	30	*7.8*
15-29 years	22	*2.4*	132	*8.2*	61	*18.3*	141	*30.2*	59	*6.3*	62	*16.2*
30-44 years	104	*11.1*	401	*24.8*	110	*33*	172	*36.8*	157	*16.9*	94	*24.5*
45-59 years	252	*26.9*	508	*31.5*	125	*37.5*	125	*26.8*	321	*34.6*	107	*27.9*
60-74 years	349	*37.4*	405	*25.1*	34	*10.2*	28	*6*	276	*29.8*	72	*18.8*
75+ years	192	*20.5*	101	*6.3*	3	*<1*	0	*0*	85	*9.2*	18	*4.7*
Mean age		*60.5 years*		*49.6 years*		*42.9 years*		*38.4 years*		*53.4 years*		*43.9 years*
Body site injured												
Head/face/neck	141	*15.1*	213	*13.2*	59	*17.7*	44	*9.4*	122	*13.1*	50	*13.1*
Trunk	288	*30.8*	271	*16.8*	63	*18.9*	83	*17.8*	218	*23.5*	62	*16.2*
Upper extremity	231	*24.7*	515	*31.9*	119	*35.7*	150	*32.1*	302	*32.5*	118	*30.8*
Lower extremity	264	*28.2*	441	*27.3*	87	*26.1*	143	*30.6*	271	*29.2*	121	*31.6*
Multiple body sites	N/A		105	*6.5*	N/A		29	*6.2*	N/A		26	*6.8*
Other specified body site	2	*<1*	36	*2.2*	2	*<1*	10	*2.1*	2	*<1*	4	*1*
Unspecified body site	9	*<1*	33	*2*	3	*<1*	8	*1.7*	14	*1.6*	2	*<1*
Nature of injury												
Fracture	598	*64*	476	*29.5*	193	*58*	118	*25.3*	574	*61.8*	106	*27.7*
Open wound	64	*6.8*	218	*13.5*	20	*6*	49	*10.5*	60	*6.5*	49	*12.8*
Intracranial	63	*6.7*	30	*1.9*	28	*8.4*	9	*1.9*	47	*5.1*	4	*1*
Dislocation, sprain & strain	35	*3.7*	442	*27.4*	30	*9*	147	*31.5*	44	*4.7*	107	*27.9*
Superficial	40	*4.3*	146	*9*	10	*3*	49	*10.5*	41	*4.4*	41	*10.7*
Injury to internal organ	26	*2.8*	2	*<1*	1	*<1*	1	*<1*	17	*1.8*	0	*0*
Injury to muscle/tendon	6	*<1*	97	*6*	4	*1.2*	28	*6*	18	*1.9*	27	*7*
Injury to nerves & spinal cord	8	*<1*	0	*0*	7	*2.1*	1	*<1*	6	*<1*	1	*<1*
Multiple nature of injury	3	*<1*	48	*3*	1	*<1*	7	*1.5*	1	*<1*	9	*2.3*
Other specified nature of injury	17	*1.8*	96	*5.9*	5	*1.5*	33	*7.1*	31	*3.3*	19	*5*
Unspecified nature of injury	67	*7.2*	59	*3.7*	34	*10.2*	25	*5.4*	90	*9.7*	20	*5.2*
Length of stay												
Less than 2 days	366	*39.1*	N/A		180	*54.1*	N/A		466	*50.2*	N/A	
2-7 days	370	*39.6*	N/A		111	*33.3*	N/A		346	*37.2*	N/A	
8-30 days	180	*19.3*	N/A		39	*11.7*	N/A		105	*11.3*	N/A	
31+ days	19	*2*	N/A		3	*<1*	N/A		12	*1.3*	N/A	
Mean length of stay		*5.2 days*		*N/A*		*3.8 days*		*N/A*		*3.8 days*		*N/A*

Source: VAED (admissions) and VEMD (non-admissions).

Note: (1) Excludes 45 injury cases that occurred in the home but the activity was given as working for income

ladder slides down the wall when the base of the ladder slides away from it), user slip or misstep, user loss of balance and ladder malfunction.

Ladder instability (slide out and sideways tilting):

- *Presented following fall from a ladder from roof level, ladder slipped in the wet and fell straight back on him.*
- *Male who has slipped off ladder, ladder fell away and he was left hanging approx 12 feet by his arm.*
- *In the garden cleaning gutters, injury caused when ladder slipped and he fell off.*

User slip or misstep:

- *Location back yard, climbing ladder caused by lost balance when he missed the step.*
- *Outside pruning roses fell off ladder when missed rung.*
- *In the garden doing home renovations, injury caused when he slipped from ladder.*

User loss of balance:

- *In the backyard cleaning the gutter, fell forward from ladder.*
- *In the garage on a ladder putting chairs in the roof, lost balance when climbing the ladder.*
- *In the yard, up a ladder painting, lost balance and fell.*

Ladder fault/malfunction:

- *Patient on stepladder that broke, fell hard onto both feet, unable to weight bear since.*
- *Outside doing hammering, caused by ladder rung broke and he slipped.*
- *Sore left lower leg after 6 feet fall from roof after ladder collapsed.*

Admissions: Length of stay

Thirty-nine percent of admitted persons (n=366) stayed in hospital for less than 2 days, 40% for between 2 and 7 days (n=370) and 19% for between 8 and 30 days (n=180). The average length of stay in hospital was 5.2 days (Table 4).

The following are descriptions of injuries and treatment for three of the most serious cases constructed from coded data on the VAED:

- *Person aged in their 60s had a 3 month hospital stay after sustaining intracranial injuries, and multiple fractures of the skull, facial bones and ribs. The injury was a result of a fall from a ladder in the home. The injuries required allied health interventions such as occupational therapy, social work, physiotherapy, psychology and speech pathology.*

- *Person aged in their 40s, sustained multiple injuries after falling from a ladder at home. Injuries included; complete lesion of thoracic spinal cord, multiple open wounds of the head and multiple fractures of the thoracic vertebra, the base of the skull and the ribs. These injuries required a hospital stay of many months. Procedures she required included spinal surgery involving an open reduction of fractures and dislocations of the spine, blood transfusions, multiple brain scans and multiple allied health interventions including, but not limited to, physiotherapy, social work, occupational health and dietetics.*

- *Person aged in their 40s had a hospital stay of nearly 4 weeks after sustaining the following injuries; traumatic haemothorax, fractured scapular, multiple rib fractures and fractures of the lumbar vertebrae at levels 1, 2 and 3. The injury was a result of a fall from a ladder in the home. These injuries required extensive surgery and many allied health interventions such as occupational therapy, social work, pharmacy and physiotherapy.*

Ladder falls in the workplace (n=800 hospital-treated injuries, average annual frequency n=400)

Over the two-year period July 2002-June 2004 there were 333 admissions and 467 E.D. presentations to Victorian hospitals for ladder fall injuries that occurred in workplaces (when the injured person was working for income) (Table 4).

Gender and age

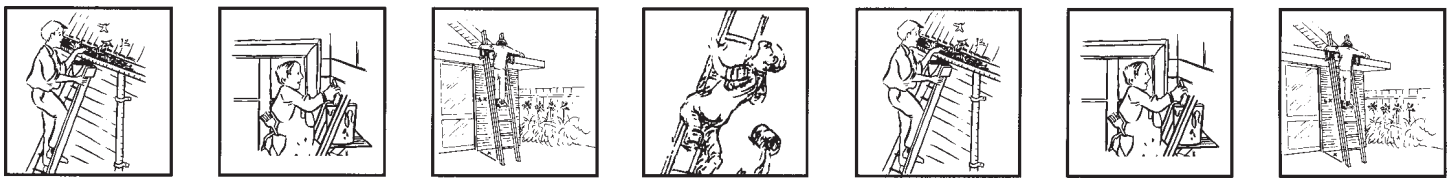
Males were grossly over-represented in workplace-related ladder fall injury cases (92%, n=735 hospital-treated injuries). Cases were fairly evenly spread across 15-year age groups from age 15 to age 59. On average, admitted cases tended to be a few years older than non-admitted cases (Mean age 42.9 years for admissions years cf. 38.4 years for non-admissions).

Industry involved

Data on industry in which the injury occurred was poor. One-third of admitted cases were not coded for industry (33%, n=111) and an additional 27% were coded to 'other specified industry' (n=91). Of cases given a specific code (n=142), construction (54% of specified cases, n=71), agriculture/forestry/fishing (16%, n=21) and wholesale/retail (12%, n=16) accounted for most of the specified cases. Information on the occupation/ industry of injured person was not generally included in narrative data for E.D. presentations (non-admissions). Industries mentioned included building, construction, factory work, plastering and painting.

Specific location of injury event

There is sparse information on the specific location of these incidents. Half of all workplace ladder falls admissions recorded on the VAED were coded to 'unspecified location' (n=168). Of the remaining admissions (n=165), 41% (n=56) occurred in industrial and construction areas, most commonly construction areas and factories, 18% (n=29) occurred in trade and services areas, most commonly shops and stores,



and 13% occurred in private home while the person was working for an income (n=21). Few VEMD narratives gave information on the specific location of the ladder fall injury event.

Injury type and body site
The most commonly occurring hospital-treated injuries were:

- upper extremity fracture (18%, n=146);
- lower extremity fracture (12%, n=99);
- dislocation, sprains and strains of the lower extremity (9%, n=74); and
- fractures to the trunk region (7%, n=55).

Contributory factors/circumstances of injury
Examination of narratives identified the same common mechanisms of injury for workplace-related ladder falls as for ladder falls in the home, namely ladder slide out (where the top of the ladder slides down the wall whilst the base of the ladder slides away from it), user slip or misstep, user loss of balance and ladder malfunction. Lack of a safety latch on the ladder was also mentioned in a few narratives.

Admissions: Length of stay
Fifty-four percent of admitted persons (n=180) stayed in hospital for less than 2 days, 33% for between 2 and 7 days (n=111) and 12% for between 8 and 30 days (n=12). The average length of stay in hospital was 3.8 days. The following are descriptions of injuries and treatment for three of the most serious cases constructed from coded data on the VAED:

- *Person aged in their 40s sustained multiple fractures and dislocation of vertebra with a complete lesion of the spinal cord resulting in paraplegia. These injuries occurred in a fall from a ladder while working for income and required a hospital stay of 3 months. Injuries required open reduction of fractures and dislocations of the spine, and internal fixation of the spine. Multiple allied health interventions such as occupational therapy, social work, physiotherapy, dietetics, psychology and speech pathology were also required.*

- *Person aged in their 50s, sustained multiple injuries after falling from a ladder while working in construction. Some of the more serious injuries included: a focal brain injury, multiple fractures of the femur, multiple facial fractures (including the jaw) and multiple fractures and dislocations of the foot, humerus and radius. These injuries required a hospital stay of several weeks and treatments and procedures such as reduction of fracture of the pelvis, open reduction of fracture of humerus, open reduction of fracture of foot, hyperbaric oxygen therapy and multiple allied health interventions including physiotherapy and occupational health assessment.*

- *Person aged in their 50s had a 2 week hospital stay after sustaining a fractured heel and injuries to the tibial artery and the lateral plantar nerve. The injury was a result of a fall from a ladder when working for income in the manufacturing industry. Treatments involved surgery to reduce the fracture and internal fixation was required.*

'Other and unspecified' ladder falls (n=1,312 hospital-treated injuries, average annual frequency n=656)

Over the two-year period July 2002-June 2004 there were 929 admissions and 383 E.D. presentations to Victorian hospitals for ladder falls that occurred in other and unspecified settings (Table 4).

Frequency, age and gender
Males were also over-represented in ladder fall cases (82%, n=1,072 hospital-treated injuries). Admitted persons were, on average, approximately 10 years older than non-admitted persons (mean age of admitted persons 53.4 years cf. mean age on non-admitted persons 43.9 years).

Injury type and body site

- The most commonly occurring hospital-treated injuries were:
- upper extremity fracture (21%, n=278);
- lower extremity fracture (17%, n=227); and
- fractures to the trunk region (12%, n=155).

Activity and location
Analysis of these variables produced no reliable information on the location of these incidents and the activity being engaged in at the time of injury due to missing data.

Admissions: Length of stay
Half of admitted persons (n=466) stayed in hospital for less than 2 days, 37% for between 2 and 7 days (n=346) and 11% for between 8 and 30 days (n=105). The average length of stay in hospital was 3.8 days.

Other (non-fall) causes of ladder injury

The VEMD was used to source data on non-fall ladder injuries for both admissions and E.D. presentations, as there are no codes to capture ladder injuries from causes other than falls in the VAED. There were 343 identified non-fall ladder injury presentations to Victorian emergency departments over the two-year period July 2002-June 2004, 34 admissions and 309 E.D. presentations, non-admissions (Table 5). The major non-fall causes of hospital treated ladder injuries were struck by/collisions with object (51%) and cutting/piercing (22%).

Major causes of other hospital-treated ladder injuries excluding falls, July 2002-June 2004 **Table 5**

Injury cause	Departure Class: Admissions n	Admissions %	Presentations, non-admissions n	Presentations, non-admissions %	Total n	Total %
Struck by collision with object	13	*38.2*	163	*52.8*	176	*51.3*
Cutting/piercing object	11	*32.4*	66	*21.4*	77	*22.4*
Other specified external causes	7	*20.6*	63	*20.4*	70	*20.4*
Unspecified causes	3	*8.8*	17	*5.5*	20	*5.8*
Total	**34**	***100.0***	**309**	***100.0***	**343**	*100.0*

Source: VEMD July 2002-June 2004, admissions and non-admissions included

Ladder injuries caused by struck by/collision with object (n=176)

More than three-quarters of ladder injuries caused by struck by/collision with objects occurred among persons aged between 15 and 59 years (78%, n=138), particularly those aged 30-44 years (n=66). The overall male: female ratio was 75:25 and males were over-represented in all 15-year age groups except 75 years and older.

The most frequently injured body site was the head (21%, n=37), followed by the hand (15%, n=27), foot (10%, n=18) and face (10%, n=18). The most common specific injuries were open wounds of the head (11%, n=20), sprains and strains of the lower extremity (7%, n=12), open wounds of the hand (6%, n=11), fractures of the wrist and hand (6%, n=10), and open wounds of the lower leg and foot (6%, n=10).

Forty-five percent of injuries occurred in the home (n=79) and 22% occurred in trade or service areas (n=38). Only 7% of struck by/collision with ladder injury cases were admitted to hospital (n=13).

The following narratives detail the circumstances of some of the more serious injuries (admitted cases):

- *Up a ladder with a chainsaw fell off the ladder and landed on left wrist, then fell on running chainsaw and lacerated right forearm*
- *Felling tree, branch fell onto ladder pinning leg between ladder and tree*

Some descriptions seem to indicate that the ladder may have been faulty or that design solutions could be sought to reduce these injuries:

- *Caught right arm in folding ladder, fractured radius and ulna*
- *Laceration to left middle finger, jammed between ladder*
- *Laceration to left leg while climbing up metal step-ladder*

Ladder injuries caused by cutting and piercing (n=77)

Nearly two-thirds of ladder-related cutting and piercing injuries occurred to person aged between 25 and 54 years (65%, n=47), particularly those aged 35-49 years (n=30). Ninety-four per cent of injury cases were males. The most common specific injuries were open wounds of the hand (38%, n=29), forearm (10%, n=8) and lower leg (10%, n=8). Sixty-eight percent of injuries occurred at home (n=52) and 14% of injuries required admission to hospital (n=11).

Narratives detailing circumstances of some of the more serious injuries (admitted cases):

- *1 metre fall from ladder landing on knees both arms through glass, lacerations to left and right arms, left arm laceration to belly of muscle*
- *Partial amputation/avulsion to left middle finger in step ladder*
- *Fell off ladder landing on plate glass window causing lacerated ulna artery*

Some descriptions indicated that the ladder may have been faulty or that design solutions could be sought to reduce these injuries:

- *Working up a ladder that collapsed (multi-joint ladder), patient caught hold of fixed metal ribbon cutting ungloved hand*

Ladder injuries by other and unspecified causes (n=90)

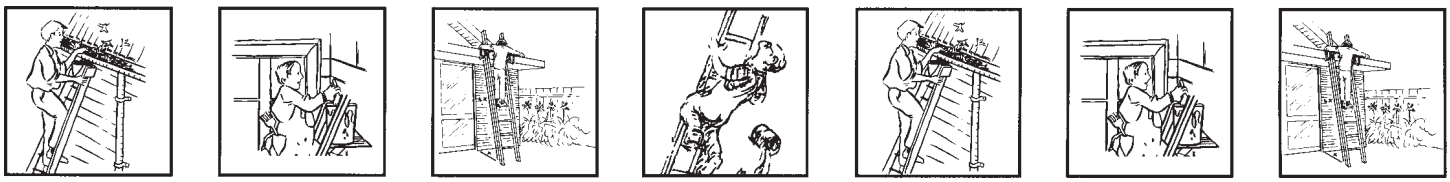
Just over half of the cases classified under 'other and unspecified' causes were aged between 25 and 49 years (57%, n=51). Males were over-represented (73%). The most frequently injured body site was the hand (18%, n=16), followed by the ankle (13%, n=12) and knee (12%, n=11). The most common specific injuries were sprains and strains of the ankle (9%, n=8), and the knee (7%, n=6) and open wounds of the hand (7%, n=6).

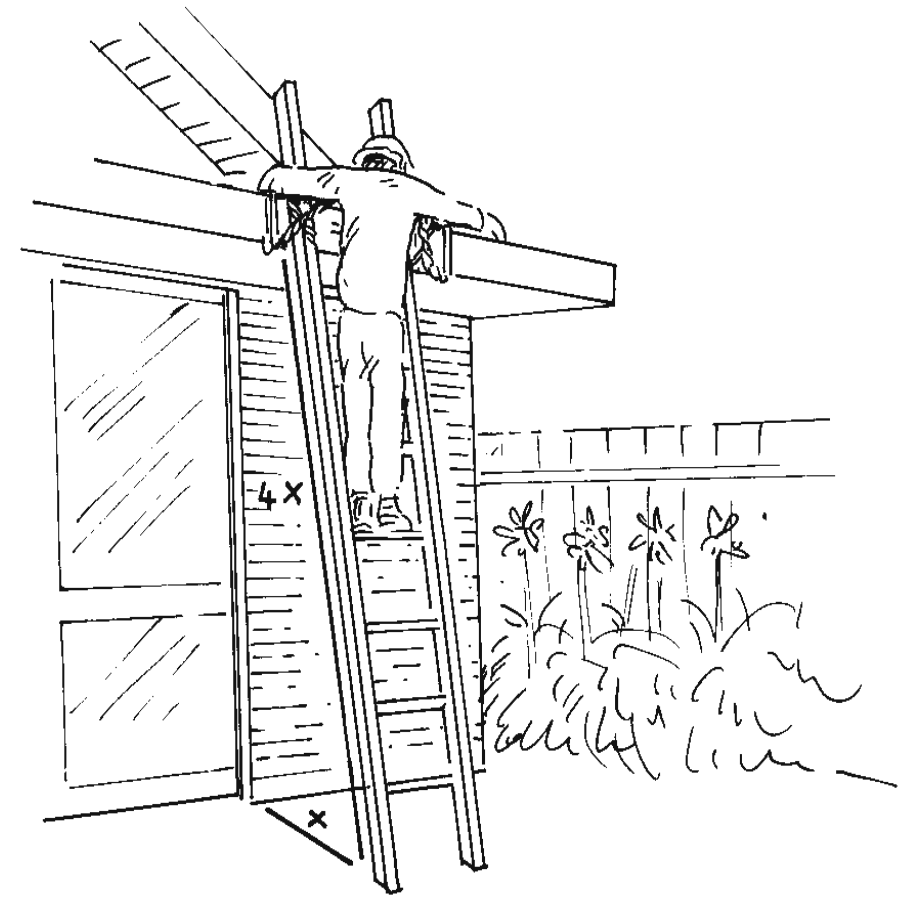
Forty-seven percent of injuries occurred at home (n=42) and 22% occurred in trade or service areas (n=20). Eleven percent of injuries required admission to hospital (n=10).

Discussion

Ladders are associated with a considerable number of fall from height injuries that require hospital treatment each year in Victoria. Recent data indicate that on average there are at least 6 fatalities and 2,500 hospital-treated ladder injuries each year in Victoria.

All 12 fatalities recorded in 2002 and 2003 and 93% of the 5,000 hospital-treated injury cases recorded over the two-year period 2002/3 to 2003/4 were caused by falls.





Between 1994 and 2004, the hospital admission rate for ladder fall injuries increased by 40%. Older males were over-represented in ladder fall injury cases. Eight of the twelve ladder-related fatalities recorded on the ABS-DURF (67%) were males aged 60 years and over, and all these cases were due to falls from ladders that occurred in the home. There was also significant representation of persons aged 60 years and older among hospitalisations (43%) and E.D. presentations (25%) for ladder fall injuries. Most of these cases occurred in the home. The average age of ladder fall injury hospitalisations was 55 years compared to 47 years for E.D. presentations.

Tsipouras et al (2001) reported similar findings from a case series of 163 patients with occupational and non-occupational ladder-related injury who presented to the emergency department of the Austin Hospital in Melbourne between 1994 and 1997. Cases were predominantly male (83%) and the mean age in years of non-occupational ladder injury cases was 52 years compared with a mean age of 36 years for occupational ladder injury cases. In the only other published Australian study that reported on ladder injury, Driscoll et al. (2003) utilised Coroners' records from 1989-92 to identify and study 296 fatal incidents arising from unpaid work at home ("home duties deaths"). The authors commented that elderly persons, usually males, were most commonly involved in the fatal home duties incidents that involved ladder use (n=~53 cases). Some overseas case series also report over-representation of older males in home ladder injury cases (Faergemann & Larsen, 2000; Faergemann & Larsen, 2001; Muir & Kanwar, 1993)

Although the data on location of injury in our study was incomplete, the available data indicated that 71% of ladder-related injuries occurred in the home, mostly when the householder was doing indoor and outdoor home maintenance, gardening (including pruning) and cleaning tasks. Tsipouras et al. (2001) also reported a high proportion of home ladder injuries (78%) and a similar set of documented reasons for using the ladder in non-occupational settings: home maintenance including repairs, cleaning gutters and painting (51%); gardening, including picking fruit and pruning (19%); and 'other' (30%). Other published small retrospective studies of serious ladder injuries presenting to hospitals or fracture clinics in Sweden, Denmark, the U.K. and the U.S. report smaller proportions of ladder injuries occurring in the home, ranging between 50% and 68% (Bjornstig & Johnsson, 1992; Faergemann et al., 2001; Muir & Kanwar, 1993; Partridge et al, 1998).

Older persons (aged 65 years and older) should be discouraged from climbing ladders to do home maintenance tasks. An important approach to achieving a downturn in ladder injury among this age group is the provision of alternative reliable and low-cost home maintenance services for tasks performed at height. In a recent qualitative study, MUARC researchers conducted 15 focus groups involving 118 persons aged 60 years and older in two Melbourne communities to explore their level of involvement and motivations for engaging in Do-It-Yourself (DIY) home maintenance tasks (Ashby et al., 2005). The motivations for doing DIY tasks ranged from necessity (for economic reasons) to personal preference to enhance fitness levels, and for the satisfaction and pride that came with successfully completing DIY tasks. Knowing when to give up DIY tasks appeared to be a complex and emotive issue.

This study, the Austin hospital case series and overseas studies all report that the extremities were most commonly injured, most frequently resulting in sprains and fractures of the wrist, ankle or foot (Muir & Kanwar 1993; Tsipouras et al. 2001; Faergemann & Larsen, 2001; O'Sullivan et al., 2004;). Precise height of fall data were available for 139 of the 163 Austin Hospital ladder injury cases.

Fall heights ranged from 0-6 metres with a mean of 2.1 metres (2.6 metres for occupational and 2.0 metres for non-occupational ladder cases). Multiple regression analyses performed by the authors showed that injury severity increased significantly with increasing height of the fall, and increasing age ($P<0.05$ for both).

Although the mechanisms of injury were not well or consistently reported in the VEMD case narratives analysed for our study, they appear similar to those commonly reported in the research literature. Mechanisms include ladder slide out and sideways tilting; user slip, trip or misstep; user loss of balance including backward falls; and ladder or ladder support collapse (Bjornstig & Johnsson, 1992; Hakkinen, 1988; Faergemann & Larsen, 2001; Tsipouras et al. 2001).

A number of preventive measures to address ladder falls have been suggested and some have been implemented, however no publications were found evaluating the effectiveness of any ladder injury prevention measure. One implemented measure is the use of a 'stay' or a 'stand-off' that can be bolted to the existing ladder and used against surfaces that are too brittle or weak to support the top of the ladder (such as gutters or plastic features). Other safety design features incorporated into portable ladders include improved non-slip rubber tread for ladder footings, a wooden/metal crossbar for extra support at the top of the ladder, and angled rungs that lie horizontally (and feel more comfortable) when the ladder is positioned correctly. Slip-resistant rung covers are available commercially and study authors also suggest that ladders should be constructed in such a way that they are automatically placed at the optimal touching angle, an inclination of approximately 1:4 (Bjornstig & Johnsson, 1992).

Safe design and manufacture of portable ladders and guidance on their safe use and care are addressed in the Australian and New Zealand four-part Standard for Portable Ladders (AS/NZS 1892). Compliance with the Standard by manufacturers is voluntary. The Standard specifies the minimum safety requirements for the design and manufacture of portable metal (AS/NZS 1892.1:1996), timber ladders (AS/NZS 1892.2:1992) and reinforced plastic ladders (AS/NZS 1892.3:1996) rated for industrial or domestic use including test methods, and it provides a set of guidelines for the selection, safe use and care of portable ladders (AS/NZS 1892.5:2000). Portable ladders - Part 6: Other materials, is currently in preparation (DR 05081) to cover alternatives to traditional materials, including laminated timber stiles, which are becoming more common. The Standards for metal and reinforced plastic portable ladders are also currently under revision, mainly to clarify points in the test method (Standards Australia, 2002). AS/NZS 1892 does not cover ladder accessories such as ladder levellers, stabiliser or standoff devices, ladder jacks, straps or hooks.

The guidelines in the Standard and authors of research articles consistently recommend a number of safe practices for ladder use including:

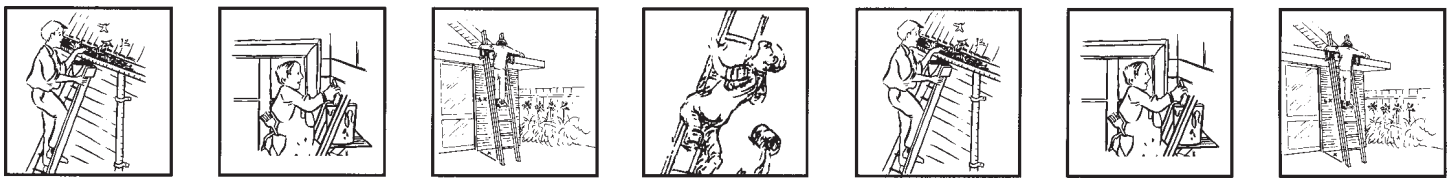
- having someone stand at the base of the ladder to both brace the ladder and observe the climber;
- securing the ladder by tying the ends to structures;
- avoiding dangerous behaviour such as over-reaching, carrying excessive loads or moving the ladder during ascent; and, importantly,
- pitching the ladder so that the angle of the ladder is no steeper than 4 units of height per unit of width.

There is disagreement in the literature on the optimal angle of placement of the ladder with laboratory experiments indicating that the often recommended angle of 76° relative to the ground (Bjornstig & Johnsson, 1992) is too steep and that an angle between 66° and 70° provides greater resistance to both slipping and climber instability (Hakkinen, 1988). In the United States, ladders are designed and tested on an angle of 75.52°, which is also recommended as the limiting ladder set-up angle to avoid slide out (Barnett, 1996; Switalski & Barnett, 2003). The guidelines in the Australian Standard endorse the 1:4 pitch angle 'rule of thumb'—the horizontal distance between the support point of the ladder and foot of the ladder is approximately one quarter of the supported length of the ladder. (See diagram)

Available data indicated that about 20% of hospital-treated ladder injury cases in our study were injured in the workplace, similar to the proportion reported from the Austin Hospital case series (22 %) but less than reported in overseas studies (33-53%) (Bjornstig & Johnsson, 1992; Muir & Chester, 1993; Partridge et al., 1998; O'Sullivan et al, 2004). Prevention of injuries from falls from height is a current priority of WorkSafe Victoria (WorkSafe, 2005). The failure of industry-based guidelines to prevent falls from height resulted in WorkSafe and the Victorian government switching to a regulatory approach.

The Occupational Health and Safety (Prevention of Falls) Regulations were passed in Victoria in 2003 and apply to fall hazards of more than 2 metres. Under the new regulations, ladder use to undertake tasks at height is not prohibited but ladder use is placed in the lowest level of the hierarchy of control of falls risks, behind undertaking work on the ground or on a solid platform; undertaking work using a passive fall prevention device (e.g. temporary work platform, scaffolding roof safety mesh or guard railing); undertaking work using a work positioning system (e.g. industrial rope access system or a travel restraint system that enables a person to be positioned and safely supported at a work location); and undertaking work using a fall injury prevention system (e.g. industrial safety net or catch platform) (WorkSafe, 2005).

Employers are advised that ladders may only be used until a safer alternative is available and that new and practical alternatives are appearing frequently in response to the need to prevent injurious falls and to the new regulations. Where tasks must be done with a ladder and there is a risk of falling more than two metres, the law now requires that a risk assessment of the task must be undertaken and that



workers are provided with sufficient information, instruction and training to enable them to work safely (WorkSafe 2005).

Potential falls from heights of 2 metres or less are not covered by these Regulations but the general safety provision of the revised Occupational Health and Safety Act (2004), which came into force in July 2005, applies (WorkSafe, 2004). Under the revised Act, employees have a duty to provide and maintain, so far as reasonably practicable, a safe working environment, and therefore the risks of falling from heights of up to 2 metres must be controlled.

The information covered in the WorkSafe publication *Prevention of falls-Ladders* on the safe use of ladders is relevant to both workers and persons doing home maintenance and can be downloaded from the Victorian WorkCover Authority WorkSafe website www.workcover.vic.au. The strict new fall from height regulations in the workplace stand in stark contrast to the lack of controls and action on falls from height (mostly involving ladder use) in the home environment, where most fatal and serious ladder injuries occur.

The future direction for injury prevention in the area of ladder fall injuries appears to be best done through innovations in ladder accessories (eg. attachment points on buildings); design solutions to reduce the overall need to use ladders for cleaning and maintenance tasks performed at heights (eg. the broader adoption of self-cleaning glass, re-designing guttering to eliminate the need for cleaning or the application of safer gutter cleaning methods); design measures to minimise sliding or tipping risks and slipping on rungs or steps; measures to reduce ladder use by older persons for home maintenance tasks; and community education and training on safe ladder use for home maintenance tasks.

Further research is needed to determine whether any tangible real-world benefits would flow from broader adoption of available technologies and new preventive measures. Initiatives to better identify and describe ladder injury cases on existing hospital Injury surveillance datasets should focus on improving case narrative data on the VEMD so that product involvement is better specified. The structure of ICD-10-AM precludes the identification of non-fall ladder cases on the VAED and is not geared to systematically identify consumer product involvement in injury causation.

Recommendations

- Investigate and promote acceptable and effective alternatives to the performance by older persons of home maintenance tasks at height that require the use of ladders.
- Design and implement community education (including practical demonstrations) and training in safe ladder use targeted to adult householders of both sexes and delivered in community and hardware/ gardening retail settings.
- Monitor the effectiveness of the new Victorian Occupational Health and Safety (Prevention of Falls) Regulations in reducing injury due to falls from height in the workplace. Investigate the translation of similar safety measures to householders.
- Conduct research into the efficacy of recent safety innovations in ladder design (including ladder accessories) in preventing ladder fall injuries, and support the wider adoption of useful measures.
- Conduct research to identify design solutions to reduce or eliminate the need for access to height for home maintenance purposes.
- Develop initiatives to improve the identification and description of ladder-related injury cases on existing hospital Injury surveillance datasets. The focus should be on improving case narrative data on the Victorian Emergency Minimum Dataset (VEMD) so that consumer product involvement is better specified.

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Methods of extracting ladder injuries from injury fatality files and hospital injury surveillance datasets — Box 1

Australian Bureau of Statistics Death Unit Record File (ABS DURF): The ABS DURF is a record of unnatural deaths and data are coded to ICD version 10. Cases were selected if the cause of death was recorded under code W11 'Fall on or from ladder'.

NCIS staff supplied national Coroners' Information System (NCIS) summary data. Cases were selected by using a word search of the all reports on Victorian cases recorded on the NCIS database for the terms 'ladders' and 'scaffolding' and cases were manually checked to determine eligibility.

Hospital-treated ladder injury data were extracted from the Victorian Admitted Episodes Dataset (VAED) and the Victorian Emergency Minimum Dataset (VEMD) using different methods due to coding differences.

Victorian Admitted Episodes Dataset (VAED): The VAED records hospital admissions for all Victorian hospitals, both public and private. Up to June 1998 data were coded to the International Classification of Diseases (ICD) version 9. From July 1998 forward, data are coded to ICD version 10 with Australian modifications (adequacy of coding is reviewed every two years and improvements introduced). There is only one code for ladder related injury: W11 'Fall on and from ladder'. For the trend analysis, the ICD9 external cause code 881.0 'Fall from ladder' was used as it matches W11.

Victorian Emergency Minimum Dataset (VEMD): The VEMD records presentations to 28 of the 35 Victorian public hospital emergency departments for 2003-4 and to all 37 hospitals with 24-hour emergency services from the beginning of 2004. Admissions were excluded to prevent double counting. There is no separate code for ladder injuries in VEMD. Cases were extracted by word search in narrative data. This strategy identified ladder injury cases from any cause, including falls. Records were checked and wrongly coded cases excluded.

Issues affecting the quality and completeness of ladder-related injury data extracted from VISU-held datasets — Box 2

Australian Bureau of Statistics Death Unit Record File (ABS DURF) and the Victorian Admitted Episodes Dataset (VAED)

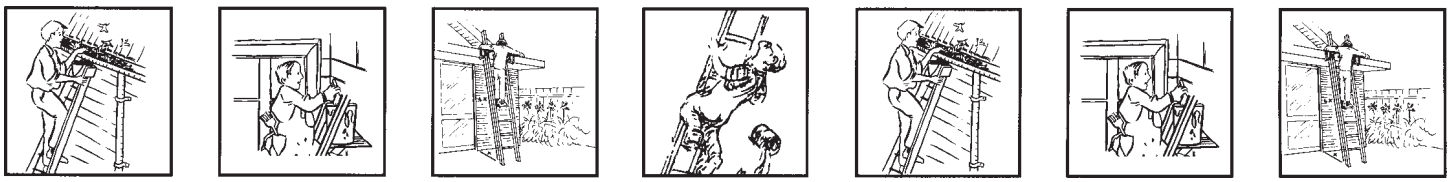
The ABS DURF and the VAED contain only coded data using the WHO International Classification of Diseases (ICD) system, Version 10 (ICD-10). Australian Modifications to ICD-10 provide additional sub-codes in the VAED. Neither of the two datasets contains case descriptions (narratives) to provide additional information on the mechanism and circumstances of the injury, including the level of product involvement. There is only one code for ladder injury in ICD-10: W11 'Fall on and from ladder', therefore ladder-related injury frequency data extracted from both of these datasets underestimate the size of the problem due to lack of capture of cases due to other causes, such as cutting/piercing or hit/struck/crush.

Victorian Emergency Minimum Dataset (VEMD)

Two major issues affect the quality and completeness of ladder injury data in the VEMD are:

(1) There is no specific code to separately identify ladder injury records on the dataset. Injuries involving ladders can only be identified by text searching the 'description of injury event' narratives. Unfortunately, VEMD narrative data are incomplete and their quality varies across and within participating hospitals. A recent quality check by VISAR on VEMD data submitted for the period July-December 2004 identified that, on average, only 34% of narratives collected by hospitals are graded 'good to excellent', meaning they provide two pieces of information over and above what is known from the coded data. Therefore, beyond mention that the injury involved a ladder, narratives were unlikely to provide further useful detail on the precise mechanism and circumstances of the injury; and

(2) The VEMD only contained presentations data from 28 of 35 public hospitals with 24-hour Emergency Departments for 18 months of the two-year period covered by this study.



Short report

Vehicle jack injuries

Erin Cassell, Karen Ashby

Working under a vehicle supported by a jack can cause death or severe crushing injury. There is a mandatory Australian safety standard for vehicle jacks but related injuries continue to occur. The Australian Competition and Consumer Commission (ACCC) reports that 19 Australians were crushed and killed by a vehicle they were working under in the four years up to 2004. All the deaths were men and involved the vehicle being lifted or supported in the wrong way.

This short report covers hospital treated injury related to the use of vehicle jacks utilising hospital emergency department injury surveillance data extracted from the Victorian Emergency Minimum Dataset (VEMD). These data underestimate the size of the injury problem because there is no specific code for injuries related to vehicle jacks on the VEMD and data were extracted using a word search of the case narratives that are of variable quality. The search did not include trolley jacks.

- There were 178 ED presentations to Victorian hospitals for vehicle jack injuries over the 5-year period 2001-5. Of these, 16 (9%) were admitted to hospital and the other 162 (91%) were treated in the ED and discharged.
- All injured persons were male and 70% were aged between 15 and 44 years.
- Over half of the injuries occurred in the home including the garage, garden and driveway (n=97, 55%), a further 30% (n=36) happened in the workplace and 10% (n=17) occurred on the road, street or highway.
- The most common types of injury were open wounds (20%), fractures (20%), sprain/strain (17%) and crushing injury (16%). One third of all injuries (and one-third of serious injuries) were to the hand (n=61, 34%). Other body sites commonly injured were the chest (n=16, 9%), foot (n=14, 8%), face (n=13, 7%) and shoulder (n=13, 7%).
- Most injuries (62%) were caused by the person being hit/struck/crushed by an object – either the jack or the vehicle being supported by the jack.

The narrative (free text) descriptions of the injury events provide some additional information on the mechanism and circumstances of injury. Eleven of the 16 hospitalisation admissions (68%) and at least 79 of the 168 non-admitted cases (47%) were injured when the jack reportedly 'slipped', 'collapsed' or 'gave way' and the vehicle fell on the person. In 38 of all these cases (42%) the injured person was described as working under the vehicle at the time the jack shifted/collapsed or the description of the injury site (chest, leg, shoulder, head) indicated that the person had a substantial part of their body under the vehicle. The other common injury scenarios were that the person's hand or finger got caught in the mechanisms of the jack when it was being used or the person's finger was crushed between the jack and a part of the vehicle.

Discussion

Home and professional mechanics risk serious injury if they get underneath a car supported by a vehicle jack or jacks. A vehicle specific jack is supplied with the vehicle for the sole purpose of changing a flat tyre. It should match the model of the vehicle it is used with. All jacks sold in Australia including those that come with new cars are required by law to comply with the Australian Standard, AS/NZS 2693, which specifies design, construction, performance and labelling requirements.

A trolley jack (that conforms to the mandatory safety standard AS/NZS 2615) and safety stands (that conform to the mandatory safety standard AS/NZS 2538) that have sufficient capacity to lift and bear the weight of the vehicle, respectively, should be used by the home mechanic when doing repairs or to get under a vehicle. Vehicle ramps provide an alternative method for raising a vehicle. Further safety guidelines on raising a vehicle using a trolley jack are available in a ACCC safety alert pamphlet 'Working under a vehicle – vehicle jack safety' that can be downloaded from the ACCC's website: www.accc.gov.au searching through the 'publications' page.

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COMMUNITY**SAFETY**MONTH

October

Community Safety Month 2006 is being led by Department of Justice (DOJ) and coordinated by the Strategic Communications Branch and in partnership with the VSCN. Planning is well underway, with registration of activities already taking place. Keep an eye out for regular updates through various mediums or go to the CSM website: www.communitysafetymonth.com.au to register your activities or VSCN website: www.vscn.org.au

For further information contact:
Lisa Purchase, Manager, Community Safety Month via lisa.purchase@justice.vic.gov.au or Barbara Minuzzo, VSCN Executive Secretary via vscn.vscn@rch.org.au

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4th VSCN Annual Conference

"What is your local solution?"

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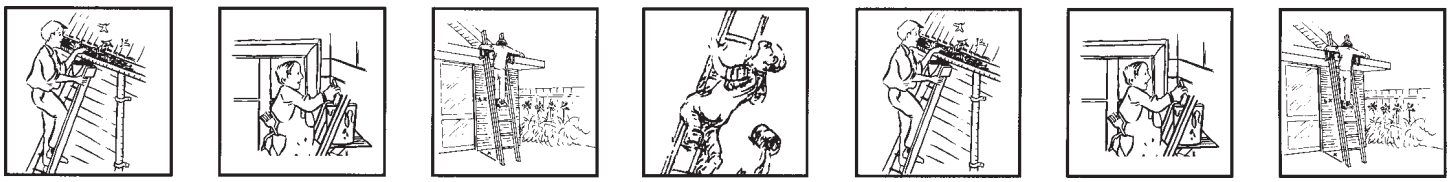

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VISU Executive/Editorial Board

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
Western Hospital - Footscray
Western Hospital - Sunshine
Williamstown Hospital
Wimmera Base Hospital
From November 1995
Dandenong Hospital

From December 1995
Royal Victorian Eye & Ear Hospital
Frankston Hospital

From January 1996
Latrobe Regional Hospital

From July 1996
Alfred Hospital
Monash Medical Centre

From September 1996
Angliss Hospital

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:

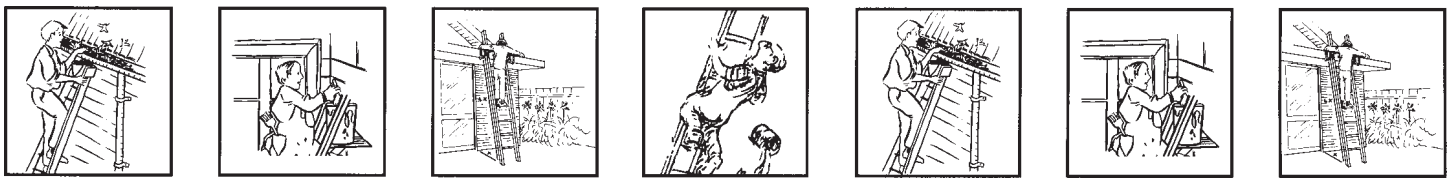
Enquiries	(03) 9905 1805
Co-ordinator	(03) 9905 1805
Director	(03) 9905 1857
Fax	(03) 9905 1809

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

All issues of *Hazard* and other information and publications of the Monash University Accident Research Centre can be found on our internet home page:http://www.monash.edu.au/muarc/visu

Coronial Services

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



A Victorian Government initiative

Victoria The Place To Be

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