



MONASH University
Injury Research Institute

REPORT ON THE REDUCTION OF MAJOR TRAUMA AND INJURY FROM LADDER FALLS

Jennie Oxley

Joan Ozanne-Smith

Steve O'Hern

Fiona Kitching

Monash University through its
Injury Research Institute (MIRI) and
Department of Forensic Medicine (DFM)

October 2014

CONTENTS

1	INTRODUCTION	9
1.1	BACKGROUND	9
1.2	PROJECT OBJECTIVES	10
1.3	OUTLINE OF THE REPORT	10
2	LITERATURE REVIEW	12
2.1	METHODOLOGY	12
2.2	PREVALENCE OF LADDER FALLS	13
2.3	MECHANISMS OF INJURY AND INJURY OUTCOMES	13
2.4	EXISTING INITIATIVES AND APPROACHES TO REDUCE THE INCIDENCE AND SEVERITY OF FALLS	15
2.5	DESCRIPTION OF CURRENT INDUSTRY STANDARDS AND REGULATIONS	17
2.5.1	<i>National Regulators</i>	18
2.5.2	<i>International Standards and Regulations</i>	20
2.6	SUMMARY	22
3	ANALYSIS OF HOSPITAL AND DEATH DATA	24
3.1	VICTORIAN INJURY SURVEILLANCE UNIT (VISU) DATA	24
3.1.1	<i>Methods – Case selection and data analysis</i>	24
3.1.2	<i>RESULTS</i>	26
3.2	ANALYSIS OF VICTORIAN STATE TRAUMA REGISTRY DATA	40
3.2.1	<i>METHODS – CASE SELECTION AND DATA ANALYSIS</i>	40
3.2.2	<i>RESULTS</i>	40
3.3	ANALYSIS OF NATIONAL CORONIAL INFORMATION SYSTEM (NCIS) DATA	43
3.3.1	<i>Methods – Case selection and data analysis</i>	43
3.3.2	<i>Results</i>	45
3.4	SUMMARY	50
4	CONSULTATION	53
4.1	DOMESTIC LADDER USER SURVEY	53
4.1.1	<i>Recruitment</i>	53
4.1.2	<i>Survey</i>	54
4.1.3	<i>Results</i>	54
4.2	KEY STAKEHOLDERS	65
4.2.1	<i>Stakeholder Identification</i>	65
4.2.2	<i>Interview Protocol</i>	66
4.2.3	<i>Results</i>	67
4.3	SUMMARY	73
5	SUMMARY OF FINDINGS AND OPPORTUNITIES FOR REDUCING LADDER FALLS	75
5.1	SUMMARY OF THE FINDINGS	75
5.2	OPPORTUNITIES FOR REDUCING LADDER FALLS	77
5.3	CONCLUSIONS	82
6	REFERENCES	83

EXECUTIVE SUMMARY

Ladders are a frequently used consumer product in domestic environments for everyday tasks and Do-It-Yourself (DIY) projects. However, within the domestic environment the use of ladders represents one of the highest risks of fall-related injuries and deaths (Haywood, 1996), with ladders being the consumer product most often associated with DIY related deaths and hospitalisations (Faergemann & Larsen, 2000; Cassell & Clapperton, 2006).. Moreover, in recent years there has been an increase in ladder falls injury, particularly in the domestic context, and the injuries resulting from these falls have not been the subject of any injury prevention initiative, despite the clear gains in reducing ladder-related falls and injuries in the workplace through strict regulations and preventative action.

Given the magnitude of ladder fall injuries and the associated trauma and costs, a four-phased project was undertaken to understand the issues surrounding major trauma and injury from ladder falls and to provide the evidence base on which effective programs and action can be implemented and supported by the Victorian Department of Health and other sectors.

Findings:

Injury data analysis: Analyses of injury data at all levels of severity from Emergency Department presentations, hospital admissions, major trauma and death were undertaken. Across all severity levels, domestic ladder falls accounted for a high proportion of all ladder falls and this was especially so for major trauma and death cases. Older males accounted for the majority of cases (especially deaths) and the majority of cases resided in metropolitan areas. Factors associated with high level injury severity included older age, gender (male), activity type (outdoor activities including pruning, trimming, fruit picking, and body region injured (head). Key characteristics of ladder fall injury cases by injury severity level are summarised below.

	ED presentations	Hospital admissions	Major trauma hospital admissions	Deaths
Number of ALL cases (average per year)	1,331	1,251	86	9
Proportion of domestic cases (average per year)	64.1%	65%	73.3%	72%
Peak age group	55-59 years	65-74 years	N/A	75-84 years
Gender (male)	76.2%	76.3%	N/A	94.9%
Most common body region injured	Wrist and hand, ankle and foot	Head, thorax, knee and lower leg	N/A	head
Activity	Leisure	Unpaid work	Outdoor (trimming, pruning, picking fruit)	Outdoor (trimming, pruning, picking fruit)
Residence (metropolitan areas)	66%	76%	N/A	74%
Cause of injury (fall)	88.7%	84.7%	N/A	98.5%

Literature review: The review revealed that there is relatively little literature addressing the issues surrounding falls from ladders in the domestic context. Despite the severity of ladder-related injuries, few existing initiatives and programs addressing falls outside the workplace were identified.

Within the workplace, the adoption of Australian Standards and implementation of Occupational Health and Safety Regulations have increased the accountability of employers regarding employee safety in the workplace. These regulations provide enforceable rules governing the usage of ladders .

However, in the domestic setting, it is argued that controlling non-occupational ladder usage is generally impractical and unenforceable. Notwithstanding, there are some government, advocacy, consumer and injury prevention groups that provide information on ladder safety techniques, and ladder manufacturers, both in Australia and internationally, have implemented various design features to improve safety and reduce the chance of misuse. Most importantly, there was no evidence found in the literature attesting to the effectiveness of any initiatives in reducing the incidence and severity of falls from ladders.

Consultation: Important in-depth information from consumers and key stakeholder groups was collected using survey and interview techniques.

Participants in the consumer survey were generally representative of the target group of older adults, especially older males. The majority of participants used ladders frequently for a range of indoor and outdoor activities. With regard to questions on safe use of ladders the findings revealed that, while many participants were aware of ladder safety issues, few took appropriate steps to ensure their safety, and substantial numbers engaged in unsafe practices and behaviours.

Approximately 13 percent of the sample group indicated that they had experienced a ladder-related injury. Moreover, a significant proportion reported that they knew of someone else who had experienced a ladder-related injury.

The stakeholder interviews provided an invaluable source of information not gained from the literature review or data analysis. All stakeholders noted that domestic ladder-related fall injuries were a significant problem and that they were aware of or had implemented various preventative initiatives. While there were few evaluations of initiatives, there was general agreement that there are significant gaps in addressing safe domestic ladder use and more needs to be done to reducing the incidence and severity of these injuries.

It was interesting to note that WorkSafe had successfully implemented initiatives that have resulted in significant reductions in ladder-related deaths and serious injuries. These have centred around implementation of regulations, while the current emphasis within the workplace is to use alternatives to ladders wherever possible.

Stakeholders also indicated that, while it is difficult to introduce regulations and legislation for domestic ladder users, such as has been achievable in the workplace, there are alternative measures that may be successful, including working with the manufacturing, building and retail sectors, providing targeted and informative guidelines for consumers, and ensuring that this information is widely accessible.

Opportunities for reducing ladder falls

The report provides relevant and valuable injury information concerning the circumstances of reported injuries and fatalities, attitudes and behaviours of the general public and information on initiatives and standards to assist in the development and evaluation of community health, safety and injury prevention strategies, such as community awareness initiatives and education, legislative and regulatory changes and safety-related environmental, equipment and product design improvements.

The findings of the analyses undertaken in each of the project phases led to a range of opportunities being identified to reduce ladder falls across health, design (manufacture and building), and regulatory government sectors, as well as opportunities for local government, advocacy groups, industry (manufacture and retailers) and support services for seniors. These are listed in the table below.

Conclusions

This study employed a multi-disciplinary approach to understand the issues surrounding ladder fall injuries in the domestic context. The findings of injury data sources, a review of national and international literature, and consultation with consumers and key stakeholder groups, together, have been synthesised to provide a set of evidence-based initiatives to reduce the incidence and severity of ladder fall injuries. These opportunities also look at reducing the overall costs to the community (current costs for hospital admissions only are estimated at more than \$18.3 million over the last three years). The opportunities provided are centred around eight complementary themes and include enhancements to design, manufacture and the environments in which ladders are used, education and promotional activities, enhanced data systems, and areas warranting further research.

Key opportunities for reducing ladder falls are identified as follows:

1. Improving the design and mechanism of ladders for safe consumer use through reviewing the strength and stability of ladder design.
2. Supporting ladder standard and regulation improvements and enhancement for improved compliance and ladder manufacture.
3. Supporting safe ladder use through building design innovation and features such as gutter guards and anchor points.
4. Improving surfaces around ladders, such as the use of anti-slip floor coverings and surface treatments to reduce injury risk from falls.
5. Promoting of the use of protective equipment when using ladders in the domestic context.
6. Supporting public awareness of the risks and dangers of ladder use in the domestic setting through public education and resources on ladder fall prevention.
7. Promoting alternatives to ladder use such as services and resources available to domestic ladder users within the community.
8. Addressing the prevention of domestic ladder falls and fall injuries through multi-sectorial collaboration and further research as required.

Key Areas	Interventions for consideration	Priority	Stakeholders
Ladder design improvements	Consider: <ul style="list-style-type: none"> • Providing adequate strength for loading in normal and foreseeable use. • Reviewing design to avoid slippage of foot of ladder and laboratory testing new designs. • Reviewing design to strengthen the stability of ladders and laboratory test new designs. • Including mechanism for lifting objects whilst on ladder (within the ladder's load tolerance). • Providing a rod or pole extending above the top of step-ladders to hold while working on the ladder. 	Medium Term	Australian Competition and Consumer Commission Ladder Manufacturers Association of Australia Standards Australia
Ladder Standards and Regulations improvements	Consider: <ul style="list-style-type: none"> • Reviewing existing Standards and Regulations to identify areas for potential enhancement or requirements for additional standards or regulations. • Mandating Standards where compliance is inadequate 	Short Term	Australian Competition and Consumer Commission Standards Australia
Building design innovations	Consider: <ul style="list-style-type: none"> • Working with key stakeholders to investigate the evidence regarding the effectiveness of gutter guard installation on preventing ladder falls • The feasibility of mandating installation of gutter guards in domestic building design codes. • Identifying effective gutter cleaning or guarding and maintenance mechanisms that don't require use of ladders (performance test such products currently on the market) and encouraging design innovation as required. • Including ladder anchor points in domestic building design codes. • The effectiveness of commercially available anchoring devices for the top of the ladder. 	Long Term	Australian Building Codes Board Victorian Building Authority Master Builders Australia Victorian Department of Transport, Planning and Local Infrastructure

Improved surface treatment around ladders	<p>Consider:</p> <ul style="list-style-type: none"> • Examining the effectiveness of existing anti-slip mat products on preventing ladder falls. • Investigating the potential for developing improved/enhanced protective surface treatments to address sliding (e.g., slip resistant surface treatments [paint, etc.], portable anti-slip mats and/or ladder chocks). • Investigating the potential for developing portable impact absorbing under surfacing treatments to reduce injury risk when falls occur. 	<p>Medium Term</p>	<p>Hardware retailers Ladder Manufacturers Association of Australia Australian Competition and Consumer Commission Independent Living Centre</p>
Promotion of use of protective equipment	<p>Consider:</p> <ul style="list-style-type: none"> • Promoting the use of safety harnesses, appropriate and non-slip footwear and other equipment/clothing when using a ladder. • Undertaking a feasibility study to determine potential protective effect of bicycle helmets to prevent head injuries in ladder falls. 	<p>Medium Term</p>	<p>Ladder Manufacturers Association of Australia Australian Competition and Consumer Commission Independent Living Centre</p>
Public education on ladder fall prevention	<p>Consider:</p> <ul style="list-style-type: none"> • How ladder fall prevention can be better incorporated into broader falls prevention activities. • Researching and scoping a targeted education campaign on safe ladder use. A targeted education campaign could include the following components: <ul style="list-style-type: none"> ○ Public service announcements on TV (e.g., covering ladder angle; footing and friction issues; securing ladders; and safe reach from ladders). TV advertisements appropriately designed for the target audience provide the most efficient way to impart information when there is wide community lack of understanding. ○ Publicising issues of concern: angle of extension ladders; reach while on the ladder (e.g. belt buckle rule); highest safe level on step-ladder; even ground requirement and firm footing with high friction (rubber feet, rough surface material) for ladder; correct ladder and tools for task; correct footwear; alternatives to ladder use; having another person present while using a ladder; 	<p>Short Term Medium Term Medium Term</p>	<p>Victorian Department of Health Independent Living Centre Peak bodies for older adults (eg. Council on the Ageing) Hardware retailers Ladder Manufacturers Association of Australia Community Groups for older adults (e.g., Mend's Sheds, Senior Citizens) RACV Years Ahead Personal Safety program Vic Health</p>

	<p>communicating statistics about ladder fall injury.</p> <ul style="list-style-type: none"> Promoting an appropriate smart phone app re safe positioning of ladders (http://www.cdc.gov/niosh/topics/falls/mobileapp.html). Recommending DIY programs on commercial television to include disclosure of risks and safety advice. Innovations such as buy-back programs for defective ladders; or council subsidised neighbourhood programs of cherry-picker equipment availability (a street at a time) for pruning, annual gutter cleaning and roof maintenance tasks. Promoting the resources and services available through Home and Community Care and the Independent Living Centre to assist older residents with home maintenance. In view of the current changes to the HACC program (transitioning to a national government program) with a current consultation phase, there may be an opportunity to clarify an effective role for HACC in either providing services that require access to heights or in providing realistic alternatives for older people. 	<p>Long Term</p> <p>Short Term</p>	
Promote alternatives to ladder use	<p>Consider:</p> <ul style="list-style-type: none"> Widely promoting the resources and services available through organisations such as HACC, Independent Living Centre, etc., to assist older residents with home maintenance. Strategies that may make the use of these resources more acceptable to older adults. A targeted education campaign on use of alternatives to ladder use 	Short Term	<p>Local Government</p> <p>Home and Community Care providers</p> <p>Independent Living Centre</p> <p>Victorian Department of Health</p>
Multi-sectorial collaboration	<p>Consider:</p> <ul style="list-style-type: none"> Benefits of an inter-sectorial workshop to assist with engaging relevant stakeholders. The workshop could identify high priority actions and discuss processes for progressing. 	Short Term	<p>Victorian Department of Health</p> <p>Monash University (Monash Injury Research Institute, Dept. Forensic Medicine)</p>
Areas for further research	<p>Consider:</p> <ul style="list-style-type: none"> A prospective study to obtain more detail on circumstances of falls by means of in-depth interviews of hospital admitted injured persons to 	Long Term	<p>Monash University (Monash Injury Research Institute, Dept. Forensic Medicine)</p>

	<p>identify potential risk factors.</p> <ul style="list-style-type: none"> • Using information from the current study and the proposed in-depth interview study, to design a case control study to clearly identify additional risk factors for domestic ladder falls, where the cases are from the interviewed sample. Such research could include: <ul style="list-style-type: none"> ○ An appropriate test to assess the physical capacity of individuals (particularly older persons) to use ladders or to safely work at heights. ○ Ladder fall site visits and reconstructions to understand the circumstances of falls, landing zone, surface conditions and forces that need to be overcome to protect against serious injury in the event of ladder falls ○ Determining physical limits of ladders ○ Investigating alternative designs for ladders ○ Investigating design solutions to reduce the need for ladder use e.g. re-designed roof gutters (hinged for cleaning; lowering gutters for cleaning; etc.) ○ An evaluation of initiatives to assess their effectiveness in reducing the incidence and severity of ladder fall injuries 		<p>Australian Building Codes Board Victorian Building Authority Master Builders Australia Victorian Department of Transport, Planning and Local Infrastructure Victorian Department of Health</p>
<p>Enhanced data systems</p>	<p>Encourage:</p> <ul style="list-style-type: none"> • More comprehensive collection of detailed information regarding the circumstances of ladder falls through emergency department, trauma registry and coronial data systems 	<p>Long Term</p>	<p>Victorian Department of Health Victorian State Trauma Outcome Registry and Monitoring Group Victorian Department of Justice</p>

1 INTRODUCTION

This report presents the findings of a study addressing the issues surrounding falls from ladders in the domestic context.

The Victorian Department of Health aims to provide support for the best health and wellbeing for all Victorians and achieves this through planning, policy development, funding and regulation of health services and providers and activities which promote and protect Victorians' health. One of the key Divisions within the Department, the Health Service Performance and Programs (HSPP) Division, is responsible for health service governance, monitoring, funding, policy, models and systems, state-wide health system planning, reform and innovation programs, and system-wide quality, safety and patient experience.

The Department recognise that, while extensive work is currently underway in the area of low falls prevention amongst the elderly at the Commonwealth, State and Local Government levels, there has been an increase in ladder falls injury, particularly in the domestic context, and the injuries resulting from these falls have not been the subject of any injury prevention initiative, despite the clear gains in reducing ladder-related falls and injuries in the workplace through strict regulations and preventative action.

The Department has therefore called for a report on the issues surrounding injury from ladder falls in the home environment, focussing on analysis of the available data and identifying effective countermeasures with the view to identifying 'best-practice' interventions and practical actions that can be undertaken by the Department to achieve significant reductions in the incidence and injury severity of ladder-related injury.

This introductory chapter sets the scene and provides an overview of the existing understanding of falls from ladders and the gaps in our knowledge of the contributing factors. It describes the aims and objectives of the study, and a brief introduction to the methods employed to undertake the project.

1.1 BACKGROUND

Ladders are a frequently used consumer product in domestic environments for everyday tasks and Do-It-Yourself (DIY) projects. However, within the domestic environment, the use of ladders represents one of the highest risks of fall-related injuries and deaths (Hayward, 1996), with ladders being the consumer product most often associated with DIY related deaths and hospitalisations (Faergemann & Larsen, 2000; Cassell & Clapperton, 2006).

In Victoria, the frequency of ladder falls resulting in serious injury has doubled between 2002 and 2013. Between 2010 and 2013 there were over 5,000 hospital admissions due to ladder falls, with a similar number of patients receiving emergency department treatment (Dept. Health, 2014). While it has been estimated that ladders are involved in only one to two percent of occupational injuries in industrialised countries [4], previous research has found that between 60 and 80 percent of ladder injuries requiring hospitalisation are occurring in non-occupational settings (Bedi & Goldbloom, 2008)

The HSPP Division of the Department of Health Victoria has commissioned Monash University, through its Injury Research Institute (MIRI) and Department of Forensic Medicine (DFM), to undertake a review of the issues surrounding major trauma and injury from ladders falls in the home environment, with the purpose of identifying effective interventions and practical actions that can be undertaken by the Department of Health to reduce the incidence and severity of ladder-related injury.

1.2 PROJECT OBJECTIVES

The overall aim of this project is to understand the issues surrounding major trauma and injury from ladder falls and to provide the evidence base on which effective programs and action can be implemented to support safe ladder use or alternatives to ladder use in the home environment. Specifically, the objectives of the study are to:

- i) Examine current and trend data on falls from ladders in the domestic context;
- ii) Understand the circumstances of ladder falls;
- iii) Understand the use of ladders amongst consumers (including motivations for use, behaviour, perception of safety, etc.);
- iv) Document and understand industry standards and regulations pertaining to ladder product safety;
- v) Review existing national and international initiatives to reduce ladder fall injuries;
- vi) Provide the evidence base on which effective programs and actions can be implemented to support safer ladder use in the home environment; and,
- vii) Identify opportunities to reduce the incidence of ladder falls and severity of injuries.

1.3 OUTLINE OF THE REPORT

To address the above aims and objectives a four-phased project was proposed. The phases, key tasks and the proposed methods for each of these components are presented in the following Chapters.

Chapter 2 presents the findings of the review of the published and grey literature. It summarises the evidence regarding what is currently known about the prevalence of injuries from falls from ladders, as well as the mechanisms of injury and injury outcome. It also describes current national and international initiatives addressing falls from ladders, and summarises current industry standards and regulations.

Chapter 3 presents the findings of data analyses. Three sources of data were accessed to understand the full extent of the problem of serious injury related to domestic ladder falls and includes death and serious injury data.

Chapter 4 presents the findings of the consultation phase of the project. This includes two components, i) a survey of ladder consumers, and ii) in-depth interviews with key stakeholders. This phase provides a general understanding of the perceptions of ladder safety and the use of ladders from consumer

groups as well as an understanding of perceptions of key stakeholders regarding their roles and responsibilities in manufacturing and providing safe equipment and services to consumers.

Chapter 5 draws together the findings of the previous three project phases. A comprehensive account of the current and trend data on falls from ladders in the domestic context is discussed, as well as a summary of what has been achieved in Australia and elsewhere to address ladder injuries. Also discussed are: what appears to be working and the factors that are associated with this success, and what has not progressed as well and the barriers to successful implementation

In addition, a suite of opportunities to reduce ladder falls is provided for the Department of Health to consider in the short, medium and longer term. These opportunities in Victoria and beyond ensure the effective strategies and initiatives can be undertaken by the Department of Health and other sectors to reduce the incidence of ladder-related injury in the home environment.

2 LITERATURE REVIEW

A targeted review of published and 'grey' literature and material relevant to ladder safety was undertaken to address three of the main project objectives, that is, objectives ii), iv) and v). The review addresses the following topics:

- Understanding the incidence and prevalence of ladder falls, mechanisms of injury and injury outcomes;
- Describing and evaluating existing international and national evidence-based initiatives and approaches to reduce the incidence, severity and outcomes of ladder falls; and
- Describing current industry standards and regulations as they relate to ladder safety in both occupational and non-occupational contexts.

2.1 METHODOLOGY

For each of the topics addressed in the review, recent published research and other grey literature was sought. An extensive range of search engines and databases, available through Monash University library services, was utilised to source relevant published scientific literature. The main databases and search engines that were used included: Embase, SafetyLit, ScienceDirect, Ingentaconnect, Tandfonline, CRCNetbase, OSH reference collection, and other relevant databases including PsychInfo, Medline, Cochrane Library and Scopus. In addition, grey literature and government reports were sourced through the Monash library, libraries associated with relevant government agencies, key contacts within government agencies and from other institutional libraries providing literature addressing injury, injury prevention and home safety. Key words included: 'ladder', 'safety', 'fall', 'injury'.

The publically accessible websites of national and state occupational health and safety regulators and authorities were also searched for Standards, Codes of Practice and other safety material using the key word 'ladder'. The Australian Standards were accessed through the Monash Library as these Standards are not freely publically available. Publically available Coroners' inquest findings and recommendations were searched and extracted for Australian states and territories.

Selected national and international websites were also searched and accessed for relevant information.

The findings of the review are presented in the following sections:

- The prevalence of ladder falls;
- The mechanisms of injury and injury outcomes;
- International and national initiatives to reduce the incidence and severity of ladder falls; and,
- A description of current industry standards and regulations.

2.2 PREVALENCE OF LADDER FALLS

Ladders are a frequently used consumer product, in domestic environments, for everyday tasks and Do-It-Yourself (DIY) projects. Within the domestic environment, the use of ladders represents one of the highest risks of fall-related injuries and deaths (Hayward 1996), with ladders being the consumer product most often associated with DIY related deaths and hospitalisations (Faergemann and Larsen 2000, Cassell and Clapperton 2006).

In Australia, the frequency of ladder falls resulting in serious injury is increasing (Cassell and Clapperton 2006, Kent and Pearce 2006). While previous research has found that between 60 and 80 percent of ladder injuries requiring hospitalisation are occurring in domestic settings (Björnstig and Johnsson 1992, Bedi and Goldbloom 2008), recent data indicates that there are at least 6 fatalities and 2,500 hospital-treated occupational and domestic ladder injuries each year in Victoria (Cassell and Clapperton 2006).

It has been estimated that ladders are involved in only one to two percent of occupational injuries in industrialised countries (Häkkinen, Pesonen and Rajamäki, 1988). Furthermore, findings suggest that males and the elderly, persons over 60 years of age, are over-represented when considering falls from conventional ladders (Björnstig and Johnsson 1992, Cassell and Clapperton 2006), representing up to 81 percent of all hospital-treated ladder injuries. In contrast, females are more likely to experience falls from smaller step ladders. D'Souza et al. (2007) reported that the mean age of those injured in domestic environments was significantly higher compared to occupational injuries.

2.3 MECHANISMS OF INJURY AND INJURY OUTCOMES

The vast majority of older person ladder injuries have been found to occur in the home, mostly when the householder was doing indoor and outdoor home maintenance (Cassell and Clapperton 2006). Injuries to older persons have been associated with a reduction in flexibility, mobility, reaction time and poorer balance (Ashby et al. 2005). Despite how challenging some of these tasks can become for older Victorians, they continue to engage in DIY practices as a means of home repair and maintenance as opposed to seeking professional assistance. Typical indoor activities that are associated with ladder injuries include: painting; changing light bulbs; and, hanging pictures and plastering. Common outdoor activities include: cleaning gutters; painting; engaging in home maintenance; and, gardening.

The most common mechanisms for injury associated with the use of ladders are falls from heights and ladders sliding away from under the user (Häkkinen et al. 1988). Further, even falls from small heights, less than one metre, have been shown to have the potential to result in serious injuries (Partridge et al. 1998). Other common mechanisms of injury include: ladders sliding down the wall when the base of the ladder is not fixed; user slips or missteps; loss of balance; and, ladder malfunctions, such as the supports collapsing.

Ladder injuries are serious in nature due to the relatively high trauma energy associated with falls from heights (Björnstig and Johnsson 1992). In their study of Swedish ladder injuries Björnstig and Johnsson (1992) found that the average height of a fall from a ladder was 2.3 metres with a range of 0.2 to 10.5 metres. The study also found that on average men fell from an average height of 2.4 metres compared to 1.9 metres for women.

Previous research has found that a high proportion of ladder injuries are preventable and are often a result of the ladder slipping or tipping, feet slipping out from rungs or reaching out too far (Bedi and Goldbloom 2008). Research conducted by the Australian Competition and Consumer Commission (ACCC, 2010) found that 43 percent of ladder incidents were caused by ladder instability. Incorrect placement of the ladder during setup, unsafe handling of the ladder leading to damage and inappropriate conduct including overreaching and carrying large loads during use were also identified as potential risk factors.

The ACCC also identified that users can avoid the risk of falling from a ladder by:

- securing the ladder, through either tying the ends or having another person brace it;
- avoiding dangerous behaviour, such as over-reaching, carrying excessive loads or deliberately moving the ladder during ascent; and,
- pitching the ladder at an angle of 70-75 degrees relative to the ground, as recommended by the Occupational Health and Safety guidelines for portable straight ladders.

These findings suggest that there is a need for improved ladder design and to improve the provision of adequate education on the proper usage of ladders, and appropriate footwear and personal protective equipment to wear when using a ladder. Interventions should also take particular account of the physical limitations of elderly persons.

Calculations performed by Björnstig and Johnsson (1992) and experimental tests conducted by Häkkinen et al. (1988) show that the friction forces required to keep standing ladders in position can increase by a factor of 17 when standing on the top rung compared to the bottom rung of a 5 metre ladder. Additionally, it was found that most of the free-standing ladders that slid in these studies had protective features against sliding; however they were not effective in preventing the incident.

Injuries associated with ladder falls typically occur when hitting the floor or ground, when hitting an object in the vicinity of the ladder such as benches or tables or due to impact with the ladder itself (Björnstig and Johnsson 1992). Some of these injuries may have been avoidable had the area around the ladder been cleared prior to work commencing.

Ladder falls are associated with a wide array of injuries, including injuries to upper and lower limbs, head, spine, thorax and abdomen (Faergemann and Larsen 2000). In most circumstances injuries result in a contusion or sprain, with fractures and dislocations the next most common types of injuries.

More serious injuries associated with ladder falls include: fractures to the skull; facial fractures; intracranial injuries; lesion of the spinal cord; fractures to vertebra; pneumothorax; and, radiological significant pulmonary contusion (Cassell and Clapperton 2006, ACCC 2010).

Regression analyses conducted by Cassell and Clapperton (2006) revealed that injury severity increased significantly with increasing height of the fall and increasing age. This confirmed the findings of previous studies (Björnstig and Johnsson 1992).

Björnstig and Johnsson (1992) reported that on average 1.5 registered injuries were sustained per person from ladder falls and that 30 percent of those injured reported some ongoing symptoms, disabilities or functional limitations more than a year after the injury. On average, those who sustained a ladder-related injury and are admitted to hospital are much older than non-admitted persons, illustrating

the increased severity associated with ladder falls for older persons, and their increased frailty and reduced ability to recover from injury compared with younger adults (Cassell and Clapperton 2006).

2.4 EXISTING INITIATIVES AND APPROACHES TO REDUCE THE INCIDENCE AND SEVERITY OF FALLS

To date, it appears that very little has been done to establish preventative strategies to support safe ladder usage outside the workplace, with limited information provided for home and personal use of ladders. It has been estimated that ladders are involved in only one to two percent of occupational injuries in industrialised countries (Häkkinen et al. 1988), with injuries in domestic settings representing the majority of ladder-related injuries. It is noted that legislative measures aimed at controlling domestic ladder usages are generally impractical and unenforceable (Bedi and Goldbloom 2008).

While domestic injuries resulting from ladder falls are far more commonplace compared with workplace ladder falls in Victoria, the majority of safety initiatives have been directed towards occupational settings. Within the workplace, the adoption of Australian Standards and implementation of Occupation Health and Safety (OH&S) Regulations have increased the accountability of employers regarding employee safety in the workplace. These regulations provide enforceable rules governing the usage of ladders (Occupational Health and Safety (Prevention of Falls) Regulation, 2003) .

The Victorian Workcover Authority provides information for employers, who have responsibilities under the Occupational Health and Safety Act 2004 (WorkSafe Victoria 2005). The guidance includes methods for reducing the likelihood and consequence of injuries sustained while using a ladder. 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.

The Occupational Health and Safety Regulations require the following:

- A risk assessment of the tasks to be completed for any job that requires a ladder or a risk of falling more than two metres;
- Workers must be provided with sufficient training to enable them to work safely;
- If an employee is to undertake a task that involves the possibility of a fall from height, the employer must ensure that the risk of a fall is assessed and then eliminated;
- If it is not reasonably practicable to eliminate the risk then the risk is reduced so far as is reasonably possible; and,
- The employer must also ensure that the ladder is appropriate for the task to be undertaken and is appropriate for the duration of the task and that it is set up in a correct manner.

While domestically there has been little done to implement safety initiatives in the domestic setting, the literature review did identify programs in place in the United States. The American Ladder Safety Institute is an organisation targeted at improving ladder safety amongst consumers. Their website (<http://www.laddersafety.org/>) provides information on basic ladder safety techniques, and in particular recommends a three-point-climbing technique, where ladder users are recommended to have three limbs in contact with the ladder during ascent and decent. The website also includes online training

videos which demonstrate correct ladder setup, usage and how to select an appropriate ladder for the job. Similar web-based initiatives may be a cost effective means of providing ladder safety for domestic users.

Additional safety initiatives include various design features incorporated into ladder manufacture to reduce the chance of misuse and reduce the risk of serious injury, both in Australia and internationally. Safety features incorporated into ladders include rubber tread, crossbars for added support at the top of the ladder, angled rungs that lie horizontally, ladder designs that are automatically placed at the optimal touching angle (approximately 1:4) and hooks and spikes to help stabilise and support ladders (Björnstig and Johnsson 1992).

In a search of Australian websites various products were identified aimed at improving ladder safety, including roof anchors and static line systems to provide restraint and fall protection, ladder stabilisers which prevent sideways movement and help hold ladders in place, and permanent brackets to prevent ladder sliding, sideways movement as well as damage to gutters (HoldSafe 2014, SafetyLink 2014). However it is noted that the majority of these products were targeted towards occupational ladder users. Moreover, while these initiatives hold some promise in improving ladder safety, no evidence of their effectiveness is available.

Additionally the Victorian Workcover Authority recommends having someone stand at the base of the ladder to brace and observe the climber, securing the ladder by tying the top end to a structure and bracing the bottom end, use of a 'stay' or a 'stand-off' which allows the top of the ladder to be positioned away from the wall and avoid gutters, downpipes or brittle surfaces, avoiding dangerous behaviour such as over-reaching, carrying excessive loads or moving the ladder during ascent; and pitching the ladder so that the angle of the ladder is no steeper than 1:4.

Currently there is little knowledge in the community regarding ladder safety in domestic environments (Faergemann and Larsen 2000, Tsipouras 2001, Bedi and Goldbloom 2008) In a small survey of hardware store staff conducted by Bedi and Goldbloom (2008) the majority of staff were unaware of any courses, training or other information which could be obtained prior to using a ladder .

In New Zealand, the Accident Compensation Corporation (ACC) reported that, between 2007 and 2009, almost 7,000 people were injured using ladders in and around their home, with on average, over 130 people injured each week using a ladder at home. Over 70 percent of these ladder-related injuries at home involved a fall. From 2007 to 2009 there were 340 serious harm accidents from falls in the construction sector and more than 50 percent of falls working at height were from less than 3 metres. About 70 percent of those falls were from ladders or roofs (Source: Department of Labour). More recent figures from the ACC (2014) showed that 8,700 new claims were made for domestic injuries, 3,800 for work related injuries with a total of 14,400 active ladder related injury claims. Moreover, the estimated cost to New Zealand for active claims relating to ladder injuries was over NZ\$34 million per year. While it was not possible to determine how many of these reported injuries were due to unsafe multipurpose ladders as opposed to other factors, it is likely, given complaints received and from test results obtained, that a significant number could be attributed to unsafe multipurpose ladders.

Through their review of the literature, Bedi and Goldbloom (2008) identified a number of measures that could be targeted towards domestic ladder usage. They acknowledged that, while many

countermeasures have been suggested, there is little available evidence of their effectiveness. Notwithstanding, they identified potential countermeasures targeted at three stages initially focusing on actions to prevent injuries occurring, secondary actions to reduce the likelihood of an injury event and tertiary actions taken to minimise the harmful consequences. Included in their recommendations are modifications to the household to make ladder usage safer such as reducing the need to use ladders (i.e. installation of blockage proof gutters) and the installation of safety latches and hooks, education to promote correct and competent ladder usage, the use of personal protective gear and appropriate clothing, including footwear, helmets (type not specified) and safety harnesses, informing others of ladders being used and having some way of alerting others in an emergency (personal alarm system, mobile phone etc.).

Additional measures identified by Ashby et al. (2005) include provision of training courses in ladder usage at the point of sale. Courses should cover aspects such as appropriate clothing and personal protective equipment, avoiding usage in adverse weather conditions, checking ladder integrity, correct inclination angles and positioning techniques and how to safely secure a ladder.

No initiatives of this kind were found in Australia during the current literature search. Additionally, consultation with hardware store representatives did not identify any such courses that were available through major retailers. Several ladder safety courses were identified through online searches; however these courses were targeted towards occupational users to ensure compliance with the Health and Safety at Work Act.

Further, findings from a research report from Liberty Mutual Research Institute for Safety in the US (Chang et al., 2005) indicated that 'when the ladder's inclined angle was adjusted from 75 to 65 degrees, the friction required to keep the ladder in place increased by 73 percent, thus significantly increasing the risk of slippage' (p.6). The study confirmed that the angle of incline is the most critical factor affecting the required friction at the bottom of the ladder, but the findings also showed climbing height and speed to be significant factors. Moreover, the required friction increased approximately nine percent for each rung higher upon which participants positioned themselves, and when participants increased their climbing speed from 55 to 75 steps per minute, the required friction increased nearly 6.5 percent. While the results of this study support the recommended 75 degree inclined angle, they also point to a need for more information on how ladder injuries occur and for evidence-based approaches to help workers use ladders more safely.

2.5 DESCRIPTION OF CURRENT INDUSTRY STANDARDS AND REGULATIONS

Recently, there has been a drive for improvements in the design of ladders in Australia and New Zealand, with both the adoption and update of numerous Australian and Australasian Standards. These standards address the issues of design, construction and installation of ladders.

Additionally there have been numerous State and Territory based OH&S strategies targeted towards the reduction of ladder-based injuries in the workforce (see Appendix A). All of these strategies provide consistent advice.

2.5.1 National Regulators

This section provides details of the various National regulators and Standards documents

Australian Standards

Fixed ladders:

AS 1657 – 2013 Fixed platforms, walkways, stairways and ladders – Design, construction and installation

Standards Australia has released a new version of AS 1657 - 2013 *Fixed Platforms, walkways, stairways and ladders – design, construction and installation*. The new standard serves to reduce ambiguity and give guidelines for manufacturers, and provide greater safety of the users involved in accessing of fixed ladders, platforms and walkways.

The standard was prepared by the Standards Australia Committee SF-013, Platforms, walkways, stairways and ladders. The following organisations are represented on the committee:

- Australian Aluminium Council
- Australian Building Codes Board
- Australian Industry Group
- Australian Rope Access Association
- CSIRO
- Department of Justice (Tasmania)
- Energy Networks Association
- Engineers Australia
- Ladder Manufacturers Association of Australia
- Master Builders Australia
- Property Council of Australia
- Victorian Workcover Authority
- WorkCover New South Wales

This committee considered a number of International Standards on the subject of platforms, walkways, stairways and ladders for gaining access to machinery. While some of the material from these Standards has been included, the committee thought it inappropriate to adopt them as Australian Standards.

The scope of the standard is to set out requirements for the design, selection, construction and installation of fixed platforms, walkways, stairways and ladders that are intended to provide safe access to places used by operating, inspection, maintenance and servicing personnel.

Portable ladders:

There are a series of Standards covering the design, manufacture and use of portable ladders for Australia with some also applying to New Zealand. The Standards in this series are:

	1892	<i>Portable ladders</i>
AS/NZS	1892.1	Part 1: <i>Metal</i>
AS	1892.2	Part 2: <i>Timber</i>
	1892.3	Part 3: <i>Reinforced Plastic</i>
AS/NZS	1892.5:2000	Part 5: <i>Selection, safe use and care</i>

AS/NZS 1892.1:1996 *Portable Ladders: Metal*

This Standard is one of a series of joint Australian/New Zealand Standards covering safe design, manufacture and use of portable ladders and attachments. During preparation of this Standard, reference was made to the Standards listed below:

- ANSI A 14.2 – 1990 Specific requirements for portable metal ladders
- BS 2037 (1984) Portable aluminium ladders, steps, trestles and lightweight stagings
- CAN3-Z11-M81 Portable ladders
- NZS 5233 – 1986 Specifications for portable ladders (other than timber ladders)

This Standard sets out safety requirements for the design and manufacture of portable metal ladders. The Standard covers single and multiple section ladders, multipurpose ladders, combination ladders and those special purpose ladders (defined within the Standard).

AS 1892.2 – 1992 *Portable ladders Part 2: Timber*

During preparation of this Standard, reference was made to the Standards listed below:

ANSI A14.1 (1982) Ladders – Portable, wood, safety requirements

BS 1129 (1982) Specification for portable timber ladders, steps, trestles, and lightweight stagings

NZS 3609 (1978) Specification for timber ladders

SCC CAN3-Z11-M81 Portable ladders

This Standard sets up the minimal constructional and safety requirements for the design and manufacture of portable ladders with timber stiles.

AS/NZS 1892:5:2000 *Portable ladders Part 5: Selection, safe use and care*

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF/34, Portable Ladders, as a revision of AS 1982.4(Int) – 1992, Portable ladders, Part 4: Selection, safe use and care and NZS 3609:19785, Specification for timber ladders, in part.

This Standard sets out the minimum recommended safe practices and requirements for the selection, use and maintenance of portable ladders. The requirements of this Standard need not apply where recognized safe work procedures are in place.

This is the key Standard for safety issues including: pitch angle, footing, support for the top of the ladder, climbing ladders, working on ladders, repositioning ladders, electrical hazards, and safety inspection tips.

Australian Competition and Consumer Commission (ACCC)

The ACCC produced two publications in 2006 but no ongoing campaign or active distribution of information is apparent. The publications are listed below:

Safety alert: Using a ladder 2006

Poster: Using a ladder 2008

Safe Work Australia

Safe Work Australia has developed two Codes of Practice in relation to falls in the workplace, as follows:

Code of Practice: Managing the risk of falls at workplaces

This Code of Practice on how to manage the risk of falls in the workplace is approved under section 274 of the *Work Health and Safety Act* (the WHS Act).

Code of Practice: Preventing falls in housing construction July 2012

Similarly, this Code of Practice on how to prevent the risks of falls in housing construction is approved under section 274 of the Work Health and Safety Act (the WHS Act).

This Code is a revised version of the National Code of Practice for the Prevention of Falls in Housing Construction (2010), updated to reflect the requirements under the WHS Act and Regulations. It provides practical guidance for persons conducting a business or undertaking on how to eliminate, or if that is not possible, minimise the risk of falls from height in housing construction.

In this document, it is acknowledged that ladders are used extensively in the housing construction industry. However, many falls take place when people are working from ladders. The document also notes that, when using a ladder:

- the working width and movement is limited
- the time involved in moving and setting up ladders is often underestimated when planning work
- the working position on ladders is often uncomfortable (the need to stretch sideways, work above shoulder height and stand on narrow rungs for a long time) and may cause musculoskeletal disorders.

For these reasons, statements suggesting consideration of using elevating work platform or scaffolding to increase safety and efficiency are included.

2.5.2 International Standards and Regulations

A search of international Standards and Regulations was undertaken and the findings are summarised below.

Canada

The Canadian Centre for Occupational Health and Safety provides information and e-courses on a variety of ladder aspects:

- Extension ladders
- Fixed access ladders
- Inspection
- Portable ladders
- Securing portable ladders
- Step ladders
- Storage and handling

In addition, the Canadian Occupational Safety Group offers Ladder Safety Training Online (<https://www.osg.ca/online-ladder-safety-training>). The program is comprised of five modules addressing i) hazard identification and control, ii) ladder selection, iii) inspection procedures, iv) safe ladder set-up and use, and v) proper care, transportation and storage. It complies with all the necessary regulations and is produced in order to accommodate various learning styles filled with graphics and video to make it easy to understand, memorable and accurate.

United Kingdom

The Ladder Association, formerly the British Ladders Manufacturers Association, is the trade body for ladders in the United Kingdom (UK). The Association's safety campaigns are focused on ladders in the workplace. In 2012, the Ladder Association assumed responsibility for the administration of the Ladder Exchange Program (see: www.ladderexchange.org.uk). The program is supported by the Ladder Association, in partnership with the Health and Safety Executive (HSE) and the access industry, and is an exchange program designed to remove broken, bent or damaged ladders from the workplace for safe, new ones at a discounted price, and has the message 'Don't let a dodgy ladder shatter your life". It additionally contributes to raising awareness and understanding of how to use ladders and step ladders safely by offering ladder-training courses for a fee and provides a free booklet about ladder safety.

United States of America

The American Ladder Institute (ALI) is a national trade association whose mission is education of the public as to the proper selection, care and safe use of ladders (www.laddersafety.org). ALI is the American National Standards Institute (ANSI) approved developer of industry standards. The ALI also represents the business interests of its membership, which is comprised of ladder manufacturers and component suppliers. It has developed a free online safety training program, which outlines safe ladder practices in all applications, such as construction/painting, building and custodial services, warehousing, power, manufacturing, chemical and petrochemical, oil and gas, and at home (see: <http://www.laddersafetytraining.org>).

New Zealand

The Consumer Affairs Association in New Zealand have implemented a number of initiatives regarding safe ladder use both in the workplace and in the domestic setting. The Commerce Commission's surveillance activities following an initial Unsafe Goods Notice established a large number of non-compliant products on the market. The resulting recall actions and redesigned products have been continually addressing this.

The ACC investigations are on their websites listed and briefly described below:

Ladder safety standards

This webpage introduces the Ministry's investigation of the safety of ladders being sold online and discusses the consideration of whether the current safety standard should be strengthened or made mandatory. It also provides a question and answer page with tips of purchasing a safe ladder online:

http://www.consumeraffairs.govt.nz/news/media-releases/ministry-to-step-up-ladder-safety-after-injuries/?searchterm=ladders*.

Unsafe Goods Notice

The Unsafe Goods Notice can be accessed in pdf from the following website:

<http://www.consumeraffairs.govt.nz/legislation-policy/acts-regulation/product-safety-standards/unsafe-goods-notices/current-bans>

Workplace ladder safety

Workplace ladder safety is also addressed, previously through the Department of Labour which is now part of MBIE, but this function has devolved into the new Worksafe agency. These fact sheets contain tips and strategies to prevent falls from heights. While not specifically workplace or home environment specific, the information is relevant for domestic ladder users. Information and guidelines are provided on the following websites:

<http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/safe-working-with-ladders-and-stepladders/factsheet-safe-working-ladders-stepladders.pdf>

<http://www.business.govt.nz/worksafe/information-guidance/national-programmes/preventing-falls-from-height-in-construction/what-safe-looks-like/ladders>

The ACC also has information on their website:

http://www.acc.co.nz/preventing-injuries/at-work/industry-specific-safety/PRD_CTRB133131

http://www.acc.co.nz/preventing-injuries/at-home/PRD_CTRB133131

While these webpages address injuries at work and at home separately, the messages are the same, and address four key issues: i) is a ladder the safest way to do the job? ii) check your ladder first – is it safe?, iii) safe ladder setup, and iv) using the ladder safely.

2.6 SUMMARY

The review of the literature revealed that there is relatively little literature addressing the issues surrounding falls from ladders in the domestic context. Regarding the prevalence, it is clear that injuries sustained from ladder falls is a significant public health issue, resulting in serious injury outcomes (deaths and serious injuries), and, unlike falls from ladders in the workplace setting, appears to be on the increase. Most importantly, the findings suggest that males and the elderly (persons over 60 years of age), are over-represented in deaths and serious injuries from falls from ladders.

A handful of studies have examined the contributing factors to ladder falls, and, in general, it appears that many result from the ladder slipping or tipping, feet slipping out from rungs or reaching out too far.

In addition, other risk factors include: incorrect placement of the ladder during setup, unsafe handling of the ladder leading to damage and inappropriate conduct including carrying large loads during use.

Despite the severity of ladder-related injuries, and research indicating that a high proportion of ladder-related injuries are preventable, few existing initiatives and programs addressing falls outside the workplace were identified.

Within the workplace, the adoption of Australian Standards and implementation of Occupational Health and Safety Regulations have increased the accountability of employers regarding employee safety in the workplace. These regulations provide enforceable rules governing the usage of ladders .

However, in the domestic setting, it is argued that controlling non-occupational ladder usage is generally impractical and unenforceable. Notwithstanding, there are some government, advocacy, consumer and injury prevention groups that provide information on ladder safety techniques, and ladder manufacturers, both in Australia and internationally, have implemented various design features to improve safety and reduce the chance of misuse. Furthermore, there are various Standards and Regulations that manufacturers must adhere to, and updated Standards and guidelines aim to improve the design and manufacture of ladders.

Most importantly, there was no evidence found in the literature attesting to the effectiveness of any initiatives in reducing the incidence and severity of falls from ladders.

3 ANALYSIS OF HOSPITAL AND DEATH DATA

In addition to a review of the literature addressing falls from ladders, analyses of various Victorian data sources were undertaken to enhance our understanding of the extent of the problem in Victoria, addressing project objectives i) and ii). Specifically, the analyses were undertaken to describe the full extent of the problem of serious injury and death related to domestic ladder falls. Three sources of data were accessed for several levels of severity of falls, from hospital emergency department presentations to deaths. These included:

- Victorian Injury Surveillance Unit (VISU) Data
- Victorian State Trauma Registry Data
- National Coroner's Information System (NCIS)

This section outlines, for each data source, the methods of data extraction and analysis and provides the findings of the analyses, along with interpretation of the findings.

3.1 VICTORIAN INJURY SURVEILLANCE UNIT (VISU) DATA

The VISU holds hospital-treated injury data at two levels of severity: hospital admissions and Emergency Department (ED) presentations and is funded by the Victorian Department of Health. De-identified unit record files on Victorian injury hospital admissions and ED presentations are provided to VISU by the Department of Health.

For the purposes of this analysis on Victorian ladder fall injury, the following data sources were accessed:

- Hospital admissions data were extracted from the Victorian Admitted Episodes Dataset (VAED) - all Victorian public and private hospitals contribute hospitalisations data to the VAED; and
- Emergency department presentations (non-admissions) data were extracted from the Victorian Emergency Minimum Dataset (VEMD) – currently the 38 Victorian hospitals that provide a 24-hour emergency service contribute injury surveillance data to the VEMD.

3.1.1 Methods – Case selection and data analysis

Data over the fourteen (14) year period, July 1st, 1999 to June 30th, 2013 were examined.

3.1.1.1 Hospital Admissions

Hospital admissions recorded on the VAED are coded using the ICD coding system, 10th Revision Australian Modifications (ICD-10-AM). Deaths in hospital and transfers within and between hospitals were excluded. All non-Victorian residents were also excluded.

Case selection procedure

- Data were extracted from the VAED using the following variables
 - Financial year of admission = '1999/00-2012/13'
 - ICD-10-AM external causes codes used to extract data
 - First external cause code: W11 "Fall on and from ladder".

Notes:

- ***In July 2012 the Victorian Hospital Admission Policy changed significantly meaning that patients who received their entire care within a designated emergency department or urgent care centre could no longer be eligible for admission regardless of the amount of time spent in the hospital. This has had the effect of reducing the number of admissions recorded on the VAED for the 2012/13 financial year. For this reason VISU suggests caution should be exercised when interpreting potential changes in the number of hospital admissions in 2012/13 compared with previous years.***
- Data on body region and injury type are based on primary diagnosis code.
- Cells with values less than 5 have been replaced by an asterisk (*) as a privacy protection measure.

3.1.1.2 Emergency Department (ED) presentations

Emergency Department (ED) presentation data were extracted from the VEMD. All non-Victorian residents were excluded.

Case selection procedure

- Data were extracted from the VEMD using the following variables
 - Financial year of ED presentation = '1999/00-2012/13'
 - A search of the text variable 'description of injury event' was conducted to identify ladder-related cases. Search terms included 'ladder', or variations and derivatives.
- Cases subsequently admitted as inpatients were excluded for most analyses to avoid double counting with VAED data. However, these admitted cases from the VEMD were used for the analysis of narrative data (section 3.5).

Notes:

- Information contained in the text variable 'description of injury event' was used to code the detailed circumstances of the ladder fall for the final three years of the study period (2010/11-2012/13).
- Cells with values less than 5 have been replaced by an asterisk (*) as a privacy protection measure.

- Case identification is reliant on good data being provided. Data is collected in the busy ED, so detailed data collection is not always achieved. Hence these data may be an underestimate of the true number of cases.

3.1.1.3 Data analysis

Data were analysed using SPSS v21.0. Descriptive frequencies and cross-tabulations were performed.

3.1.2 RESULTS

This section provides the findings of the analysis of ED presentations and hospital admissions for all ladder-related injury (fall and non-fall injury). First, an overview is presented of the trends in ED presentations for all ladder-related injury (fall and non-fall injury) and hospital-treated ladder FALL injury. For hospital treated ladder fall injury, trends are provided for all ladder fall injury cases and then separately for cases that occurred at home and those that occurred when working for income (Section 3.1.2.1).

Section 3.1.2.2 provides an overview of age and gender breakdown of persons treated for ladder fall injury over the most recent 3 year period (2010/11-2012/13). This information is provided for all ladder fall injury cases and then separately for cases that occurred at home and those that occurred when working for income.

Section 3.1.2.3 provides a more detailed analysis of hospital-treated HOME ladder fall injury over the most recent 3 year period (2010/11-2012/13).

Section 3.1.2.4 provides an analysis of the case narratives that are available in the VEMD in order to attempt to gain a better understanding of the circumstances of home ladder fall injury.

3.1.2.1 All ladder-related injury, Victoria 1999/00-2012/13

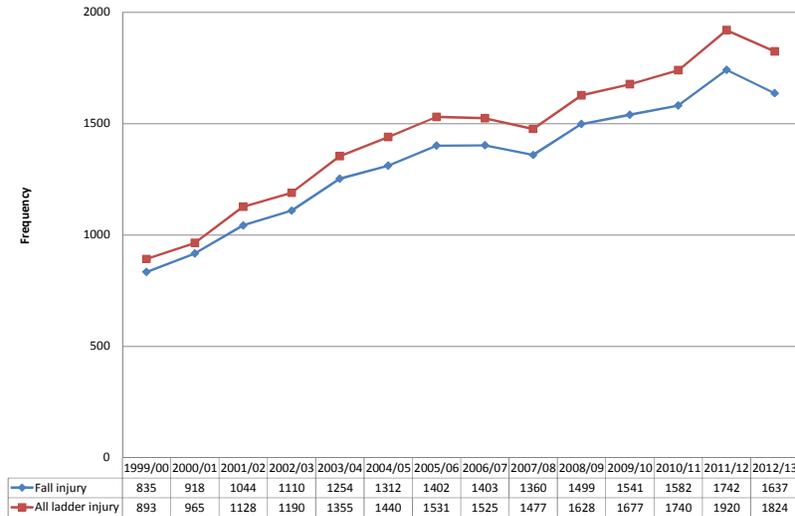
There is no code to identify non-fall related ladder injuries in the VAED so this section includes data from the VEMD only.

Over the 14-year period 1999/00-2012/13 more than 20,000 ladder-related injury ED presentations (including subsequent admissions) occurred among Victorian residents (n=20,293). The majority of these ED presentations were fall-related (91.8%, n=18,639).

Figures 3.1 and 3.2 show the frequency of ED presentations and hospital admissions and demonstrate that ladder-related injury has increased over time.

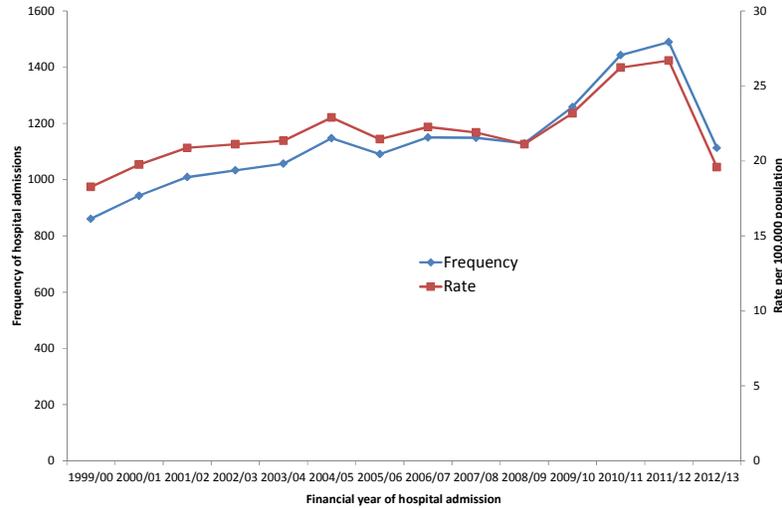
For ED presentations (Fig. 3.1), although some of the increase over the first half of the period could be the result of new hospitals being included in the VEMD collection, the number of hospitals contributing has largely been consistent since the 2004/05 year. The proportion of ladder-related injury ED presentations that are fall-related decreased slightly over the 14-year period (from 93.5% in 1999/00 to 89.7% in 2012/13) although falls still accounted for at least 9 out of 10 ladder-related injury ED presentations in 2012/13.

For hospital admissions (Fig 3.2), both the frequency and rate showed a generally increasing trend over the period before a sharp decline in 2012/13 (see note above).



Source: Victorian Emergency Minimum Dataset (VEMD)

Figure 3.1: Trend in frequency of all ladder-related injury (fall and non-fall) ED presentations, Victoria, 1999/00-2012/13 (n=20,293)



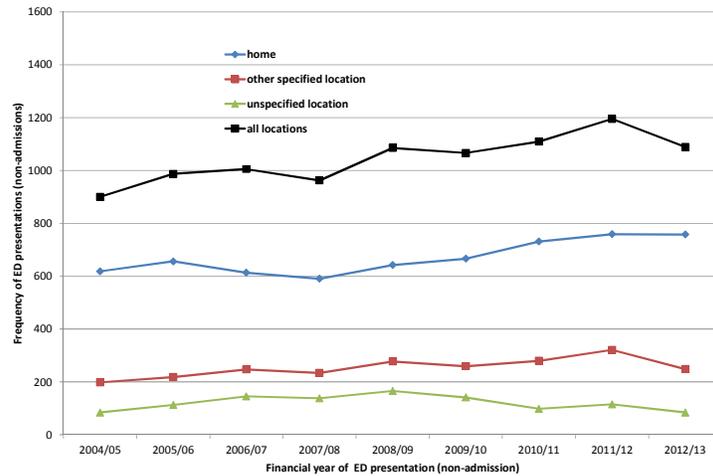
Source: Victorian Admitted Episodes Dataset

Figure 3.2: Frequency and rate per 100,000 population of ladder fall injury hospital admissions, Victoria 1999/00-2012/13 (n=15,874)

The frequencies of ladder fall injury by the location in which the fall occurred for ED presentations and hospital admissions are shown in Figures 3.3 and 3.4.

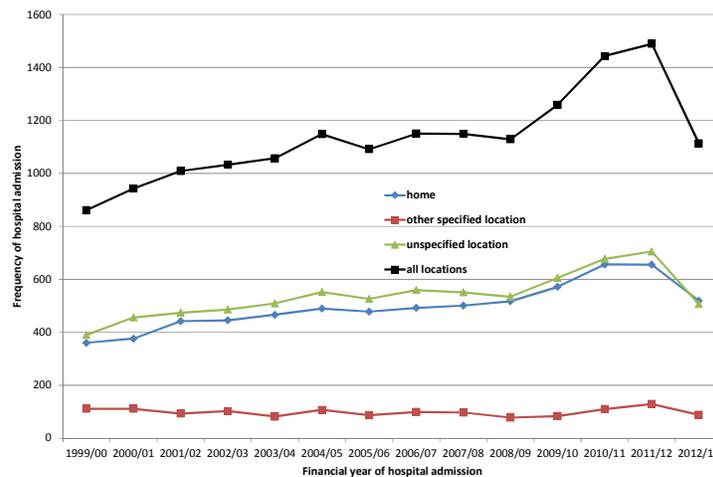
For ED presentations (Fig. 3.3), the home is the most common specified location, accounting for 64.1 percent of ladder fall ED presentations over the 9-year period (n=6,032). Moreover, this figure demonstrates that the increase in home ladder fall injury ED presentations appears to be driving the overall increase in ladder fall ED presentations over the period.

For hospital admissions (Fig. 3.4), while the location is unspecified in almost half of ladder fall injury admissions (47.4%, n=7,530), of admissions with a specified location (n=8,344), the home was the most common location of injury occurrence and this was consistent over the period (83.5%, n=6,967).



Source: Victorian Emergency Minimum Dataset

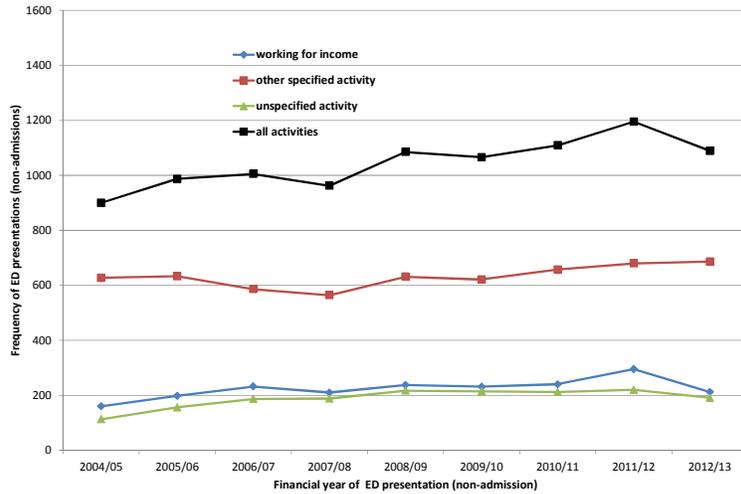
Figure 3.3: Ladder fall injury ED presentations by location of occurrence, Victoria 2004/05-2012/13 (n=9,398)



Source: Victorian Admitted Episodes Dataset

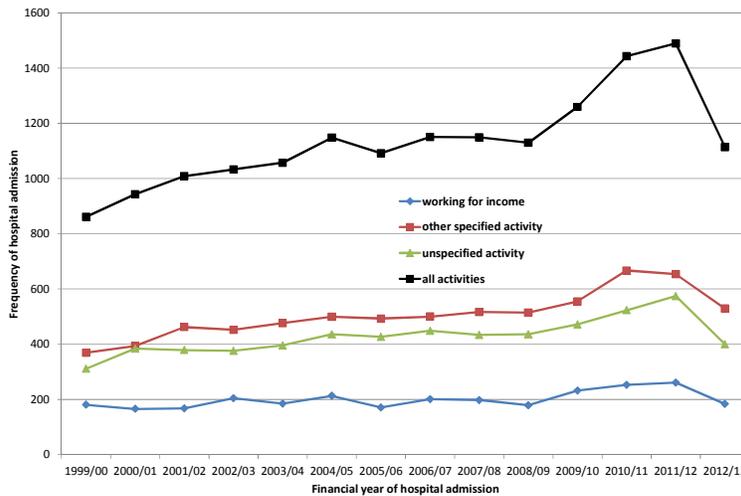
Figure 3.4: Ladder fall injury hospital admissions by location of occurrence, Victoria 1999/00-2012/13 (n=15,874)

Figures 3.5 and 3.6 show the frequency of ladder fall injury by the activity engaged in at the time of injury. For ED presentations (Fig. 3.5), around one-fifth of all ladder fall injury ED presentations occurred at work and this proportion has remained fairly consistent over the 9-year period (21.4%, n=2,015). For hospital admissions (Fig. 3.6), the activity is unspecified in a high proportion of ladder fall injury admissions (37.8%, n=5,997). Of those admissions with an activity specified (n=9,877), around 30 percent were working for income at the time of injury (28.3%, n=2,797, range 25.8% in 2005/06 to 32.9% in 1999/00).



Source: Victorian Emergency Minimum Dataset

Figure 3.5: Ladder fall injury ED presentations by activity when injured, Victoria 2004/05-2012/13 (n=9,398)



Source: Victorian Admitted Episodes Dataset

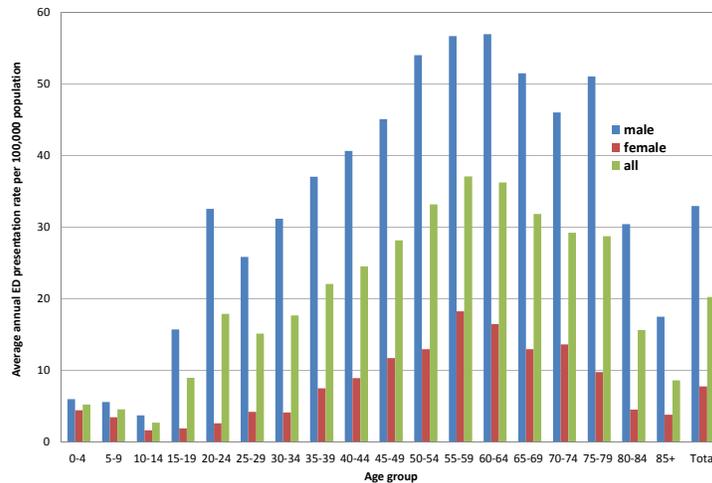
Figure 3.6: Ladder fall injury hospital admissions by activity when injured, Victoria 1999/00-2012/13 (n=15,874)

3.1.2.2 Hospital-treated ladder fall injury, Victoria, 2010/11-2012/13

The remaining sections of the VISU analysis focus on the latest 3-years of hospital-treated data. First, an overview of the age and gender of persons injured in different settings (all, settings, the home, and while working for income) is provided.

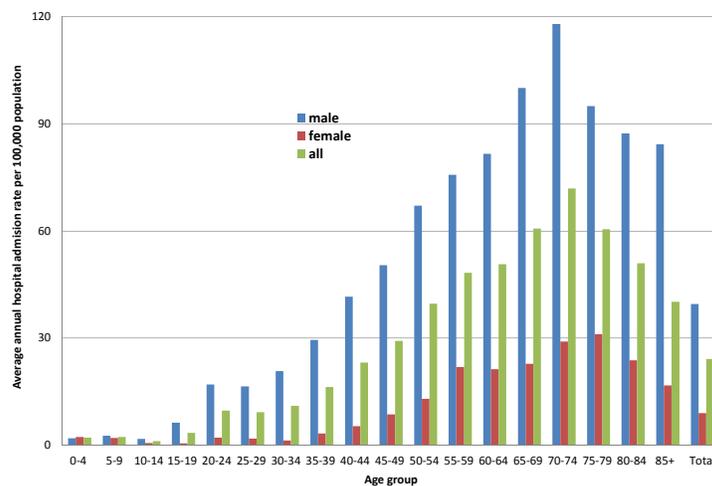
All ladder fall injuries, 2010/11-2012/13

Figures 3.7 and 3.8 show the average annual ladder fall injury ED presentation and hospital admissions rate per 100,000 population.



Source: Victorian Emergency Minimum Dataset

Figure 3.7: Average annual ED presentation rates for ALL ladder fall injury by age group and gender, Victoria 2010/11-2012/13



Source: Victorian Admitted Episodes Dataset

Figure 3.8: Average annual hospital admission rates for ALL ladder fall injury by age group and gender, Victoria 2010/11-2012/13

For ED presentations, rate per 100,000 population generally increased with age to a peak at 55-59 years before then declining with increasing age. Males had higher ED presentation rates overall and in every age group compared with females. The peak age groups for both males and females were 60-64 years and 55-59 years.

For hospital admissions, the rates generally increased with age to a peak at 70-74 years before then declining with increasing age. Males had higher hospital admission rates overall and in every age group compared with females. The peak age group for males was 70-74 years, whereas for females it was the slightly older 75-79 years age group. Overall, the rate of hospital admissions of those aged 55 years and older was 56 per 100,000 population, compared with 11 per 100,000 population for those aged 54 years and below.

Compared with ED presentations, the general trend was that those requiring hospital admission were older than those being treated in the ED.

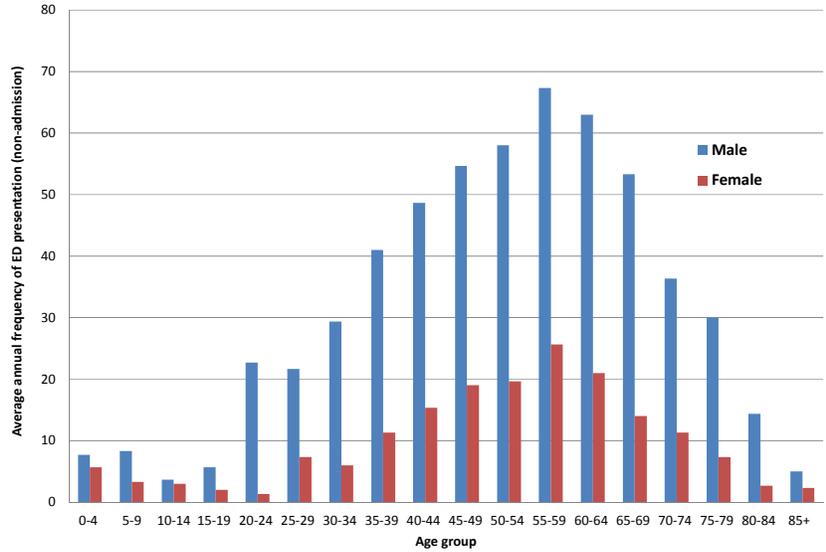
HOME ladder fall injuries, 2010/11-2012/13

Figures 3.9 and 3.10 show the average annual frequencies for HOME ladder fall injury ED presentations and hospital admissions. Overall, males accounted for around three-quarters of hospital-treated home ladder fall injuries and this was consistent for ED presentations and admissions. Almost two-thirds of those treated in hospitals for home ladder fall injury were aged between 45 and 74 years (62.6%, n=2,552). The peak age groups for ED presentations (non-admissions) the peak age group was the slightly younger 55-59 years while for hospital admissions, most were aged between 65-69 and 70-74 years.

For ED presentations, the frequency generally increased with age to a peak at 55-59 years before then declining with increasing age. Males accounted for a higher number of admissions at every age group. The peak age group for both males and females was 55-59 years (Fig. 3.9).

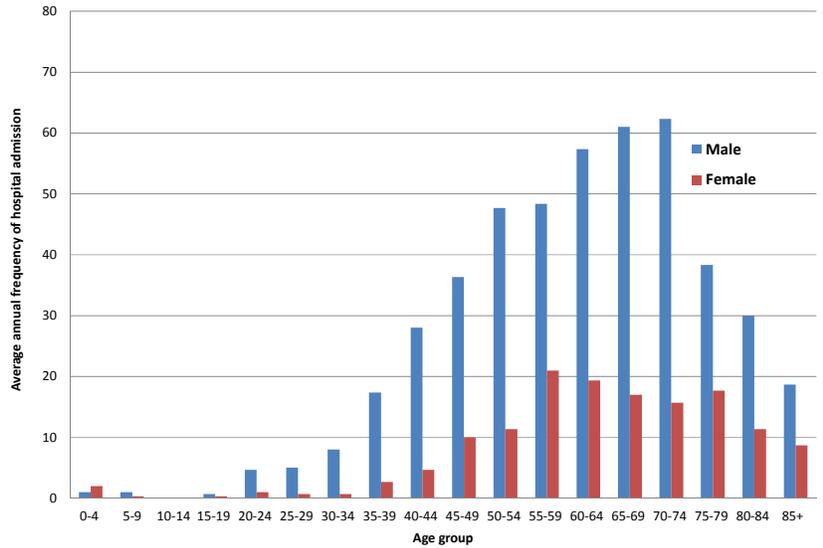
For hospital admissions, the frequency generally increased with age to a peak at 70-74 years before then declining with increasing age. Males accounted for a higher number of admissions at every age group except among 0-4 year olds. The peak age group for males was 70-74 years, whereas for females it was the younger 55-59 years age group (Fig. 3.10).

Similar to all fall injuries, compared with ED presentations, the general trend was that those requiring hospital admission for home ladder fall injuries were older than those being treated in the ED.



Source: Victorian Emergency Minimum Dataset

Figure 3.9: Average annual frequency of ED presentations for HOME ladder fall injury by age group and gender, Victoria 2010/11-2012/13

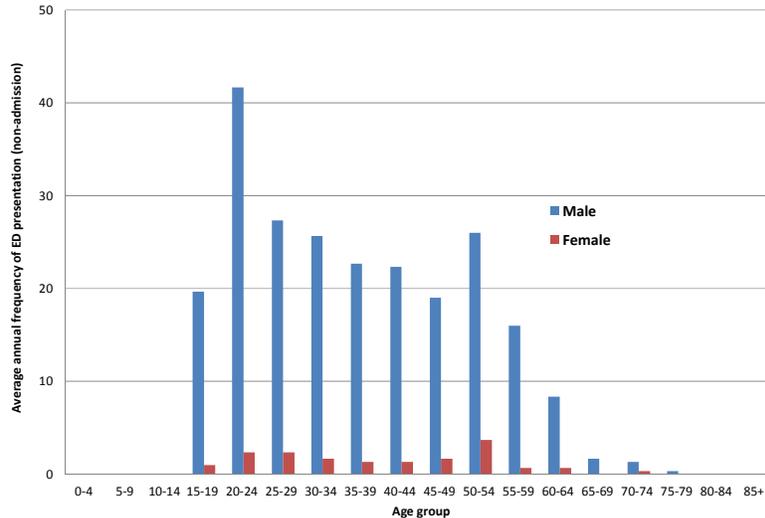


Source: Victorian Admitted Episodes Dataset

Figure 3.10: Average annual frequency of hospital admissions for HOME ladder fall injury by age group and gender, Victoria 2010/11-2012/13

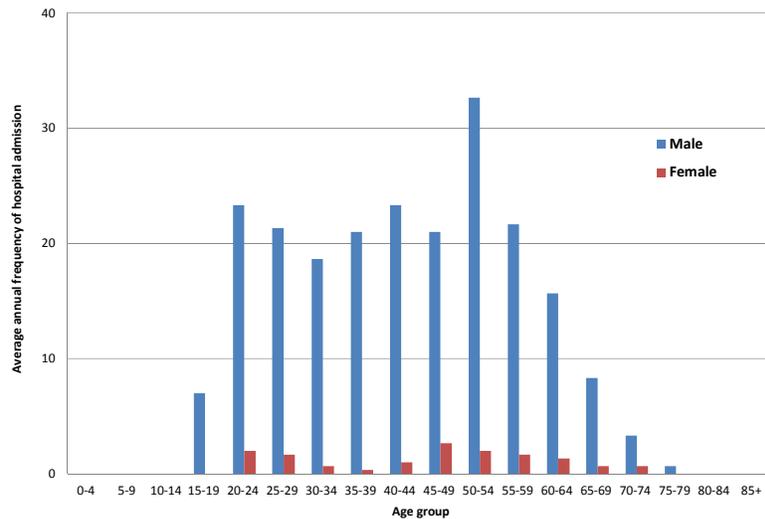
WORKING FOR INCOME ladder fall injuries, 2010/11-2012/13

Figures 3.11 and 3.12 show the average annual frequency for WORKING FOR INCOME ladder fall injury ED presentations and hospital admissions. The patterns are very different to the home ladder fall injury patterns. Almost all injuries occurred among men, and the age of those injured is generally younger, with most presentations and admissions amongst those aged 15-59 years for ED presentations and amongst those aged 20-64 years for hospital admissions.



Source: Victorian Emergency Minimum Dataset

Figure 3.11: Average annual frequency of ED presentations for WORKING FOR INCOME ladder fall injury by age group and gender, Victoria 2010/11-2012/13



Source: Victorian Admitted Episodes Dataset

Figure 3.12: Average annual frequency of hospital admissions for WORKING FOR INCOME ladder fall injury by age group and gender, Victoria 2010/11-2012/13

3.1.2.3 Hospital-treated home ladder falls 2010/11-2012/13

This section provides an overview of additional characteristics of the 4,077 hospital-treated ladder fall injuries that occurred in the home over the most recent 3-year period (2010/11-2012/13).

Table 3.13 shows the body regions injured among home ladder fall injury ED presentations and hospital admissions. The head (n=276, 15.1%), thorax (n=286, 15.6%), and knee & lower leg (n=268, 14.6%) were the most common body sites injured among hospital admissions, whereas the ankle & foot (n=379, 16.9%) and the wrist & hand (n=369, 16.4%) were the most common body sites injured among ED presentations.

Table 3.13: Hospital-treated home ladder fall injury – body site injured and nature of injury, Victoria 2010/11-2012/13 (n=4,077)

		ADMISSIONS		ED PRESENTATIONS		ALL HOSPITAL - TREATED	
		n	%	n	%	N	%
Body Site	Head	276	15.1	291	13.0	567	13.9
	Neck	51	2.8	27	1.2	78	1.9
	Thorax	286	15.6	173	7.7	459	11.3
	abdomen, lower back, lumbar spine & pelvis	240	13.1	133	5.9	373	9.1
	shoulder & upper arm	170	9.3	192	8.5	362	8.9
	elbow & forearm	220	12.0	206	9.2	426	10.4
	wrist & hand	62	3.4	369	16.4	431	10.6
	hip & thigh	123	6.7	44	2.0	167	4.1
	knee & lower leg	268	14.6	248	11	516	12.7
	ankle & foot	117	6.4	379	16.9	496	12.2
	multiple body regions	*	*	156	6.9	157	3.9
	unspecified body region	16	1.0	29	1.3	45	1.1
	Total	1,830	100.0	2,247	100.0	4,077	100.0
Nature of Injury	Fracture	1,116	61.0	613	27.3	1,729	42.4
	open wound	138	7.5	325	14.5	463	11.4
	intracranial injury	125	6.8	34	1.5	159	3.9
	dislocation, sprain & strain	75	4.1	663	29.5	738	18.1
	superficial injury	61	3.3	229	10.2	290	7.1
	injury to internal organs	54	3.0	*	*	58	1.4
	injury to muscle & tendon	38	2.1	129	5.7	167	4.1
	injury to nerves & spinal cord	29	1.6	*	*	31	0.8
	injury to blood vessels	8	0.4	*	*	11	0.3

	crushing injury	0	0.0	16	0.7	16	0.4
	other & unspecified injury	186	10.2	229	10.2	415	10.2
	Total	1,830	100.0	2,247	100.0	4,077	100.0

Source: VAED (hospital admissions) and VEMD (ED presentations).

Table 3.13 also shows the nature of injury differed between hospital admissions and ED presentations. Fractures accounted for more than 60 percent of hospital admissions (n=1,116, 61.0%), followed by open wounds (n=138, 7.5%) and intracranial injuries (n=125, 6.8%). In contrast, dislocations, sprains and strains (29.5%, n=663) and fractures (27.3%, n=613) were most common among ED presentations.

Table 3.14 shows that approximately a quarter of persons injured in home ladder falls who are admitted to hospital reside in regional/rural areas (n=441, 24.1%), whereas around a third of persons who are treated and discharged in the ED without being admitted live in regional/rural areas (n=767, 34.1%).

Table 3.14: Hospital-treated home ladder fall injury – broad geographic region of residence, Victoria 2010/11-2012/13 (n=4,077)

		ADMISSIONS		ED PRESENTATIONS		ALL HOSPITAL - TREATED	
		n	%	n	%	N	%
Broad geographic region	Melbourne Metropolitan Area	1,389	75.9	1,480	65.9	2,869	70.4
	Regional/Rural Area	441	24.1	767	34.1	1,208	29.6
	Total	1,830	100.0	2,247	100.0	4,077	100.0

Source: VAED (hospital admissions) and VEMD (ED presentations).

Note: see Appendix B for full breakdown of hospital-treated cases by Local Government Area (LGA).

Tables 3.15 to 3.17 provide an overview of the burden of injury related to home ladder fall injury hospital admissions only, as the information on length of stay and bed days is only relevant and costs information is only available for admitted cases.

Forty-five percent of patients had a hospital stay of less than 2 days (n=817), around 40 percent stayed in hospital for between 2 and 7 days (n=720, 39.3%) and 16 percent required a stay of more than 8 days (n=293) (Table 3.15).

Table 3.15: Home ladder fall injury - length of stay (hospital admissions only)

		Frequency	%
Length of Stay	< 2 days	817	44.6
	2-7 days	720	39.3
	8-30 days	277	15.1
	31+ days	16	0.9
	Total	1,830	100

Source: Victorian Admitted Episodes Dataset (hospital admissions).

In order to understand the true picture of the burden of home ladder fall injury cases admitted to Victorian hospitals, Tables 3.16 and 3.17 include all recorded home ladder fall injury hospital admissions (n=2,395) without excluding transfers, deaths or non-Victorian residents.

Table 3.16 shows home ladder fall injury admissions accounted for almost 15,000 hospital bed days over the 3-year period 2010/11-2012/13. The mean length of stay per case was 6.2 days (range 1-181 days).

Table 3.16: Home ladder fall injury - total hospital bed days (hospital admissions only)

Financial Year of Patient Admission	N	Sum	Mean	Range
2010/11	843	5,203	6.2	1 - 71 days
2011/12	861	5,769	6.7	1 - 181 days
2012/13	691	3,873	5.6	1 - 65 days
TOTAL (all years)	2,395	14,845	6.2	1 - 181 days

Source: Victorian Admitted Episodes Dataset (hospital admissions).

Table 3.17 shows the direct hospital costs associated with Victorian home ladder fall injury admissions over the 3-year study period was more than \$18.3 million. The average hospital cost for each admission was \$7,666 (range \$666-\$187,009).

Table 3.17: Home ladder fall injury - direct hospital costs (hospital admissions only)

Financial Year of Patient Admission	N	Sum	Mean	Range
2010/11	843	\$6,524,115	\$7,739	\$832 - \$153,856
2011/12	861	\$6,691,502	\$7,772	\$666 - \$187,009
2012/13	691	\$5,143,568	\$7,444	\$955 - \$125,193
TOTAL (all years)	2,395	\$18,359,185	\$7,666	\$666 - \$187,009

Source: Victorian Admitted Episodes Dataset (hospital admissions).

3.1.2.4 Detailed circumstances associated with hospital-treated home ladder fall injury (2010/11-2012/13)

The mechanisms of the ladder falls are not recorded in the VAED. The case narratives for both admissions and non-admissions for home ladder fall injury recorded on the VEMD were extracted and analysed. The quality of narratives varied greatly with most only recording that the injury was a fall from a ladder with no further information (see Table 3.18). A further five mechanisms of injury were identified. Of these specific mechanisms, 'user slip or misstep' accounted for the most presentations and subsequent admissions.

Table 3.18: Mechanism of injury of home ladder falls based on “description of injury event” text field (all ED presentations)

		ADMISSIONS *		ED PRESENTATIONS		ALL ED PRESENTATIONS	
		n	%	n	%	n	%
Specific Cause	ladder instability (slide out and sideways tilting)	28	2.7	67	3.0	95	2.9
	user slip or misstep	61	5.9	203	9.0	264	8.1
	user loss of balance	11	1.1	24	1.1	35	1.1
	ladder fault/malfunction	*	*	11	0.5	15	0.5
	body part caught in ladder	12	1.2	41	1.8	53	1.6
	fall from ladder (no further information)	915	88.7	1,901	84.6	2,816	85.9
Total		1,031	100.0	2,247	100.0	3,278	100.0

Source: Victorian Emergency Minimum Dataset (VEMD).

A sample of informative narratives is included here to provide an indication of the mechanisms and circumstances of home ladder fall injury.

Example case narratives for mechanism of injury – home ladder falls only

Ladder instability (slide out and sideways tilting)

- standing 14 feet above ground on top of a ladder when the ladder collapsed and upon falling became entangled in ladder
- cleaning gutters and ladder slipped on wet deck causing a 2 metre fall
- on ladder which gave way resulting in approximate 2 metre fall
- patient 3 metres up on ladder when it slipped out from under him, patient grabbed guttering but could not hold on
- ladder collapsed underneath patient, fall onto outstretched hand

User slip or misstep

- patient slipped 1 metre down ladder landing on lower back
- cutting branches and slipped resulting in fall from ladder
- slipped off bottom rung of ladder onto foot and heard a crack
- coming down from ladder and misjudged step resulting in a fall backward
- cleaning the spouting when slipped on ladder and fell

User loss of balance

- pruning shrubs whilst up a ladder and lost balance
- fall onto right leg after overbalancing on ladder when cleaning windows
- overbalanced when reached out on a ladder
- on a step ladder reaching up when lost balance
- climbing a ladder to retrieve ball from roof when overbalanced and fell

Ladder fault/malfunction

- painting ceiling and step ladder collapsed, fell heavily onto shoulder
- fourth step on ladder broke as patient stepped down onto it resulting in a fall
- wooden rung on ladder broke when patient on it causing fall
- cleaning gutters and ladder broke
- head injury followed fall from an old rotted ladder rung which broke

Body part caught in ladder

- right foot caught in ladder rung when falling off
- finger crushed in ladder as it collapsed when patient fell
- deep laceration after clothing was caught in ladder after slip
- left calf caught in step ladder when patient has fallen
- fall off ladder with leg caught in ladder, landing on back

Fall from ladder (no further information)

- fixing tiles on the roof when fell off ladder
- fall approximately 3 metres from ladder landing on shoulder
- fell off ladder cleaning gutters
- spinal injury following fall from ladder
- fall 1.5 metres off ladder when pruning trees in garden

Narratives were also examined for information regarding the activity being undertaken at the time of injury. Again, the quality of the narratives varied greatly. Examination of useful VEMD narratives identified that home ladder fall injuries occurred during the following outdoor and indoor activities:

- outdoor activities – cleaning gutters, painting, maintenance and gardening
- indoor activities – painting, cleaning, changing light bulbs, hanging decorations/ pictures/ décor.

A sample of informative narratives is included here to provide an indication of the activities being undertaken at the time of the home ladder fall injury.

Example case narratives for activity when injured – home ladder falls only

Cleaning

- up ladder cleaning gutters when fell and attempted to grab hold of guttering
- cleaning gutters 1.8 metres off ground when ladder collapsed
- cleaning windows when slipped off ladder
- cleaning the ceiling of the bathroom when patient misjudged 3rd step

Gardening

- fell off ladder approximately 1 metre whilst cutting hedge
- gardening up a ladder, stepped awkwardly and fell off ladder
- pruning shrubs while up a ladder and overbalanced
- pruning tree 2 metres up when fell off ladder

Changing light bulbs

- fall from top of ladder after slipping when changing light bulb
- changing light bulb in the bathroom and fell off ladder
- fell from bottom rung of ladder when changing light bulb
- was attempting to change light bulb but slipped on wet aluminium rung

Maintenance

- slid down metal ladder whilst fixing TV aerial
- fixing a gas heater in the ceiling and fell off ladder
- fell off step ladder when fixing shed
- fixing ceiling when fell off ladder
- fixing tiles on the roof when fell off ladder

Retrieving a ball

- child climbing up a ladder trying to retrieve football but fell off
- was climbing ladder to get ball from roof when fell

Painting

- painting cathedral ceiling and sheet that ladder was resting on slipped

- at home painting when misjudged last step and fell
- painting ceiling and step ladder collapsed
- outside painting and fell off ladder

Hanging decorations/pictures/décor

- in the garage hanging decorations, slipped off ladder
- taking down Christmas decorations, fell backwards off ladder
- fell off ladder whilst putting up Christmas decorations
- slipped off ladder while helping mother put up curtains

3.2 ANALYSIS OF VICTORIAN STATE TRAUMA REGISTRY DATA

Victorian State Trauma Registry (VSTR) data for the years 2005-2013 were also examined to supplement the VISU data analyses, with a focus on major trauma. VSTR data was provided by VSTORM, a Department of Health and Transport Accident Commission sponsored project.

3.2.1 METHODS – CASE SELECTION AND DATA ANALYSIS

Domestic ladder falls cases were selected using the same definition as for earlier analyses of hospital data, but selected only for cases where the Injury Severity Score (ISS) was greater than 12 (based on AIS 2008). The domestic ladder falls data was reported in the context of all ladder falls during this period and separately by demographic characteristics, fall height, activity, nature and severity of injury, discharge status and follow-up for disability after 6 months, 12 and 24 months, where available. The Glasgow Outcome Scale - Extended (GOSE) was used as the disability outcome measure.

3.2.2 RESULTS

The full tabulated results are included as Appendix C.

All ladder fall cases recorded on the trauma registry for the period 2005-2013 are shown in Table 3.19. Domestic ladder falls account for 74% of all ladder fall cases in this period.

Among the 576 domestic ladder fall cases, males accounted for 91.5 percent of cases and 70.5 percent of total cases were aged 60 years or over with only 6.8 percent aged less than 45 years. The most common activity was *trimming hedge/pruning tree/picking fruit* (89 cases) followed by *outdoors - cleaning gutters/windows/roof* (59). Other common activities were *climbing onto or off the roof - activity NFS* and *outdoors - repairing roof/gutters/antenna/light*, followed by *painting*. However, it should be noted that activity was not specified for 307 (53.3%) cases.

The domestic ladder fall height was greater than one metre in the majority of cases (n=488, 84.7%). Multiple injuries were the result of these falls in 234 cases (40.6%), which exclude major neurotrauma, and head injury of greater severity than AIS2 occurred in 214 cases (37.2%) (see Appendix C for details of injury type by year). The ISS was greater than 16 for 344 cases (59.7%).

Table 3.19 Number of ladder fall cases resulting in major trauma in Victoria (2005-2013)

	Calendar year									
	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
All VSTR Major Trauma	2060	2153	2281	2386	2549	2641	2884	2883	2935	
All ladder falls	63	58	73	54	90	89	116	126	108	776
Domestic ladder falls resulting in major trauma	50	43	51	39	66	65	82	98	82	576
% of major trauma resulting from domestic ladder falls	2.4%	2.0%	2.2%	1.6%	2.6%	2.5%	2.8%	3.4%	2.8%	

Hospital separation data were examined and are presented in Table 3.20

Table 3.20 Ladder falls patient outcome on hospital discharge

Outcome from hospital	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Death	9	6	5	5	5	8	7	11	2	58
Rehabilitation	16	12	22	13	18	27	24	28	35	195
Home	21	21	21	19	40	27	49	53	40	291
Hospital for Convalescence	1	2	2		2	1	2	6	4	20
Nursing home	1	1			1	1			1	5
Other	2	1	1	2		1				7
Survivors to discharge	41	37	46	34	61	57	75	87	80	518

The 58 deaths in hospital, and a further 7 known deaths within six months of discharge, suggest that the 78 deaths recorded by the NCIS for the longer period of 2001-2012 (see Section 3.3), could be an undercount, particularly since not all of the NCIS reported cases survived to be admitted to hospital.

The activities at the time of the ladder fall, where available for major trauma cases, are compared with those from the NCIS (Table 3.21). While cases could not be classified in exactly the same way between the free text provided with each dataset, it is clear that *trimming hedge/pruning tree/picking fruit* and outdoor activities including *cleaning and repairing gutters, roofs, etc.*, were highly represented in both.

Table 3.21 Domestic ladder fall deaths and major trauma by activity*

Activity*	Deaths Jan 2001-Dec 2012 (n=78)		Major trauma 2005-13 (n=576)	
	Frequency	%	Frequency	%
Trimming hedge/pruning tree/picking fruit	20	25.6	89	15.5
Outdoors - Cleaning gutters/windows/roof/insect screen	8	10.2	59	10.2
Climbing onto or off the roof - Activity NFS			37	6.4
Outdoors - Repairing roof/gutters/antenna/light/air conditioning/weatherboard/hot water system	17	21.8	31	5.4
Painting	7	8.9	18	3.1
Indoors - Painting/repairs/changing lightbulb/changing smoke alarm batteries/working in ceiling roof area/working in garage/shed/accessing high cupboard/blinds	13	16.7	14	2.4
Outdoors – Building/repairing/maintaining pergola/shed, verandah	4	5.1	9	1.5
Outdoors - Retrieving things from height or putting things up high			6	1.0
Other (including locked out, washing caravan, connecting pipes to water tank)	3	3.8	6	1.0
Activity not specified	6	7.7	307	53.3
Total	78	99.8	576	99.8

*Grouped according to free text

Note: specific features among the deaths include: clearing or repairing gutters, working alone, timber or broken ladder, picking fruit, roof repairs.

The number of cases for which longer term outcome measures (GOSE) was available was limited as were return to work figures (Appendix C). Of the 322 cases available to follow-up at 12 months, 30 (9.3%) had a persistent severe disability and 72 (22.4%) had a moderate persistent disability, while 207 (64.3%) had made a good recovery.

Of cases available to follow-up, 149 (injured between 2005 and 2012) were working prior to injury. At 6 months post-injury, of 140 available cases from this working group 29 (20.7%) had not returned to work, 105 (75.0%) had returned to work and return to work status was unknown for 16 cases (Appendix C).

3.3 ANALYSIS OF NATIONAL CORONIAL INFORMATION SYSTEM (NCIS) DATA

This section presents the aggregate findings of the NCIS data analysis. The NCIS, funded by each Australian State and Territory Justice Department, the Federal Department of Health, the Australian Institute of Criminology, Safe Work Australia, the Australian Competition and Consumer Commission, the Department of Infrastructure and Transport and the NZ Ministry of Justice, provides information about every death reported to an Australasian coroner since July 2000 (January 2001 for Queensland, and July 2007 for New Zealand). The system currently has over 240,000 recorded fatalities available for analysis. Relevant information regarding characteristics of deaths due to a ladder fall were available for examination.

3.3.1 Methods – Case selection and data analysis

3.3.1.1 Data Source

The data were obtained through conducting a search of the NCIS. The NCIS is an electronic database of coronial information containing case details from the coronial files of all Australian States and Territories, except Queensland, dating back to 1st July 2000. Queensland data is contained from 1st January 2001. New Zealand data is available for deaths reported from 1 July 2007.

3.3.1.2 Case Identification

The Query Design Screen was used to identify cases of relevance. The method of case identification involved searching for cases where:

- **Date notified** = Between 01/01/2001 and 31/12/2012
- **Case status** = Closed
- **Jurisdiction** = All Australian states
- **Case Type** = External cause death
- **Intent on completion** = Unintentional
- **Object (any rank):** Tool, Machine, Apparatus Mainly Used For Work-Related Activity/
Other Unpowered Equipment / Ladder, Movable Step

3.3.1.3 Data Analysis

Step 1: (National data)

The coding of all cases was checked to confirm a “fall” was involved in the fatality. If no “fall” was coded, the case was checked manually to confirm that a fall from a ladder was a contributor to the death, otherwise the case was excluded from the data set.

Step 2: (Victorian domestic data)

All Victorian cases were checked manually to confirm the incident location was a “home”¹. Cases where the incident location was not a “home” were excluded from the data set.

3.3.1.4 Limitations of Data Source

Coded fields are generally not completed until the closure of a case, and the extent of information contained in the attached text reports may vary. There are also a number of other factors which may have influenced the number of cases identified within this dataset, which are outlined below. Given these factors, there is therefore a possibility of under-reporting.

Only closed cases included

Since only cases that were closed on the NCIS following a coronial investigation were included in this dataset, there may be cases of relevance still under coronial investigation that are not included in this report.

Intent classification

The determination of the intent of a deceased person is subject to the individual determination of the Coroner investigating each fatality. In some cases, a statement as to intent will not be made by the Coroner. In these instances, only where the mechanism of death (e.g. hanging, car exhaust gassing) is highly indicative of an intentional act, or where a suicide note was present, will the death be coded by coronial clerks as due to “Intentional Self-Harm” on the NCIS. The non-standard nature of intent determination may therefore also influence the classification of deaths which are identified in this report.

Availability of documentation within NCIS database

The level of attachment of documentation varies within the NCIS database according to the reporting jurisdiction. At the time the NCIS search was conducted on 12/05/2014 the attachment of Police Narratives, Autopsy Reports and Findings on the NCIS ranged from 8 percent² to 100 percent dependent on the year/jurisdiction.

¹ A “home” for the purpose of this report is a non-commercial residence, excluding hotels, nursing homes, or orphanages. The domestic home includes garden, garage, shed. In cases of farms only farmhouse and respective gardens are included

² Please note the NCIS currently contains very limited Autopsy Reports from South Australia, likely resulting in less detailed information being available for such cases.

Coronial findings in relation to non-inquest cases may not contain details about the circumstances surrounding death. These issues have the potential to impact the accurate identification of relevant fatalities via keyword searching of attached documents on the NCIS.

Terminology within the medical cause of death

It is important to note that practices in relation to assignment of causes of death and terminology used within the medical cause of death are based on forensic pathologists’ individual professional opinion about the factors involved in the death, and are not standardised.

Reference to particular drugs, injuries or diseases within the medical cause of death are not standardised in terms of terminology or certain detection levels that warrant inclusion in a medical cause of death. Such practices may therefore influence the identification of relevant deaths based on the medical cause of death.

3.3.2 Results

There were 276 deaths identified with the date of notification to the Coroner between 01/01/2001 and 31/12/2012 that were reported to an Australian Coroner which involved **fatalities resulting from people falling off ladders**. Eighty-nine (89) cases in this cohort were reported to a Victorian Coroner. Seventy-eight (78) of the Victorian fatalities occurred in a “home”³ environment. All deaths reported were closed cases with coronial investigation formally concluded.

Table 3.22 presents the number of fatalities as a result of a fall from a ladder, by gender and work-relatedness and shows that the majority of fatalities were males (95.5%), and were non work-related (94.7%).

Table 3.22: Victorian fatalities involving falls from a ladder, by Gender of the Deceased and Work Relatedness

Work Relatedness	Gender		TOTAL
	Male	Female	
Work-related	14	0	14
Non work-related	71	4	75
TOTAL	85	4	89

³ A "home" for the purpose of this report is a non-commercial residence, excluding hotels, nursing homes, or orphanages. The domestic home includes garden, garage, shed. In cases of farms only farmhouse and respective gardens are included.

Table 3.23 shows the number of fatalities as a result of a fall from a ladder by age group and work relatedness. It shows that the majority of deaths were amongst those aged 75-84 years (41.6), and all of these were non work-related. Of non-work related ladder fall deaths, 70 (93%) were aged 55 years or over.

Table 3.23: Victorian fatalities involving falls from a ladder, by Age Range of the Deceased and Work Relatedness

Work Relatedness	Age Range [years]							TOTAL
	<35	35-44	45-54	55-64	65-74	75-84	85+	
Work-related	2	4	2	2	4	0	0	14
Non work-related	0	2	3	12	16	37	5	75
TOTAL	2	6	5	14	20	37	5	89

Table 3.24 presents an overview of the trends in deaths between 2001 and 2012. On average, 6.2 fatalities involving non work-related ladder falls in a domestic setting each year.

Table 3.24: Victorian domestic fatalities involving falls from a ladder, by Year of Reporting and by Gender of the Deceased

Year of Reporting	Gender		TOTAL
	MALE	FEMALE	
2001	3	0	3
2002	4	0	4
2003	6	0	6
2004	8	0	8
2005	10	0	10
2006	4	0	4

2007	8	0	8
2008	6	2	8
2009	6	0	6
2010	5	1	6
2011	7	0	7
2012 [^]	7	1	8
TOTAL	74	4	78

[^] – May be an underestimate in the number of cases due to the proportion of open cases remaining for these years of data.

Table 3.25 presents the number of falls from a ladder in the domestic environment between 2001 and 2012 by age group, and shows that the majority of falls occurred amongst those aged 75-84 years of age (44.9%), followed by those aged 65-74 years (21.8%). Only 23.4 percent of fatalities occurred amongst younger adults aged 35-64 years.

Table 3.25: Victorian domestic fatalities involving falls from a ladder, by Year of Reporting and by Age Range of the Deceased

Year of Reporting	Age Range [years]						TOTAL
	35-44	45-54	55-64	65-74	75-84	85+	
2001	0	1	0	1	1	0	3
2002	0	0	1	1	2	0	4
2003	1	0	0	1	4	0	6
2004	1	2	1	1	2	1	8
2005	0	0	2	1	7	0	10
2006	0	0	0	2	2	0	4
2007	1	1	4	0	2	0	8
2008	0	0	1	1	5	1	8
2009	0	0	0	3	1	2	6

2010	0	1	2	1	1	1	6
2011	0	0	1	3	3	0	7
2012 [^]	0	0	0	2	6	0	8
TOTAL	3	5	12	17	36	5	78

[^] – May be an underestimate in the number of cases due to the proportion of open cases remaining for these years of data.

Table 3.26 shows the frequency of domestic fatalities involving falls from a ladder by medical cause of death. By far, the most common cause of death was head injury, accounting for almost 68 percent of all deaths. The next most common cause of death was cervical spine injury, accounting for 9 percent of deaths.

Table 3.26: Victorian domestic fatalities involving falls from a ladder, by Medical Cause of Death Category⁴

Medical Cause of Death Category	Frequency	Percentage [%]
Head Injuries	53	67.9
Cervical Spine Injury	7	9.0
Acute Exacerbation of Natural Disease	5	6.4
Respiratory Failure	5	6.4
Chest Injuries	3	3.8
Abdominal and Chest Injuries	2	2.6
Drug Toxicity ⁵	1	1.3
Hanging	1	1.3
Multiple Injuries	1	1.3
TOTAL	78	100

⁴Cases have been categorised by the primary cause of death, as given by the pathologist.

⁵ While "Drug Toxicity" was stated as the primary cause of death, this fatality occurred following a fall from a ladder, causing a head laceration with significant blood loss. It cannot be ultimately excluded that the fall contributed to the death of the deceased.

Last, the frequency of domestic fatalities involving falls from a ladder by location is presented in Table 3.27. Approximately three-quarters of cases occurred in the Melbourne metropolitan area.

Table 3.27: Victorian domestic fatalities involving falls from a ladder, by Statistical Division (SD)⁶ of Incident Location

Statistical Division (SD)	Frequency	Percentage [%]
Metropolitan Melbourne ⁷	58	74.4
Regional Victoria ⁸	18	23.1
N/A [^]	2	2.5
TOTAL	78	100

[^]N/A: No street address was available, therefore no SD could be determined.

⁶“Statistical Division” refers to a geographic boundary within which the address of the fatal incident of the deceased is located. In order to determine the statistical division for the incident location, each street address was imported into a geo-coding software tool (Map Data Sciences, QuickLocate® Desktop). This tool produced a Statistical Division applicable to each address based on the Australian Standard Geographical Classification (ASGC) Version 2006 classification system.

⁷ “Metropolitan Melbourne” refers to Statistical Division “205”, as per ASGC system.

⁸ “Regional Victoria” for the purpose of this report refers to all cases which are not classified as “Metropolitan Melbourne” (SD ≠205)

3.4 SUMMARY

This section provides a summary of the findings from the analyses of the three sources of injury and death data. Overall, the death and serious injury data analyses support previous studies examining the prevalence of domestic ladder falls, contributing factors and injury outcomes.

The VISU data provided insights into ED presentations and hospital admissions as a result of a ladder-related injury. Between 2004 and 2013, there were 20,293 ladder-related injury ED presentations (including subsequent admissions) and the majority (91.8%) were fall-related injuries. Both the frequency and rate of ED presentations and hospital admissions showed a generally increasing trend over the period (notwithstanding a sharp decline in 2012/13 due to changes in policies that effectively reduced the number of admissions). Similarly, the frequency and rate (per 100,000 population) of ladder FALL injury ED presentations and hospital admissions showed a generally increasing trend.

An in-depth analysis of the latest three years of ED presentations and hospital admissions revealed some key findings regarding mechanism of injury and injury outcome. The key points are listed below:

Age group and gender:

- The peak age groups for hospital-admissions were 65-69 and 70-74 years while for ED presentations (non-admissions) the peak age group was the slightly younger 55-59 years
- Males accounted for around three-quarters of hospital-treated home ladder fall injuries and this was consistent for admissions and ED presentations.
- Average annual ALL ladder fall injury hospital admissions rate per 100,000 population generally increased with age to a peak at 70-74 years before then declining with increasing age. Males had higher hospital admission rates overall and in every age group. The peak age group for males was 70-74 years, whereas for females it was the slightly older 75-79 years age group.
- Average annual frequency for HOME ladder fall injury hospital admissions generally increased with age to a peak at 70-74 years before then declining with increasing age. Males accounted for a higher number of admissions at every age group except among 0-4 year olds. The peak age group for males was 70-74 years, whereas for females it was the younger 55-59 years age group.
- The pattern for WORKING FOR INCOME ladder fall injury hospital admissions is very different to the home ladder fall injury pattern, with almost all injuries occur among men aged 20-64 years.

Injury patterns:

- For hospital admissions, specific mechanisms of injury included a range of contributing factors, and 'fall from ladder' and 'user slip or misstep' accounted for the most presentations and subsequent admissions.

- Dislocations, sprains and strains (29.5%) and fractures (27.3%) were most common among ED presentations. Fractures accounted for more than 60 percent of hospital admissions, followed by open wounds (7.5%), and intracranial injuries (6.8%).
- Head, thorax, and knee & lower leg were the most common body sites injured among home ladder fall injury hospital admissions, whereas the ankle & foot, and the wrist & hand were the most common body sites injured among ED presentations.

Other:

- Approximately one-quarters of persons injured in home ladder falls that are admitted to hospital reside in Melbourne metropolitan areas. Interestingly, approximately one-third of people in regional/rural areas are treated and discharged in the ED without being admitted.
- The mean average length of hospital stay was 6.2 days. Forty-five percent of patients had a hospital stay of less than 2 days, around 40 percent stayed in hospital for between 2 and 7 days, and 16 percent required a stay of more than 8 days. The average hospital cost for each admission was \$7,666.

The analysis of VSTR data (major trauma cases admitted to hospital) added to the findings of the VAED analysis.

- Overall, there were 776 ladder fall major trauma cases between January 2005 and December 2013, of which 576 (74.2%) occurred in the domestic setting. Males accounted for the majority of cases (91.5%), and the majority were aged 60 years and older (70.5%).
- The most common activities were outdoor, and mainly trimming hedges, pruning trees and picking fruit. Other common outdoor activities included repairs (roof, gutters, etc.), painting, climbing on the roof.
- The majority of cases (84.7%) involved a fall from a height greater than one metre.
- The most common body regions injured included head, thorax
- The in-depth analysis of the NCIS data revealed some similar findings to that of the serious injury data, and some differences.
- Overall, there were 276 deaths identified to the Coroner between January 2001 and December 2012, Eighty-nine (89) cases in this cohort were reported with death due to a ladder fall, and of these, 78 (87.6%) occurred in a home environment. On average, 6.2 fatalities involving non work-related ladder falls in a domestic setting each year.
- The majority of fatalities were male (95.5%), and were non work-related (94.7%).
- The majority of falls occurred amongst those aged 75-84 years of age (44.9%), followed by those aged 65-74 years (21.8%). Only 23.4 percent of fatalities occurred amongst younger adults aged 35-64 years.

- By far, the most common cause of death was head injury, accounting for almost 68 percent of all deaths. The next most common cause of death was cervical spine injury, accounting for 9 percent of deaths. Most were from a blunt force.

Table 3.28 provides a summary of ladder fall cases: key characteristics by each level of severity and revealed some interesting findings. Across all severity levels, domestic ladder falls accounted for a high proportion of all ladder falls, and this was especially so for major trauma and death cases. Older males accounted for the majority of cases (especially deaths), the majority of cases resided in metropolitan areas.

Factors associated with high level injury severity included older age, gender (male), activity type (outdoor activities including pruning, trimming, fruit picking, and body region injured (head)).

Table 3.28: Characteristics of ladder fall injury cases by injury severity level

	ED presentations	Hospital admissions	Major trauma hospital admissions	Deaths
Number ALL cases (average per year)	1,331	1,251	86	9
Proportion of domestic cases (average per year)	64.1%	65%	73.3%	72%
Peak age group	55-59 years	65-74 years	N/A	75-84 years
Gender (male)	76.2%	76.3%	N/A	94.9%
Most common body region injured	Wrist and hand, ankle and foot	Head, thorax, knee and lower leg	N/A	Head
Activity	Leisure	Unpaid work	Outdoor (trimming, pruning, picking fruit)	Outdoor (trimming, pruning, picking fruit)
Residence (metropolitan areas)	66%	76%	N/A	74%
Cause of injury (fall)	88.7%	84.7%	N/A	98.5%

4 CONSULTATION

In addition to providing an understanding of the trends in ladder-related injuries and identifying 'best-practice' initiatives and programs, it is also important to gain an understanding of the general perceptions of ladder safety and the use of ladders from consumer groups, as well as an understanding of perceptions of key stakeholders regarding their roles and responsibilities in manufacturing and providing safe equipment to consumers, regulating the supply of safe ladders and innovating in the provision of access of heights or alternatives to the need to access heights.

This phase of the project addresses objectives iii) and iv) and utilises survey and interview techniques to gather important information from two groups, namely i) the general population of domestic ladder users, and ii) key retail, industry, government and consumer advocate stakeholders. This phase was approved by the Monash University Human Ethics Research Committee.

4.1 DOMESTIC LADDER USER SURVEY

A total of 124 domestic ladder users participated in a survey. Only participants who indicated they used a ladder at their own home or someone else's home were eligible for inclusion. Those indicating that they did not use a ladder at home or at someone else's home were excluded from participation.

The information gained from the survey has been used to compliment the evidence base regarding ladder usage and injuries and provides information on consumer views and awareness of ladder safety issues.

4.1.1 Recruitment

Participants were recruited using a range of complementary methods:

- In-store recruitment at hardware stores: Approval was gained to recruit from outside major hardware stores including Bunnings, Masters and Mitre10 stores. Store locations for recruitment were selected to gain a stratified cross sectional sample from Melbourne metropolitan and regional areas and included: Ballarat, Carrum Downs, Knoxfield, Ivanhoe, Hawthorn, and Geelong. Flyers were handed to interested participants, inviting them to access the online survey. Hard copies of the survey were available, on request.
- Advertisements on Monash University and Department of Health websites: An advertisement was included in the Monash Memo (sent to all Monash University staff and alumni), and the Seniors Online website.
- Snowballing techniques: This was our most successful recruitment strategy, where interested participants were asked to pass the information onto other family, friends and colleagues.

The recruitment strategies were designed and stratified to attract the relevant target audience for participation, which was focused on older men, who represent the majority of those injured in ladder falls.

4.1.2 Survey

The survey was designed to gather information on perceptions of safety, ladder purchase and use, behaviour and attitudes/motivations, age and design of ladder, reasons for not using alternative equipment, and fall/injury experience, and demographic characteristics. It was available online: <http://tinyurl.com/DomesticLadderSurvey>, and available in hard copy, if requested. The survey is provided in Appendix D.

The survey consisted of seven components, as follows:

1. Demographic characteristics: This section asked a range of questions on demographic characteristics including age, gender, marital status, work status, living arrangements, etc.
2. Ladder ownership: This section included questions related to ownership of ladders, including number and types of ladders owned, and characteristics of ladders (e.g., construction materials, steps or rungs, etc.).
3. Ladder usage: This section gained information on location of and reasons for ladder use, use of other products, heights typically climbed to, measures used to ensure safety, behaviour while using ladders, knowledge of safety behaviour.
4. Use of safety equipment: This section gained information on use of additional safety equipment when using a ladder, including use of protective clothing and other safety equipment, assistance by others, etc.
5. Alternatives to ladder use: Here, questions related to the use of alternatives, and knowledge of alternative methods to undertake DIY tasks around the home.
6. Personal history: In this section, participants were asked to report on additional personal characteristics, including presence of medical conditions, rating of level of fitness and physical activity, medication use, and perceptions of safety around ladders.
7. Ladder falls experience: This last section included a range of questions on falls and injuries from ladder use. Included were questions relating to: number of injury events (to self or to others), activities being undertaken, behaviour prior to sustaining the injury, and nature of the injury/injuries (body region injured, type of injury, severity of injury). Last, participants were asked to identify alternative behaviour that may have prevented the injury, or suggestions on how falls from ladders around the home might be prevented.

4.1.3 Results

Overall, 124 participants responded to the survey of which 92 percent met the inclusion requirement of having used a ladder in or around the home or someone else's home. In total, 114 participants' responses were included in the analyses. Respondents who did not meet the criteria stated that they did not own a ladder with several stating that they would just use a chair or would hire someone or have a family member help if they needed to reach a height.

4.1.3.1 Demographics

The majority of the sample were male (64.2%). A summary of the age group and gender distribution is presented in Figure 4.1 and shows a good representation of all adult age groups, with substantial numbers of older adults aged between 50-69 years, and particularly males. This corresponds with the target group of ladder users (and those sustaining a ladder-related injury). The oldest groups (aged 70 years and older) were somewhat under-represented, however.

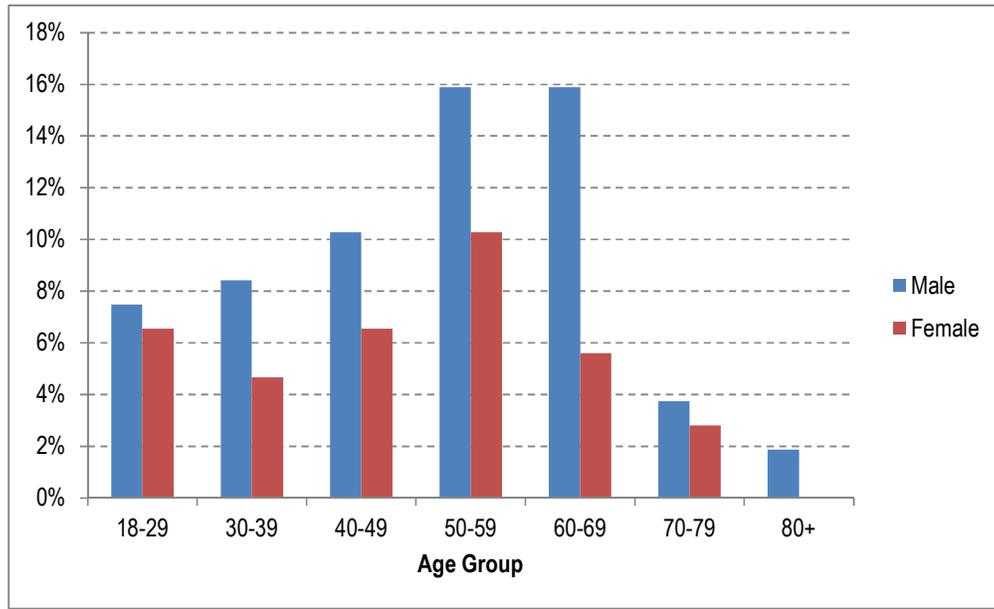


Figure 4.1: Age group and gender distribution of participants (n=114)

The majority of survey participants were either in full time work (52.6%) or retired (21.9%) with a range of occupations (either current or former) listed including, Accountants, Mechanics, Students and Doctors. The majority of respondents were either married or in a de-facto relationship (76.3%) and the majority of respondents lived in their own home (96%) which were generally separate houses (85%), semi-detached house (7%), or flat/unit/apartment (4%).

Each participant was asked to provide their postcode when completing the survey, the results show participants for diverse regions of Metropolitan Melbourne and Victoria, while the survey was also completed by residents in Tasmania, New South Wales, Queensland and the Northern Territory.

4.1.3.2 Ladder Ownership

Participants were asked to indicate the number and type of ladders they owned. All participants owned at least one ladder, and the types of ladders owned are shown in Figure 4.2.

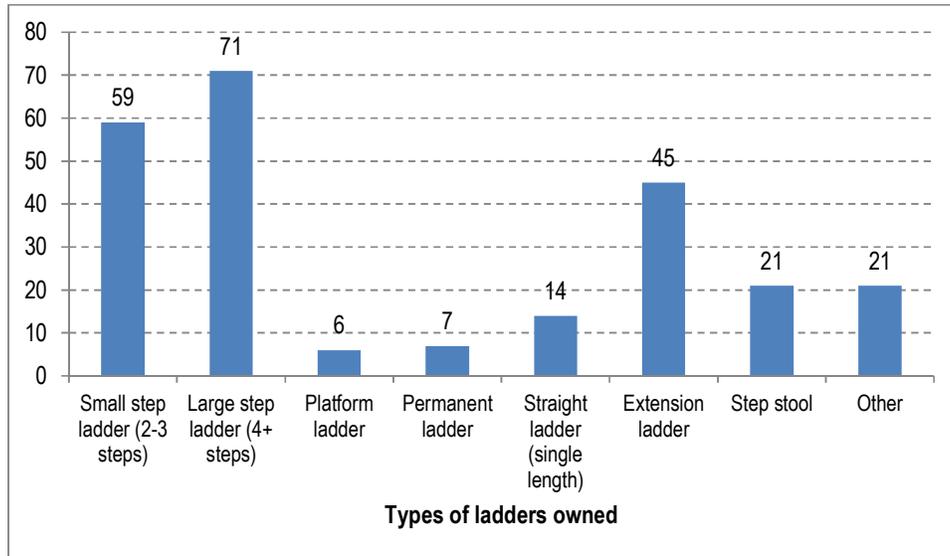


Figure 4.2: Types of ladders owned by 114 participants (total ladders = 244)

On average, participants were most likely to report owning step ladders, particularly large ones (with 4 or more steps). Other frequently owned ladders were extension ladders (45). Only small numbers of participants indicated they owned platform or permanent ladders.

Regarding age of ladder, there was a reasonably even split amongst ladders aged 2-5 years (34.2%), 6-10 years (30.7%) and over 10 years (29.8%). When asked which ladder they used most often, the majority of participants (51%) stated that they used the large step ladder most often (Figure 4.3).

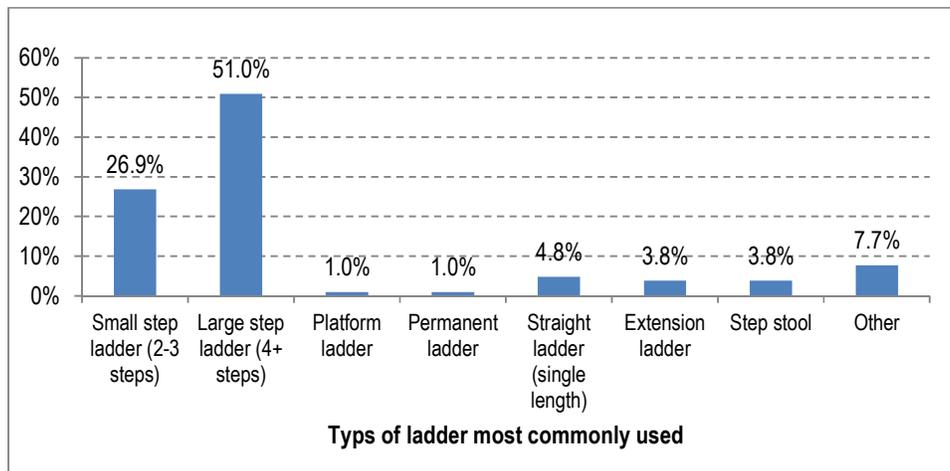


Figure 4.3: Type of ladder most commonly used (n=114)

There was an effect of gender on type of ladder used. Males were more likely to use a large step ladder, compared with females who were more likely to use a small step ladder or step stool ($\chi^2_{(2)} = 14.4, p < .05$). Further, there was no statistically significant effect of age group, with larger ladders typically the most popular ladder across each age group.

By far, the most commonly used ladders were made of aluminium (82.1%), with another 10.4 percent made of other metal. Only 4.7 percent were made of wood.

The majority of respondents did not use a ladder as part of their typical occupation (88.6%), however of the 13 who did, 69.2 percent stated that they had received ladder training and that they followed similar rules and practices when using a ladder at home.

4.1.3.3 Ladder Usage

A series of questions was asked relating to various aspects of ladder usage. First, participants were asked to indicate the most common activities they required the use of a ladder to undertake (Figure 4.4). Activities ranged from indoor to outdoor activities, and the most common reasons for using ladders were changing light bulbs (69%), pruning trees or shrubs (63%), and cleaning gutters (56%). Other frequent activities included reaching inside cupboards (40%), cleaning house exterior and interior (34% & 33%, respectively), and other garden maintenance (30%).

There were no significant gender or age group differences between ladder usage for indoor and outdoor tasks.

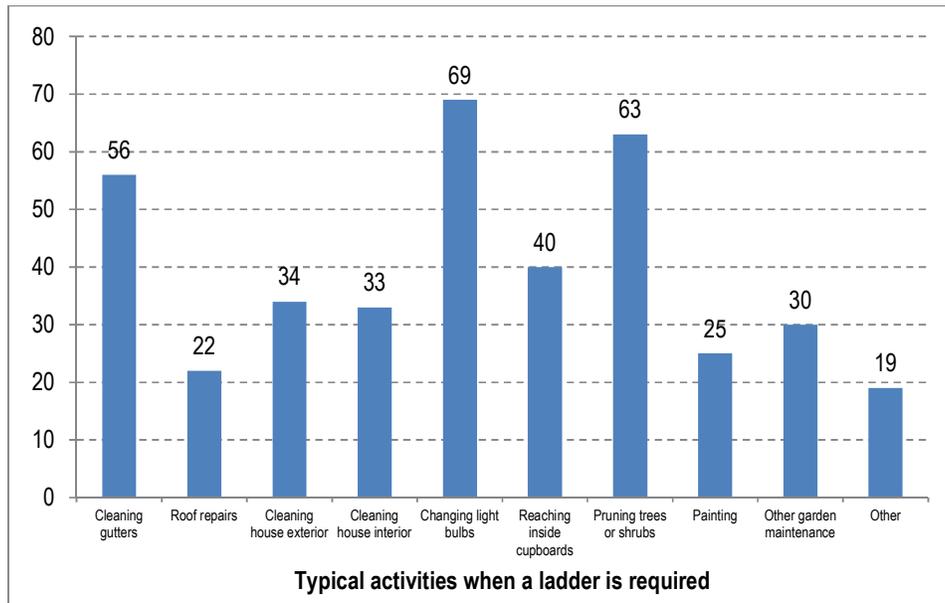


Figure 4.4: Typical activities when a ladder is required (n=114) (total activities = 244)

When asked if they used anything except for ladders, 49.1 percent stated that they did, with the majority of these respondents indicating that they used chairs (56.1%) and tables (15.7%) as the most common substitutes, with respondents also listing, milk crates, boxes and benches as other alternatives

to ladders. There was no significant difference between males and females using other items instead of ladders, younger age groups were slightly more likely to use other items however the difference was not statistically significant.

Participants were also asked to estimate the height they would typically climb a ladder inside and outside. Figure 4.5 shows a cumulative frequency graph of heights by location (indoor or outdoor).

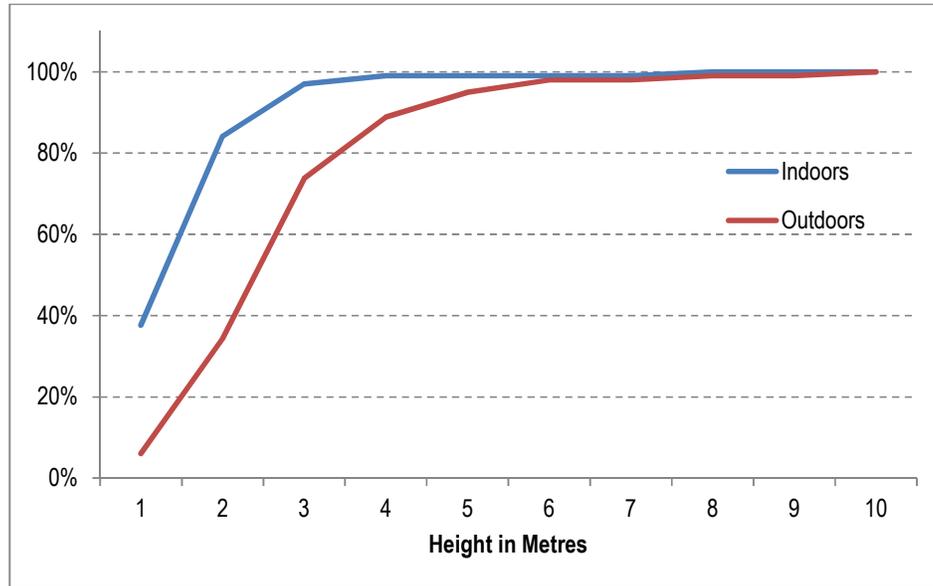


Figure 4.5: Heights typically climbed (cumulative frequency) by location

Participants generally climbed higher for outdoor purposes ($M = 2.8m$, $SD = 1.3m$) compared with indoor tasks ($M = 1.7m$, $SD = 1.0m$) ($t_{(209)} = -7.3$, $p < 0.05$). This is likely a reflection of participants accessing roofs and gutters outside as opposed to changing light globes and accessing cupboards when indoors.

Respondents were asked a series of questions relating to safe use of ladders. In general, participants were aware of manufacturers safety instructions on their ladders (55.3%), however many confessed to not reading the instructions. Similar results were found when asked about the load bearing capacity of their ladders, with many knowing that it was rated to only carry a certain load (79.8%), however, a substantial proportion of participants indicated that they occasionally, sometimes or frequently carried excessive loads (32.7%, 5.6%, 1.9%, respectively) (Figure 4.6). While males and younger participants were more likely to confess to carrying heavy loads, the differences were not statistically significant.

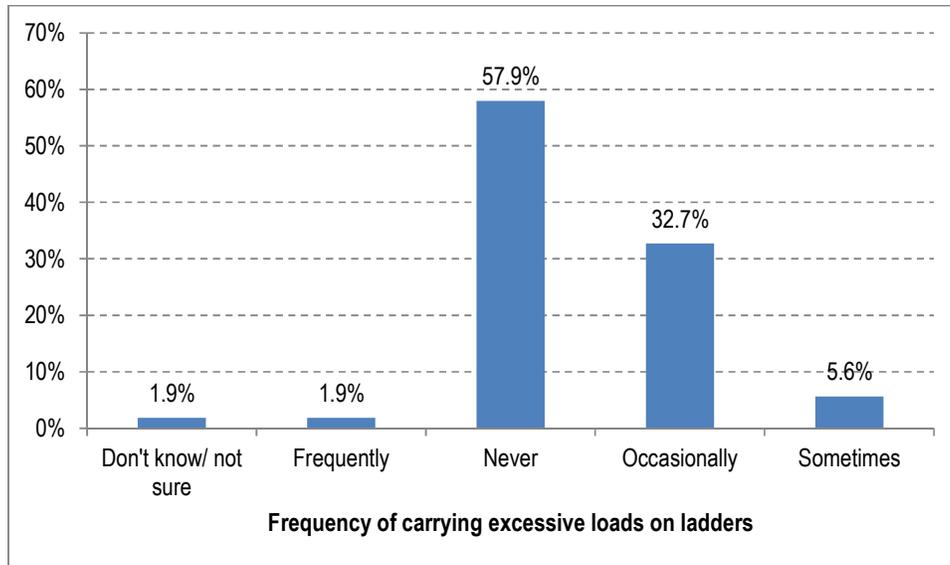


Figure 4.6: Frequency of carrying excessive loads on ladders (n=114).

A range of other risky behaviours was investigated, including reaching, repositioning ladder while in use, standing on top rung, incorrect pitch angle of ladder and non-securing of the ladder.

With regard to reaching, participants were asked how far they thought it is safe to reach with their arms from the ladder. Only 15 percent of participants indicated that up to 30cm/1ft from the ladder would be safe. The majority (65%) indicated that reaching as far as 60cm/2ft from the ladder would be safe, which is in line with recommendations, while the remainder (20%) said that reaching 1 metre/3ft 3in or more would be safe (Figure 4.7).

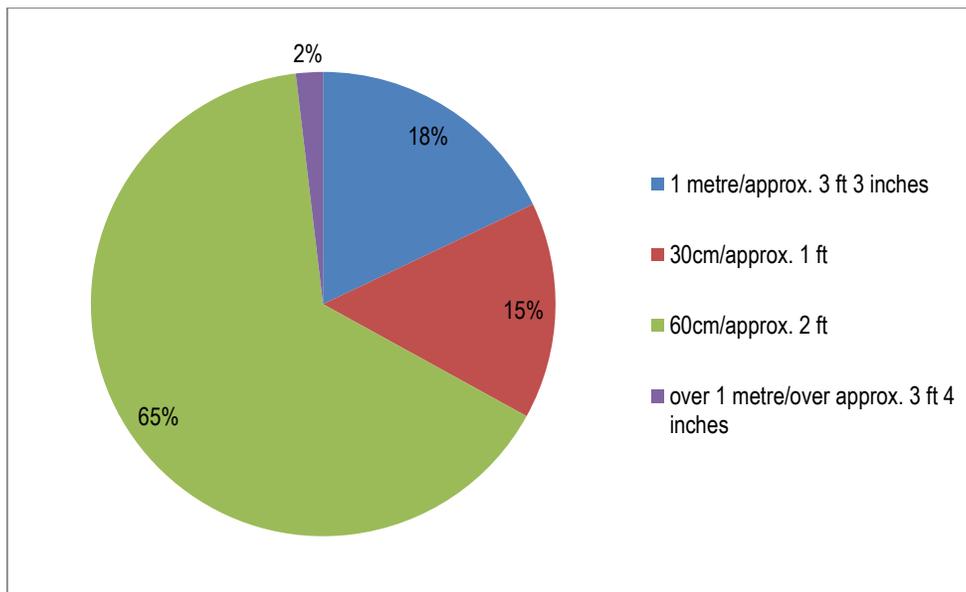


Figure 4.7: Distance that would be safe to reach from a ladder (n=114).

With regard to repositioning the ladder from the top while standing on it, only 7.0 percent of participants indicated that they did this. Further, participants were asked about how they secured their ladder. The majority of participants indicated that they never secured their ladder (83.4%) and only 4 percent indicated that they secured both top and bottom rungs (Figure 4.8).

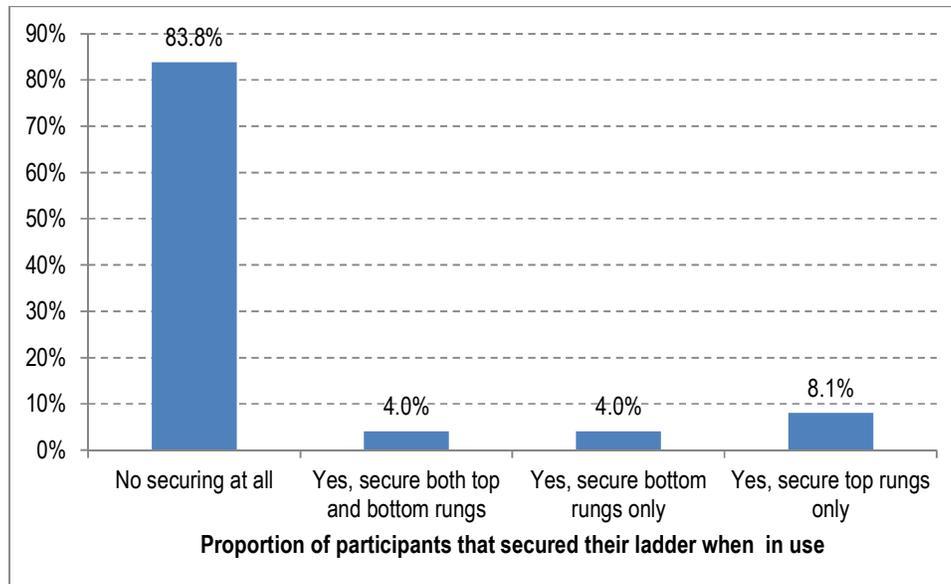


Figure 4.8: Proportion of participants that secured their ladder when in use (n=114).

With regard to highest rung that should be stood on, the majority of participants indicated that the second (52.3%) or the third (29.8%) rung from the top was the highest rung that should be stood on, while 7 percent of participants thought it was ok to stand on the top rung.

Last, participants were asked to indicate the appropriate pitch angle for safely setting up a ladder. The majority of participants answered that the appropriate pitch angle was 1:3 (40.3%) or 1:4 (21.9%). Most guidelines recommending that ladders should be erected with a pitch angle of 1:4.

4.1.3.4 Use of Safety Equipment

Participants responded to a series of questions regarding the use of safety equipment while using a ladder, including use of footwear, use of other safety equipment or personal protective gear (e.g., ropes, harnesses, etc.), and having some assistance.

With regard to footwear, Figure 4.9 shows the types of footwear worn by participants, with the majority wearing runners. A substantial proportion indicated that they wore work boots (leather: 28%, and non-leather: 7%). A small proportion (7%) also indicated that they wore no shoes at all. There were no associations between footwear and gender with 20 percent of males and females both using protective equipment. Similar results were found for persons under 60 years of age, with older adults slightly more likely to use protective equipment compared with younger adults (33.3% vs 28.5%).

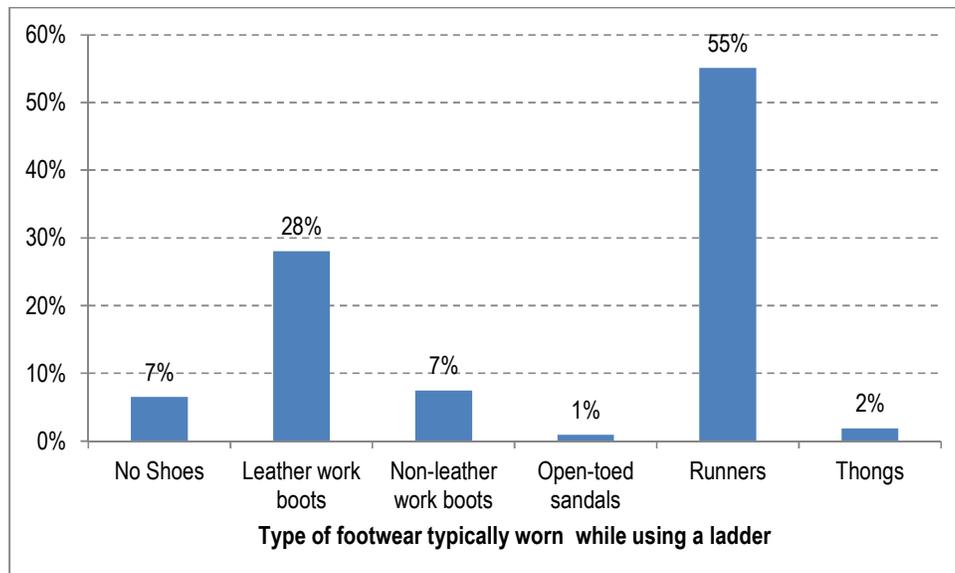


Figure 4.9: Type of footwear typically worn while using a ladder.

When asked if they used any additional safety equipment or devices, the majority of participants (93.4%) indicated that they did not use any other equipment. Of those who did, the types of equipment included: gloves, boots and safety glasses.

Last, participants were asked about the use of others for assistance while using a ladder. When using a ladder, the majority of participants indicated that they were alone (42.1%), while 18.4 percent indicated that they worked alongside someone else, or had someone else nearby (39.5%). Further, 59.6 percent of participants indicated that they made sure that someone was there to provide assistance in the event of a fall.

4.1.3.5 Alternatives to Ladders

This section of the survey addressed the use of alternative equipment to ladders. Participants were asked if they had considered a range of alternatives, as shown in Table 4.10.

Participants stated reasons such as cost, inconvenience and a preference to undertake tasks themselves as key reasons why they had not considered alternatives to ladder usage.

In addition, participants were asked to describe why it is important to undertake tasks that require the use of a ladder themselves. Responses were varied, but centred around the desire to maintain independence, costs associated with employing others to do the tasks, the belief that they possess the skills needed to undertake the tasks.

Further, participants were asked if they would approach their local council for assistance, and the majority (92.4%) indicated that they would not. When asked to indicate why, responses included: that they did not think council would help, that they did not think they were eligible for council assistance, that dealing with council was cumbersome and that they thought it would be expensive. Moreover, when asked if they were aware of the appropriate council unit that could provide these services, the majority (91.2%) indicated that they did not know.

Table 4.10: Proportion of positive responses to alternatives to ladder use by age group and gender

Alternatives	Gender		Age Group			
	Male	Female	Under 60 years	60-70 years	70-80 years	80+ years
Fitting covers to roof gutters	36.1%	40.0%	36.7%	52.0%	25.0%	0.0%
Employing a tradesman to do tasks	25.0%	47.5%	34.2%	32.0%	25.0%	50.0%
Asking other family members to do tasks	20.8%	57.5%	34.2%	40.0%	37.5%	0.0%
Moving to a lower maintenance home	6.9%	6.9%	10.1%	4.0%	12.5%	0.0%

4.1.3.6 Personal History

A series of questions were asked to gain an understanding of overall health, presence of medical conditions, and levels of physical activity.

In response to questions related to presence of medical conditions, 23.6 percent of participants indicated that they had a medical condition, while 5.2 percent also indicated that they had a medical condition that could impair their ability to use a ladder safely. They types of medical conditions identified included: vertigo, torn tendons in shoulders and assorted leg injuries.

A substantial proportion (40.4%) of those with reported medical conditions also indicated that they were taking prescribed medications for these conditions. Further, 6.1 percent of participants indicated that they were on blood thinning (anticoagulant) medications (such as Warfarin).

Participants were also asked to rate their current level of fitness. As shown in Figure 4.11, most participants rated their overall fitness as excellent or good.

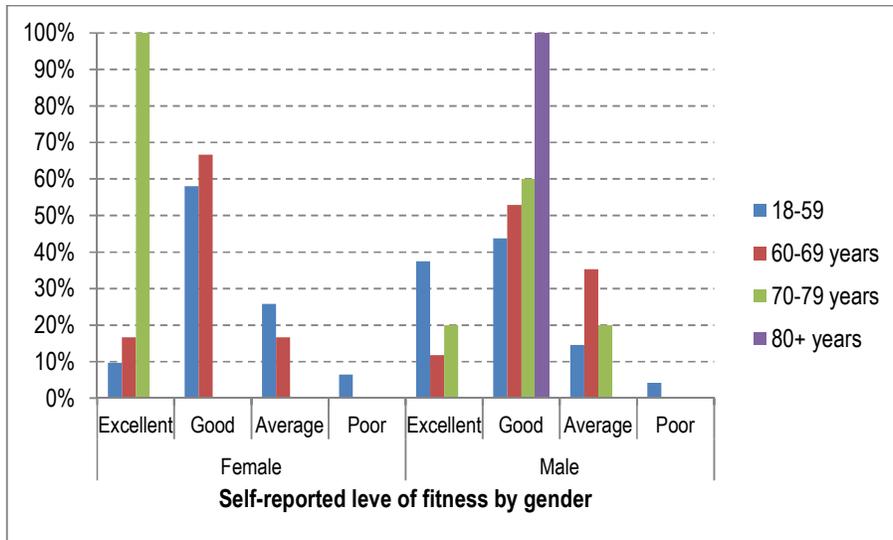


Figure 4.11: Self-reported ratings of current level of fitness by age group/gender

In addition, participants were asked to indicate how frequently they engaged in moderate to strenuous physical exercise and the amount of daily exercise. Generally, participants engaged in strenuous activity (such as fast walking, gardening, housework or organised exercise) frequently. Further, the majority of participants were active, engaging in substantial amounts of exercise daily.

In response to the question regarding difficulties in activities of daily living, the majority indicated that they did not experience any problems. Of those who did experience some difficulty, the most common problems identified were: walking without assistance, climbing stairs and lifting heavy objects.

Given that falls in general may be related to falls from ladders, some questions were asked on falls experience. A small but substantial proportion of participants had experienced at least one fall in the last year (males: 9.7% females: 15.0%). Moreover, of those who had experienced a fall, a substantial proportion of those were a result of losing balance (46.7%).

Last, two questions were posed regarding perceptions on ladder use. Most participants indicated that they did not feel scared or anxious when using a ladder (68.4%), however, a high proportion also indicated that they perceived using a ladder around the house to be a dangerous or risky activity (64.0%).

4.1.3.7 Ladder Falls

The last section of the survey asked about any experiences of falling from ladders. Overall, a small but substantial proportion (13.1%) of participants had been injured as a result of a fall from a ladder.

Moreover, there was a relatively high proportion of participants (42.1%) who indicated that they knew somebody else who had been injured as a result of a fall from a ladder.

Of those who reported being injured themselves, generally the injuries were minor and required no medical attention. The majority of participants did not seek any medical assistance (64.3%), while 28.6 percent went to a General Practitioner and 7.1 percent went to an emergency department.

Figures 4.12 and 4.13 show the injury patterns of participants who were injured in a fall from a ladder. With regard to body region injured (Figure 4.12), the majority of participants sustained a lower leg injury. Further, the types of injuries were generally bruising or lacerations (Figure 4.13).

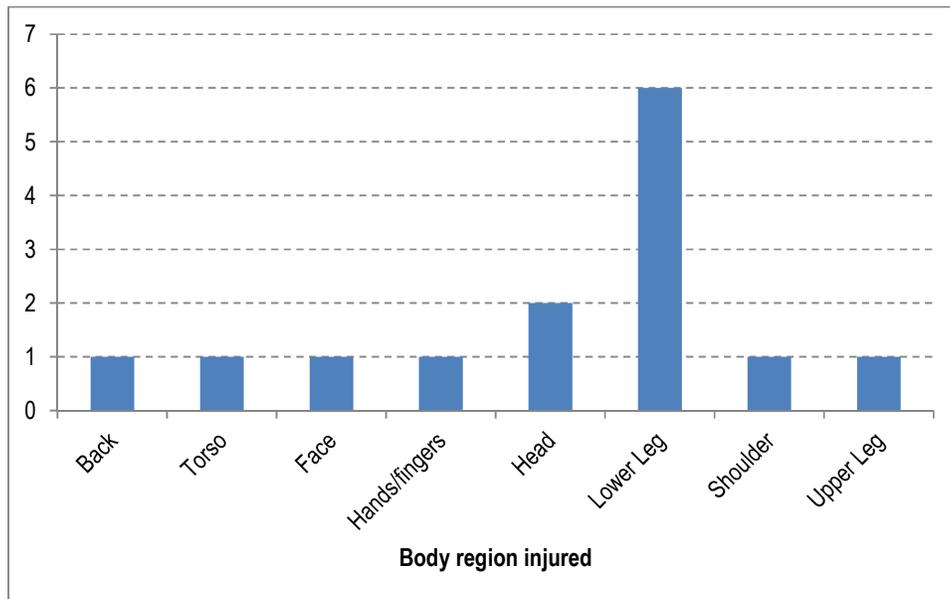


Figure 4.12: Body region injured

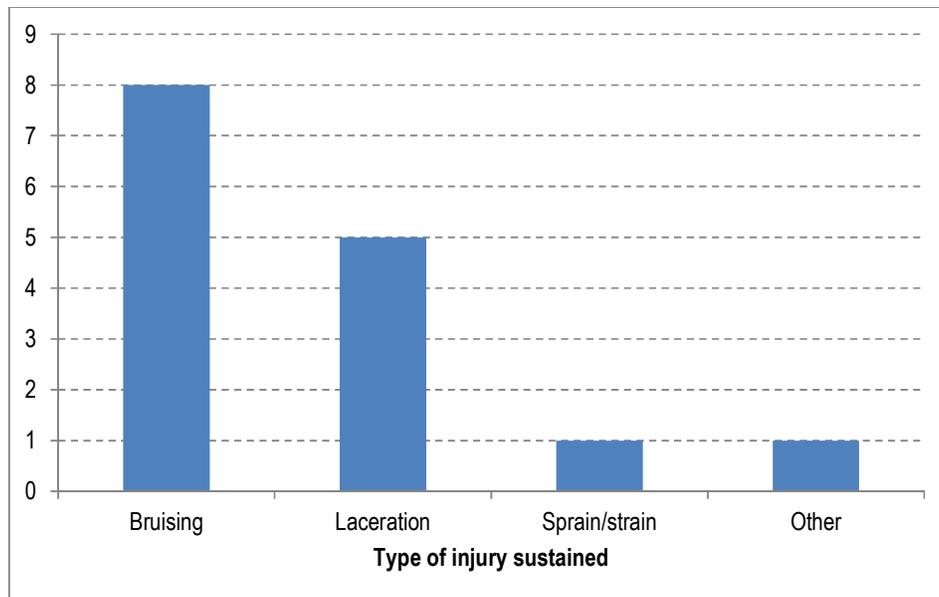


Figure 4.13: Type of injury sustained

Participants were asked to describe what went wrong and the tasks that they were undertaking when they sustained their injury. Descriptions included: the ladder braking, overreaching, slipping on the rungs, and losing balance.

Further, in their descriptions of what they could have done differently to prevent the fall, responses centred around ensuring some assistance is available, use of a better quality ladder, use of proper footwear, not over-reaching, use of better equipment while on the ladder, taking care to place the ladder and securing the ladder to increase stability. Some responses for what they could have done differently included:

“Got someone confident and able, with a better ladder to do the job.”

“Ask for someone to stand on the ladder at the bottom so it would not slip.”

“Don’t use a chainsaw on a ladder.”

“Secure the ladder appropriately or ask a mate for help.”

“Not use an old, timber ladder.”

“Move the ladder rather than reaching too far.”

“Handsaw was not an efficient tool for the job.”

“More slip-resistant shoes.”

“Get some assistance and don’t take shortcuts.”

Note: using an inappropriate tool for the task undertaken from the ladder seems to have contributed to some falls.

4.2 KEY STAKEHOLDERS

In addition to gathering information from domestic ladder users, stakeholders from groups of interest were consulted to provide additional information identifying safety features of ladders and current programs and initiatives addressing ladder safety or alternatives to ladder use.

4.2.1 Stakeholder Identification

Types of stakeholders that have some involvement in ladder design, regulations, retail or consumer advocacy were identified through national and international networks of the research team, through web-based targeted searches, and with the assistance of the Department of Health, and included a range of stakeholders from Government sectors, to consumer advocates, ladder manufacturers and retailers, local councils and regulatory organisations. While the focus was on Victorian-based government departments, organisations, retailers and consumer advocacy groups, a selection of federal and international groups were included. The stakeholders who participated included:

- Department of Health: Aged Care and Injury Prevention
- Department of Health: Home And Community Care (HACC)
- Retailer stores: Masters (Bunnings and Mitre10 stores were approached, however, did not participate)
- Ladder manufacturers: Werner ladders

- Consumer advocate: Ladder Safety expert
- ACCC
- Coroners Court: Coroners Prevention Unit
- Municipal Association of Victoria
- SafeWork Australia
- Victorian Workcover Authority
- New Zealand Trading Standards, Ministry of Business, Innovation and Employment

4.2.2 Interview Protocol

Each stakeholder organisation was contacted either with the assistance of the Department of Health or by the MIRI and DFM research team and the appropriate personnel were identified. A letter of invitation from the Department of Health (Appendix E) was sent to managers/executives requesting assistance in identifying relevant participants. Participants from stakeholder organisations based on recommendations of senior management as well as recommended individual experts were offered the opportunity to participate. On receiving contact information, an explanatory statement and consent form were provided prior to undertaking the semi-structured interview. Interviews were then arranged and conducted either in person or via phone (dependent on the preference of the interviewee[s]).

A semi-structured interview was developed and adapted for relevance to the individual stakeholder or stakeholder groups. The interview protocol included themes surrounding:

- types of ladders available in Australia and relevant Standards and Regulations;
- enforcement and review of Standards;
- safety initiatives adopted by the organisation regarding ladder use;
- approaches to ladder safety in the work environment that are not currently documented in the literature;
- effectiveness of various initiatives (in terms of implementation, sustainability, resources, relevance and management);
- barriers and facilitators to success of prevention measures;
- information available to the general public on ladder safety;
- recommendations for improvements to existing strategies
- plans for new initiatives on ladder safety;
- potential design solutions to ladders or domestic buildings;
- advantages/disadvantages of inter-sectoral approach to ladder safety;

A copy of the interview protocol is provided in Appendix F.

Interviews took approximately 40 mins to 1 hour to complete and notes were taken during each interview.

4.2.3 Results

The information gained in this phase has provided an in-depth understanding of a range of issues surrounding ladder safety that have enhanced the findings of the previous project phases. Key questions and themes were selected from the comprehensive list of questions to suit particular consultations. Major themes arising from the stakeholder consultations are summarized below.

Relevance of the domestic ladder falls problem and experience with this issue

The stakeholders consulted generally had more than 5 years of experience in their field. Those involved in manufacturing, retailing and the regulators, as well as the safety advocates had many years of direct relevant experience, whereas domestic ladder safety was a new issue for stakeholders in the health sector and local government.

Knowledge of safety concerns

There was a diverse range of information provided here by the different stakeholders, reflecting both the nature and depth of their knowledge. The health sector identified domestic ladder falls as an important cause for hospital admissions and a concern also of Victorian Coroners. Male gender and older age groups were noted as key risk factors.

In terms of use of ladder types, multi-purpose ladders were noted as of particular concern, especially in New Zealand. While other types of ladders are also of concern, data systems do not generally specify the type of ladder in Australia or New Zealand. One problem for product safety regulators is that it is not clear whether ladders are damaged before or after falls (e.g., the fall victim's legs are often entwined with the ladder after the fall).

Specific concerns raised by participants included that stepping on or off a ladder at the top is highly dangerous and leads to slippage of the ladder base. Over-reaching is a major concern as is the weight or load capacity of the ladder.

Misuse of ladders is sometimes seen in DIY activities where people do things they would never do in the work environment. These include: not taking appropriate or necessary precautions, e.g., not using harness, no proper ladder placement, with no assistance; and, not using the correct ladder for the job; ladders with wider areas to stand and choice of the correct tools for the task are all important choices for consumers.

Poor maintenance of the product is also a problem where ladders are "past their use by date, especially for older persons, but they don't want to spend money". Lack of ability for ladder work is also an issue where users "don't have the physical capacity, or are affected by medications, or comorbidity". Persons undertaking DIY activities may not possess skills to climb a ladder if they don't do it regularly whereas those working in the construction industry have to undergo training, which includes ladders, with some focus on falls.

Government departments and/or statutory authorities responsible for ladder safety in Australia, Victoria and New Zealand

The ACCC is responsible for ladder safety (non-workplace) and it is currently reviewing whether to make ladders a future focus. Mandatory reporting to the ACCC from the industry supply chain, when notified of injuries has been mandatory since 2011. The ACCC also has had a clearing house function following the Productivity Commission review of the product safety system in Australia and its report (in place since 2010). Consumer complaints are received by the ACCC and state Consumer Affairs departments and a close eye is kept on these. Product recalls are issued re misleading claims on weight capacity, particularly through non-traditional hardware supplies and online sales. Sale of ladders on eBay is also of concern.

The actual product safety standards for ladders are developed and reviewed by Standards Australia.

All external-cause deaths are required to be reported to the Coroner in Victoria for investigation (regulated according to the 2008 Victorian Coroners Act). The Coroners Prevention Unit (CPU) is involved because the Coroner recognises there are opportunities for prevention and there are a large number of deaths due to ladder falls. The CPU assists coroners to make feasible and evidence-based recommendations.

The Victorian Workcover Authority is responsible for ladder safety for the occupational setting, but for people at home it was considered by most participants to be a public health issue.

Various government departments have responsibility for ladder safety in New Zealand: customs enforces the existing ban on non-standards conforming ladders as does the Commerce Commission. Other agencies with a role include the Accident Compensation Commission (all injuries, no fault insurer), the employee authority, WorkSafe, and the Consumer Protection Authority.

Reasons for ladder injuries increasing

Many reasons were indicated across the full range of stakeholders consulted.

“Ladders are poorly maintained – they sit out in weather, and are held together by rivets, or pieces of wire”. “Use of one ladder for everything – may not be most appropriate. The use of cheaper ladders has grown rapidly and these may be less safe”. The ladder market expanded by 20 percent associated with cheaper imports. There are also online sales of poor quality ladders. Many ladders purchased on ebay and the internet don’t meet the Australian and New Zealand design standards. “The domestic user probably won’t have even the same quality of ladder as in the workplace.”

Participants consistently stated that increasing rates of domestic ladder fall injuries are due to an increased interest in DIY activities (such as clearing gutters, or attending to solar panels), which have become easier. “A lot of people are now doing their own renovations (promoted by all the TV shows) – people just jump on ladders and thinks it easy and have little awareness of the dangers. These shows tend to have better equipment than the average household”.

There is a greater number of older people who like to maintain their independence and have pleasure and satisfaction in maintaining independence through DIY activities. Vulnerable older persons are increasingly exposed, although they may be less aware of their unsteadiness and actual capabilities. At

the same time their homes are also ageing. Home maintenance is seen as a form of physical exercise. For some, it is a financial issue – “don’t want to spend more, or can’t” and also a mistrust of tradespeople.

There are also pressures on the general population due to the economic times and the costs associated with hiring a handyman to undertake simple tasks around the house.

Origin of ladders and market share

The most common ladders are multipurpose, three-step and high step ladders. The domestic ladder market is price sensitive, so most ladders are imported, mostly from China. The current market share in Australia is approximately 60 percent imports: 40 percent Australian made (and some New Zealand made in that country). Migration to imports occurred about 2005/06. The ladder wholesale and retail business is substantial and major retailers stock a range of ladders suitable for domestic and workplace use.

Most top end ladders are probably manufactured in Australia and cheaper ones imported. Imported ladders have quality control processes using proof test batches to determine if they are up to standard i.e. designed and built to the Australian Standard.

Adequacy of Australian/New Zealand Standards and barriers and enforcement

According to one participant, the Australian ladder Standards are the most stringent in the world. AS 1892 is marked on the ladder packaging. Some participants indicated the market needs a mandatory standard particularly for multi-purpose ladders (as is effectively the case in New Zealand) and one thought the standard was already mandatory. In addition to the current issues of non-conformance with load requirements, AS 1892 is considered deficient in that the ladder walk test allows up to 15 mm movement. It was also considered by several participants that ladders should be required to have rubber and not plastic feet. Some considered that Australia should ban Chinese copies of multipurpose ladders due to ladders collapsing.

Multi-purpose ladders are of most concern in New Zealand. Thus a product ban was imposed in that country on ladders non-compliant with the relevant ASNZ Standard in Nov 2012 (i.e. an unsafe goods notice was imposed) and this was made permanent May 2014. Australia has not followed this mandate.

European regulators are very interested in improving ladder standards (EN-131 has problems and therefore wasn’t used for ASNZ standards-making). However parts of industry were considered by some participants to create barriers to improved ladder safety.

The current voluntary Standards are enforced by recalls (but only if it is claimed that ladders meet standards). Recalls are listed on the ACCC website. However, it is costly to have ladders tested to the ASNZ Standard. This is also a barrier to consumer advocacy organizations such as the Australian Consumers Association as most testing laboratories are probably not NADA accredited for ladder testing). The Standards are also enforced through state Consumer Affairs offices, but only if complaints are received.

The Australian ladder Standards have not been reviewed for some time – a recommendation is needed before an AS review. The ACCC is now represented on the Australian and New Zealand Standards

Committee. It is not expected that Australia will go to a mandatory standard but this has not been discounted.

One of the problems is that little is known about the detailed circumstances of ladder falls and injury mechanisms. Hence post-injury research is needed for in situ investigations. There is also a question about whether there are adequate tests to support amendments to standards.

Who has power to improve safety of domestic ladder use, including the role of the Coroner?

Few stakeholders offered suggestions beyond Standards makers and regulators. Regulators can improve the safety of products through mandatory standards, and product recalls, standards makers, and enforcement agencies and manufacturers for innovation. One participant considered ladder safety to be an intractable problem as there is no comprehensive jurisdiction. A major barrier is that it is not understood what goes wrong in ladder falls. What problem are we trying to fix?

Victorian Coroners have the discretion to make recommendations on public health and safety and administration of justice. They also have an overarching purpose for prevention, as well as their mandate to establish the cause of death. When coroners make recommendations, to a statutory authority or entity, that agency must respond within 3 calendar months on what action has or will be taken. If they were to make recommendation for ladder safety, it has to be responded to. Once they do respond, recommendation and response becomes publicly available. They give people guidelines to help respond and to implement plans and actions. However, very few ladder falls deaths go to inquest, because so much work has already been done, many issues have been addressed, including information supplied on prevention strategies. However, it is not clear that any changes have occurred as a result of the new Victorian Coroners Act (2008).

Safety initiatives undertaken or suggested

Within the occupational setting the aim is to get away from using ladders if possible by using a better system (e.g., small scissor lift, small scaffolds, equipment that can wheel through doorways and corridors, step platforms, with guardrail). Commercial platform ladders have guard rails and locking mechanisms to stop them from moving (activated when someone stands on the ladder). While platform step ladders are available, they are expensive and there is not much margin on this product, so there is little promotion of it. Alerts on fatal injuries are provided to the Victorian workforce through a fortnightly newsletter (fortnightly), distributed to all stakeholders which raises awareness.

While Australia is trying to get away from ladders, the US relies on safety harnesses. Ladders are at the bottom of the hierarchy control. If workers need to be at height, there should be a guardrail, then use of harness, then ladders. Extension ladders are no longer allowed in the building trade except for access and egress. Extension ladders now have D-rungs rather than round rungs.

Industry and OH&S regulators indicated that there are many securing devices now available for ladders, but domestic DIY participants are unlikely to know about these. Several stakeholders felt that initiatives are needed to assist DIYers to set ladders up properly and to stand on them properly (e.g., “step ladders – often straddle across the top. – these are designed for forward facing use, and straddling makes them unstable”). “Many also don’t know that the recommended angle for straight ladders is 1:4.”

Other information that experts thought should be conveyed to domestic ladder users was to “set up correctly, don’t stand above second step, straight ladders are for climbing, not for working from”. One rule of thumb that should be coached is the “belt-buckle rule – the belt mustn’t extend beyond the ladder foot. Draw a chalk line around the base of a step-ladder in order to follow the rule.”

Most participants identified public awareness as a key issue. The ACCC conducted a consumer education program in 2006, but it is not clear how widely information was distributed. One participant considered that the ACCC 2006 brochure was too basic. A current review will determine whether the previous ACCC promotion will be resurrected in some form. ExxonMobil has also produced a pamphlet. In New Zealand campaigns have been conducted through the ACC and WorkSafe websites and with the use of pamphlets. The ACC has a travelling road show to demonstrate ladder risk to the community by direct experiential learning.

Some previous initiatives and some undertaken elsewhere were noted by stakeholders: Gorilla (ladder manufacturer) conducted a buy-back scheme with Bunnings which provided a discount on new ladders. The HSC in the UK also had a ladder buy back system. The Victorian Safe Communities network ran seminars in local government areas on DIY injury prevention.

Further opportunities were thought by stakeholders to exist with Bunnings and other major retailers through their DIY classes. One participant recommended the use of helmets while working on ladders and at heights in the domestic setting (e.g., bicycle helmets) since most ladder associated deaths and many serious hospitalisations are due to head injuries from falls.

Further incentive schemes were recommended to improve safety (“discount on old ladder, discount on buying a new ladder with seniors cards; providing council subsidized neighbourhood cherry-picker equipment for local residents to use for working at heights around their house and garden”).

One stakeholder noted that any public health intervention needs to be multifaceted and ongoing to provide evidence based ladder safety information. They would recommend that any agency that can reach out to older persons can give information: could be local council, HACC, Seniors online, i.e. capture where these people are presenting, as well as through local papers. These need to be organisations with some credibility (given that older persons may be mistrustful).

Within local government, councils operate safety committees that generally have a consistent approach to safety initiatives, though they have no specific ladder safety initiatives. Programs typically use accident data to help target safety programs to target in their health plans and strategies.

Evaluation and sustainability of interventions

The key stakeholders consulted were not aware of any evaluations for interventions conducted to date on ladder fall prevention initiatives. However, following new regulations in the work setting, the number of deaths from falls from heights came down dramatically, though this is not directly a measure of ladder safety improvements. A survey of inspectors after the new workplace regulations showed that the standards of ladder use was much higher with scaffolding used instead of ladders in many instances. Some employers actually banned the use of ladders.

Alternatives to ladder use and barriers

Several participants indicated that there are many alternatives to ladder use and to the need for DIY, but there was not much awareness of these.

In particular, older persons have always done DIY for reasons including: costs of services; not aware of enabling products; knowledge lacking in community on occupational therapy and Independent Living Centres' products; ongoing belief in their own capabilities. Potentially, also, older people have older ladders. "That generation, didn't get people in to do things. Still have the same equipment they've had for many years".

Alternatives include: tools for cleaning gutters from the ground; extension poles for painting; adaptive equipment recommended by occupational therapists, such as long armed cleaning devices; work platforms are considered safer for occupational use;

There are also realistic alternatives for home maintenance for older persons through the HACC programs provided they meet the health and needs assessments to be eligible for the program. The 73 Victorian municipalities all have home maintenance service. Information about HACC services is available via newsletters, community centres, libraries, leaflets, senior citizens services etc. The services are means tested to be affordable.

There were differences in opinion among stakeholders regarding the provision of HACC services that require access to heights, varying from HACC providers are not permitted to use ladders to participants can be eligible for basic services such as changing light globes, cleaning gutters etc.

The HACC program is about to transition from a state to a federal program, where residents will be required to gain approval from a federal body before being able to receive services at a local level. This transition period may be an opportunity to make any necessary changes to ensure that all seniors have access to services that reduce the need for them to work at heights to conduct home and garden maintenance. It was certainly the view of most stakeholders that subsidized options should be available to seniors for tasks requiring working at a height.

Barriers to the use of alternatives to ladders were identified as: ignorance, not knowing what is out there, knowing if the alternatives are good ones (evidence is lacking on the ease of use, effectiveness, cost, maintenance needs, etc.)

Another major barrier to safety was considered by many stakeholders to be home renovation shows that encourage people to undertake DIY projects without providing proper safety information.

Potential for an inter-sectoral approach to improving ladder safety or alternatives for accessing heights

All stakeholders considered that the problem of domestic ladder fall injuries could best be solved by an inter-sectoral approach to this multi-faceted issue. Most considered that the health sector should be the lead agency in an inter-sectoral approach to action. All agreed that they or their sector would be interested in participating.

4.3 SUMMARY

This chapter presented the findings of the consultation phase of the project, which gathered important in-depth information from consumers and key stakeholder groups.

Participants in the consumer survey were generally representative of the target group of older adults, especially older males, who are over-represented in the ladder-related injury statistics. The majority of participants owned more than one ladder and used them frequently for a range of indoor and outdoor activities. Indoor activities were mostly changing light bulbs and reaching inside high cupboards, while outdoor activities included clearing roof gutters, pruning trees and painting. Participants generally climbed higher for outdoor purposes compared with indoor tasks. This is likely a reflection of participants accessing roofs and gutters outside as opposed to changing light globes and accessing cupboards when indoors.

Some age group and gender differences were noted. Males were more likely to use a larger ladder, carry heavy loads and reach further than their female counterparts. Younger participants were more likely to carry heavy loads and use equipment and furniture other than ladders, and slightly less likely to use protective equipment compared with older participants.

With regard to questions on safe use of ladders the findings revealed that, while many participants were aware of ladder safety issues, few took appropriate steps to ensure their safety. The majority indicated that they:

- Reached a significant distance from the ladder;
- Rarely read safety instructions or ladder guidelines on the ladder;
- Did not secure their ladder when in use;
- Wore inappropriate footwear; and,
- Did not wear or use any additional protective gear or equipment.

In addition smaller, but significant groups of participants engaged in the following unsafe behaviours:

- Carried excessive loads;
- Stood on the top rung of the ladder; and,
- Positioned the ladder at a risky pitch.
- Worked alone.

Approximately 13 percent of the sample group indicated that they had experienced a ladder-related injury. Moreover, a significant proportion reported that they knew of someone else who had experienced a ladder-related injury. Of those who had experienced an injury, most injuries were minor, with few requiring medical treatment or hospitalisation. The majority of injuries sustained were bruising and lacerations and mainly to lower limbs.

Participants also provided some insights as to what they could have done to prevent the fall or injury and these centred around securing the ladder, having some assistance available, not over reaching, wearing appropriate footwear and using appropriate tools while on the ladder.

The stakeholder interviews provided an invaluable source of information not gained from the literature review or data analysis.

All stakeholders noted that domestic ladder-related fall injuries were a significant problem and that they were aware of or had implemented various preventative initiatives. While there were few evaluations of initiatives, there was general agreement that there are significant gaps in addressing safe domestic ladder use and more needs to be done to reducing the incidence and severity of these injuries.

It was interesting to note that the Victorian Workcover Authority had successfully implemented initiatives that have resulted in significant reductions in ladder-related deaths and serious injuries. These have centred around implementation of regulations and the current emphasis within the workplace is to use alternatives to ladders wherever possible.

Stakeholders also indicated that, while it is difficult to introduce regulations and legislation for domestic ladder users, such as has been achievable in the workplace, there are alternative measures that may be successful, including working with the manufacturing, building and retail sectors, and providing targeted and informative guidelines for consumers, and ensuring that this information is widely accessible.

5 SUMMARY OF FINDINGS AND OPPORTUNITIES FOR REDUCING LADDER FALLS

The overall aims of this study were to identify appropriate and effective opportunities for addressing ladder safety in the domestic context, improving the safe use of ladders, and reducing deaths and serious injuries resulting from falls from ladders. In order to formulate evidence-based opportunities, a good understanding of the issues was required. This was achieved by reviews of the literature and analyses of Victorian serious injury and death databases to highlight trends, prevalence, injury mechanisms and outcomes, consultation with domestic ladder users to understand behaviour and attitudes towards safe ladder use, and reviews of national and international published and in-house literature and consultation with key stakeholder groups to gain a good understanding of the main approaches to increase safe ladder use or alternatives to ladder use in the domestic context and their efficacy.

This final chapter brings together the findings from the project phases and provides an overall synthesis of the findings of the literature review, data analysis and consultation phases, and provides opportunities for the way forward. The current and trend data on falls from ladders in the domestic context is summarised, as well as consumer ladder use and attitudes to safety, and what has been achieved in Australia and elsewhere to address ladder injuries, what appears to be working and the factors that are associated with this success, what has not progressed as well and the barriers to successful implementation.

In addition a range of opportunities is provided for the Department of Health and other relevant sectors to consider in the short, medium and longer term in Victoria and beyond to ensure the effective strategies and initiatives can be undertaken to reduce the incidence of ladder-related injury in the home environment.

5.1 SUMMARY OF THE FINDINGS

It is clear that injuries sustained from ladder falls in the domestic environment is a significant public health issue, resulting in serious injury outcomes (deaths and serious injuries), and, unlike falls from ladders in the workplace setting, appears to be on the increase. Within the domestic environment, the use of ladders represents one of the highest risks of fall-related injuries and deaths, with ladders being the consumer product most often associated with DIY related deaths and hospitalisations. However, to date, it appears that very little has been done to understand the issues surrounding ladder-related fall injuries, including contributing factors, injury outcomes and initiatives to address the problem.

The analysis of serious injury and death data analyses confirmed previous findings, and revealed that older males are over-represented in all levels of injuries sustained from a ladder-related fall injury, with young-old groups (50-59 years) over-represented in less severe outcomes compared with older age groups. The peak age groups for hospital-admissions were 65-69 and 70-74 years while for major trauma and deaths, the peak age groups were 75-79 years and 80-85 years. This may be a reflection of increasing frailty with increasing age, declining physical and cognitive functioning with age that can impair balance physical ability to prevent a fall, a combination of both, or possibly factors related to the

age or condition of the ladder. Further, direct hospital costs associated with home ladder fall injury admissions in Victoria over the 3-year study period was more than \$18.3 million.

Further, there were expected differences in injury patterns associated with severity of injury. For less severe injuries (ED presentations), the majority were dislocations, sprains, strains and fractures, mainly of extremities. For more serious injuries (hospitalisations and major trauma), the majority were head, thorax and knee injuries, with fractures and contusions the most common injury types. For deaths, the overwhelming injuries were injuries to the head, followed by cervical spine injury. Most were from a blunt force associated with falling to the ground or other hard surface

The review of the existing literature showed that many ladder-related injuries result from the ladder slipping or tipping, feet slipping out from rungs or reaching out too far. In addition, other risk factors include: incorrect placement of the ladder during setup, unsafe handling of the ladder leading to damage and inappropriate conduct including carrying large loads during use. The current findings from the survey of ladder users confirmed these findings. Key findings from the survey were that, while many participants were aware of ladder safety issues, few took appropriate steps to ensure their safety. The majority indicated that they:

- Reached a significant distance from the ladder;
- Rarely read safety instructions or guidelines on the ladder;
- Did not secure their ladder when in use;
- Wore inappropriate footwear;
- Did not wear or use any additional protective gear or equipment; and,
- Worked alone.

In addition smaller, but significant groups of participants engaged in the following unsafe behaviours:

- Carried excessive loads;
- Stood on the top rung of the ladder; and,
- Positioned the ladder at a risky pitch.

When asked about use of alternatives ladder use, relatively few participants indicated that they would use alternatives, especially asking others to assist, and this was particularly so amongst older males. In addition, a high proportion of participants indicated that they would not request assistance from Council, mainly due to a perception that they would not assist adequately, individuals were not eligible, high cost, and lack of knowledge of services provided and how to access these services.

Further, the review of literature and interviews with stakeholders revealed that, despite the severity of ladder-related fall injuries, few preventative strategies to support safe ladder usage outside the workplace are provided and there is limited information provided for home and personal use of ladders.

Within the workplace, the adoption of Australian Standards and implementation of Occupational Health and Safety Regulations have increased the accountability of employers regarding employee safety in the workplace. These regulations provide enforceable rules governing the usage of ladders. Safer

equipment such as elevated platforms is recommended, but this is currently not suitable for general domestic use.

Indeed, in the domestic setting, it is argued that controlling domestic ladder usage is generally impractical and unenforceable. Notwithstanding, there are some advocacy, consumer and injury prevention groups that provide information on ladder safety techniques, and ladder manufacturers, both in Australia and internationally, have implemented various design features to improve safety and reduce the chance of misuse. Furthermore, there are various Standards and Regulations that manufacturers must adhere to, and updated Standards and guidelines aim to improve the design and manufacture of ladders, that will enhance the safety of ladders in all environments.

Alternatives either to ladder use or to vulnerable older persons accessing heights have been suggested, as have changes to building designs to provide permanent attachment points for ladders or improved gutter designs to avoid the need for regular cleaning and repairs.

5.2 OPPORTUNITIES FOR REDUCING LADDER FALLS

In general, the report has identified that, in contrast to the workplace context, there are few countermeasures addressing safe domestic ladder use or alternatives to ladder use, and of those that are implemented, there are very few evaluations of their effectiveness. Available countermeasures are generally education and promotional activities at the local level to mass media campaigns, in the form of guidelines on websites.

The analyses undertaken in each of the project phases (data analysis, consumer survey and stakeholder interviews) provide relevant and valuable injury information concerning the circumstances of reported injuries and fatalities, attitudes and behaviours of the general public and information on initiatives and standards to assist in the development and evaluation of community health, safety and injury prevention strategies, such as community awareness initiatives and education, legislative and regulatory changes and safety-related environmental, equipment and product design improvements.

The findings of the study have led to a suite of opportunities for health, design (manufacture and building), and regulatory government sectors, as well as opportunities for local government, advocacy groups, industry (manufacture and retailers) and support services for seniors. These key sectors, together, can bring about a change in ladder use, through a combination of regulation, legislation, education and public awareness campaigns, advocacy and support services to encourage improved design standards, uptake of appropriately designed ladders amongst consumers and adoption of safe ladder use practices or use of alternatives to ladders around the home.

Based on the overall study findings, we have identified the following opportunities for countermeasures addressing safe domestic ladder use for consideration by the Department of Health and other sectors, including support for multi-sectorial collaboration, ladder design and regulations, promotion of use of alternatives to ladders, and educational strategies for consumers. Opportunities for reducing ladder falls are targeted at implementation at both national and community levels.

Key opportunities for reducing ladder falls are identified as follows:

9. Improving the design and mechanism of ladders for safe consumer use through reviewing the strength and stability of ladder design.
10. Supporting ladder standard and regulation improvements and enhancement for improved compliance and ladder manufacture.
11. Supporting safe ladder use through building design innovation and features such as gutter guards and anchor points.
12. Improving surfaces around ladders, such as the use of anti-slip floor coverings and surface treatments to reduce injury risk from falls.
13. Promoting of the use of protective equipment when using ladders in the domestic context.
14. Supporting public awareness of the risks and dangers of ladder use in the domestic setting through public education and resources on ladder fall prevention.
15. Promoting alternatives to ladder use such as services and resources available to domestic ladder users within the community.
16. Addressing the prevention of domestic ladder falls and fall injuries through multi-sectorial collaboration and further research as required.

Interventions for consideration to support the above opportunities are listed as follows:

- **Improvements to ladder design:**

A substantial proportion of ladder fall injuries were sustained as a result of potential issues with the design of ladders, including collapsing, feet slipping off rungs, and instability. In addition, the issues surrounding design of ladders were raised by numerous stakeholder groups. Enhancements to ladder design have the potential to reduce ladder fall incidents and the severity of injuries, and reduce the engagement in some risky behaviours (such as over-reaching).

The following interventions are identified for consideration:

- Providing adequate strength for loading in normal and foreseeable use;
- Reviewing design to avoid slippage of foot of ladder and laboratory test new designs;
- Reviewing design to strengthen the stability of ladders and laboratory test new designs;
- Including mechanism for lifting objects whilst on ladder (within the ladder's load tolerance);
- Provide a rod or pole extending above the top of step-ladders to hold while working on the ladder.

- **Improvements to ladders Standards:**

The review of current national and international Standards and Regulations revealed that there were some opportunities to enhance some Standards for the manufacture and retail of ladders. Moreover, stakeholder groups discussed the potential for innovations.

The following interventions are identified for consideration:

- Reviewing existing Standards and Regulations to identify areas for potential enhancement or requirements for additional Standards or Regulations;
- Considering additional Standards and Regulations;
- Considering mandating Standards where compliance is inadequate.

- **Building design innovations:**

A substantial proportion of ladder fall injuries were sustained during repairs to buildings, cleaning gutters, painting, etc. In addition to the design of ladders and improvements to Standards and Regulations for the manufacture of ladders, it is important to examine the potential for innovative building design measures that can either reduce the need to use ladders, or increase the stability of ladders.

The following interventions are identified for consideration:

- Working with key stakeholders to investigate the evidence regarding the effectiveness of gutter guard installation on preventing ladder falls;
- Mandating installation of gutter guards in domestic building design codes;
- Identifying effective gutter cleaning or guarding and maintenance mechanisms that don't require use of ladders (performance test such products currently on the market) and encourage design innovation as required;
- Including ladder anchor points in domestic building design codes;
- Investigating the effectiveness of anchoring devices for the top of the ladder that are commercially available.

- **Improved surface treatment around ladders:**

The findings of the injury data clearly showed that severe injuries (especially head injuries) were the result of impact on a hard surface. To reduce the severity of injury, it is considered important to explore ways in which surfaces around ladders can be more forgiving of human tolerance to blunt forces.

The following interventions are identified for consideration:

- Examining the effectiveness of existing anti-slip mat products on preventing ladder falls;
- Investigating the potential for developing improved/enhanced protective surface treatments to address sliding (e.g., slip resistant surface treatments [paint, etc.], portable anti-slip mats and/or ladder chocks);
- Investigating the potential for developing portable impact absorbing under-surfacing treatments for use in ladder fall zones to reduce injury risk when falls occur.

- **Promotion of use of protective equipment:**

The findings of the literature review, consumer survey and stakeholder interviews suggested that lack of use of protective equipment and clothing contributed to the incidence and severity of ladder fall injuries. Promotion of the use of equipment to prevent a slip or fall, as well as equipment to reduce the

severity of injuries should be considered. Given that head injuries result in severe trauma or death, a high priority should be placed on promoting measures to reduce head injuries.

The following interventions are identified for consideration:

- Promoting the use of safety harnesses, appropriate and non-slip footwear and other equipment/clothing when using a ladder;
- Undertaking a feasibility study to determine potential protective effect of bicycle helmets to prevent head injuries in ladder falls.
- **Public education on ladder fall prevention:**

The findings of the consultation with ladder users and key stakeholder groups revealed that there is a level of misunderstanding on the risks of ladder falls and the steps that can be taken to reduce the risk of falls. It is important therefore to consider public educational strategies to disseminate safety messages for target audiences.

The following interventions are identified for consideration:

- Considering how ladder falls prevention can be better incorporated into broader falls prevention activities;
- Researching and scoping a targeted education campaign on safe ladder use. A targeted education campaign could include the following components:
 - o Public service announcements on TV (e.g., covering ladder angle, footing a friction issues, securing ladders, and safe reach from ladders). TV advertisements appropriately designed for the target audience can provide an efficient way to impart information when there is wide community lack of understanding.
 - o Publicize issues of concern: angle of extension ladders; reach while on the ladder (e.g., belt buckle rule); highest safe level on step-ladder; even ground requirement and firm footing with high friction (rubber feet, rough surface material) for ladder; correct ladder and tools for task; alternatives to ladder use; having another person present while using a ladder; communicating statistics about ladder fall injury.
- Reviewing and considering promoting an appropriate smart phone app re safe positioning of ladder (see: <http://www.cdc.gov/niosh/topics/falls/mobileapp.html>);
- Considering innovations such as buy-back programs for defective ladders; or council subsidised neighbourhood programs of cherry-picker equipment availability (a street at a time) for pruning, annual gutter cleaning, and roof maintenance tasks.
- Widely promoting the resources and services available through organisations such as HACC, Independent Living Centre, etc. to assist older residents with home maintenance;
- In view of the current changes to the HACC program (transitioning to a national government program) with a current consultation phase, there may be an opportunity to clarify an effective

role for HACC in either providing services that require access to heights or in providing realistic alternatives for older people.

- **Promotion of alternatives to ladder use:**

It was clear from discussions with workplace safety stakeholder groups and through the review of workplace safety initiatives that a key feature of success in reducing workplace ladder fall injuries has been the promotion of alternatives to ladder use. Given the success of these messages in the work environment, it is considered important for similar messages to be distributed widely amongst consumer groups who use ladders in the domestic environment. It is also important that consumers, especially older adults, are aware of services and resources available to assist with home maintenance.

The following interventions are identified for consideration:

- Widely promoting the resources and services available through organisations such as HACC, Independent Living Centre, etc. to assist older residents with home maintenance;
- Adopting strategies that may make the use of these resources more acceptable to older adults;
- Researching and scoping a targeted education campaign on use of alternative to ladder use;
- Providing widely available safety demonstrations such as the ACC travelling road show in New Zealand;
- Advocate for DIY programs to include disclosure of risks and safety advice.

- **Support for multi-sectorial collaboration**

It was clear from the stakeholder interviews and reviews of initiatives that the issues surrounding ladder fall injuries spans a number of sectors and good practice is to support multi-sector collaboration.

The following intervention is identified for consideration:

- Considering the benefits of conducting an inter-sectorial workshop to assist with engaging relevant stakeholders and plan a way ahead. The workshop could identify high priority actions and discuss processes for progressing.

- **Areas for further research:**

This study has identified many areas where improvements can be made to reduce the incidence and severity of ladder fall injuries. It has also identified some gaps in our knowledge of some additional issues which require more knowledge. A better understanding of these issues will provide the evidence on which effective treatments and initiatives can be developed. Moreover, it was clear from the review that very few initiatives have been evaluated to assess their effectiveness.

The following interventions are identified for consideration:

- A prospective study to obtain more detail on circumstances of falls by means of in-depth interviews of hospital admitted injured persons to identify potential risk factors.

- Using information from the current study and the proposed in-depth interview study, design a case control study to clearly identify additional risk factors for domestic ladder falls, where the cases are from the interviewed sample. Such research could include:
 - o Development of an appropriate test to assess the physical capacity of individuals (particularly older persons) to use ladders or to safely work at heights.
 - o Research to conduct ladder fall site visits and reconstructions to understand the circumstances of falls, landing zone, surface conditions and forces that need to be overcome to protect against serious injury in the event of ladder falls
 - o Research to determine physical limits of ladders
 - o Investigate alternative designs for ladders
 - o Investigate design solutions to reduce the need for ladder use e.g. re-designed roof gutters (hinged for cleaning; lowering gutters for cleaning; etc.)
 - o Conduct statistically robust evaluations of initiatives to assess their effectiveness in reducing the incidence and severity of ladder fall injuries.

- **Enhanced data systems:**

It is recognised that high quality, in-depth data is essential to understand the issues surrounding injuries, and to base the development of effective initiatives.

The following intervention is identified for consideration:

- Encouraging more comprehensive collection of detailed information regarding the circumstances of ladder falls through emergency department, trauma registry and coronial data systems.

5.3 CONCLUSIONS

This study employed a multi-disciplinary approach to understand the issues surrounding ladder fall injuries in the domestic context. The findings of injury data sources, a review of national and international literature, and consultation with consumers and key stakeholder groups, together, have been synthesised to identify a range of evidence-based opportunities for initiatives to reduce the incidence and severity of ladder fall injuries as well as reducing the overall costs to the community (current costs for hospital admissions only are estimated at more than \$18.3 million over the last three years). The opportunities identified are centred around eight complementary themes and include enhancements to design, manufacture and the environments in which ladders are used, education and promotional activities, enhanced data systems, and areas warranting further research.

6 REFERENCES

- Occupational Health and Safety (Prevention of Ladders) Regulation 2003. V. Parliament. **121/2003**.
- ACCC. (2010). "Ladder Injuries." Retrieved 17/04/2014, from <http://www.productsafety.gov.au/content/index.phtml/itemId/974360/fromItemId/974347>.
- Ashby, K., B. Fox, J. Ozanne-Smith, C. Brennan and J. Wenzel (2005). Investigating the over-representation of older persons in Do-It-Yourself home maintenance injury and barriers to prevention., Monash University Accident Research Centre.
- Bedi, H. S. and D. Goldbloom (2008). A review of nonoccupational ladder-related injuries in Victoria: as easy as falling off a ladder. **64**: 1608-1612.
- Björnstig, U. and J. Johnsson (1992). "Ladder injuries: Mechanisms, injuries and consequences." Journal of Safety Research **23**(1): 9-18.
- Cassell, E. and A. Clapperton (2006). Consumer product-related injury: Injury related to the use of ladders. Hazard. Melbourne, Australia, Victorian Injury Surveillance Unit [VISU], Monash University Accident Research Centre. **Hazard 63**.
- Chang. (2005). *Safety Science*, 43(7), 1-8.
- D'Souza, A. L., G. A. Smith and L. B. Trifiletti (2007). "Ladder-Related Injuries Treated in Emergency Departments in the United States, 1990–2005." American journal of preventive medicine **32**(5): 413-418.
- Faergemann, C. and L. B. Larsen (2000). "Non-occupational ladder and scaffold fall injuries." Accident Analysis & Prevention **32**(6): 745-750.
- Häkkinen, K. K., J. Pesonen and E. Rajamäki (1988). "Experiments on safety in the use of portable ladders." Journal of Occupational Accidents **10**(1): 1-19.
- Hayward, G. (1996). "Risk of injury per hour of exposure to consumer products." Accident Analysis and Prevention **28**(1): 115-121.
- HoldSafe. (2014). "HoldSafe." Retrieved 28/05/2014, 2014, from <http://ladderlock.com.au/>.
- Kent, A. and A. Pearce (2006). "Review of morbidity and mortality associated with falls from heights among patients presenting to a major trauma centre." Emerg Med Australas **18**(1): 23-30.
- Partridge, R. A., A. S. Virk and R. E. Antosia (1998). "Causes and Patterns of Injury from Ladder Falls." Academic Emergency Medicine **5**(1): 31-34.
- SafetyLink. (2014). "SafetyLink." Retrieved 28/05/2014, 2014, from <http://www.heightsafety.com.au/>.
- Tsipouras, S. H., JM; Silvapulle, MJ (2001). "Ladders: accidents waiting to happen." Medical Journal of Australia(174): 516-519.
- WorkSafe Victoria (2005). Prevention of Falls - Ladders. WorkSafe Victoria. Melbourne, WorkSafe Victoria.

Appendix A: State and Territory Occupational Health and Safety Regulation

Occupational Health and Safety regulation and information pamphlets are the two main forms of prevention initiatives in use but target occupational users.

Table 1: State and territory regulation and information

AUSTRALIAN CAPITAL TERRITORY		
<p>Work Health and Safety Act 2011</p>	<p>Chapter 4 Hazardous work Part 4.4 Falls</p>	<p>79 Specific requirements to minimise risk of fall</p> <p>(1) This section applies if it is not reasonably practicable for the person conducting a business or undertaking at a workplace to eliminate the risk of a fall to which section 78 applies.</p> <p>(2) The person must minimise the risk of a fall by providing adequate protection against the risk in accordance with this section.</p> <p>Maximum penalty:</p> <p>(a) in the case of an individual—\$6 000; or</p> <p>(b) in the case of a body corporate—\$30 000.</p> <p>Note Strict liability applies to each physical element of each offence under this regulation, unless otherwise stated (see s 6A).</p> <p>(3) The person provides adequate protection against the risk if the person provides and maintains a safe system of work, including by—</p> <p>(a) providing a fall prevention device if it is reasonably practicable to do so; or</p> <p>(b) if it is not reasonably practicable to provide a fall prevention device, providing a work positioning system; or</p> <p>(c) if it is not reasonably practicable to comply with either paragraph (a) or (b), providing a fall arrest system, so far as is reasonably practicable.</p> <p>Examples</p> <p>1 providing temporary work platforms</p>

		<p>2 providing training in relation to the risks involved in working at the workplace</p> <p>3 providing safe work procedures, safe sequencing of work, safe use of ladders, permit systems and appropriate signs</p> <p>Note 1 A combination of the controls set out in this subsection may be used to minimise risks so far as is practicable if a single control is not sufficient for the purpose.</p> <p>Note 2 An example is part of the regulation, is not exhaustive and may extend, but does not limit, the meaning of the provision in which it appears (see Legislation Act, s 126 and s 132).</p> <p>(4) This section does not apply in relation to the following work:</p> <ul style="list-style-type: none"> (a) the performance of stunt work; (b) the performance of acrobatics; (c) a theatrical performance; (d) a sporting or athletic activity; (e) horse riding. <p>Note Section 36 applies to the management of risk in relation to this work.</p> <p>(5) In this section:</p> <p>fall prevention device includes—</p> <ul style="list-style-type: none"> (a) a secure fence; and (b) edge protection; and (c) working platforms; and (d) covers.
<p>WorkSafe ACT</p>	<p>Code of Practice: Preventing falls in housing 2012</p>	<p>The Code of Practice on how to prevent the risk of falls in housing construction is an approved code of practice under section 274 of the <i>Work Health and Safety Act</i> (the WHS Act).</p> <p>This document discusses the hierarchy of control measures for controlling the risk of falls. In regards to ladder use, it identifies ladder use as the least preferable fall control measure and provides specific</p>

	<p>advice on the selection, securing of, safe use and maintenance of ladders.</p> <p>It additionally contains a ladder checklist for the use of short-term light duty work.</p>
<p>Code of Practice: Managing the Risk of Falls at Workplaces 2011</p>	<p>This Code of Practice on how to manage the risk of falls in the workplace is an approved code of practice under section 274 of the Work Health and Safety Act (the WHS Act).</p> <p>Advices that portable ladders should only be used where the use of safer systems is not reasonably practicable. Provides specific advice on the selection, positioning, safe use and maintenance of ladders.</p> <p>It highlights that fixed ladders should be installed in accordance with AS 1657 Fixed Platforms, Walkways, Stairways and Ladders—Design, Construction and Installation.</p>
<p>Guidance note: Safety when working from a height January 2013</p>	<p>Discusses risk control measures within a hierarchy of controls. Identifies ladders as the last active level of control as ladder use (before administrative controls). Advice given includes using the appropriate ladder for the task, only use for short-term work, set up and use correctly and safely and that three points of contact are always maintained.</p>
<p>Guidance note: Portable ladders May 2011</p>	<p>This guidance note identifies that the ladder is one of the most commonly used pieces of access equipment. It provides instructions on safe ladder use, use of steps and trestles, common defects and use of extension and single ladders. It emphasises portable ladders should comply with the requirements of the relevant Australian Standards.</p>
<p>Guidance – Slips, trips and falls May 2012</p>	<p>Provides guidance on the avoidance of slips, trips and falls. Specific advice for ladders given includes:</p> <ul style="list-style-type: none"> • Use a ladder that has slip-resistant feet • Set the ladder on a flat, firm surface • Face the ladder when standing up or down • Keep the centre of your body between the side rails of the ladder • Don't work from the top two steps of a stepladder.
<p>Media release - WorkSafe announce commencement of programmed inspections on working safely at height in</p>	<p>Media release announcing that WorkSafe ACT will be conducting an inspection program focusing on working safely at height in the residential housing industry in the ACT. This is following the identification of falls from heights as the leading cause of fatalities and a major cause of serious injuries in the</p>

	<p>construction April 2013</p>	<p>construction industry. They will focus specifically on work from scaffolds, on roofs and using ladders. “Nationally, ladders, in particular, have been involved in nearly half of the construction fatalities resulting from working at height,” ... “We have seen a number of serious injuries here in the ACT recently which have involved falls from ladders. Several of the workers involved in those incidents have been very lucky not to sustain even more serious injuries than they did. This inspection program will help the industry focus their attention on this specific high risk activity.”</p>
NEW SOUTH WALES		
<p>Occupational Health and Safety Regulation 2001</p>	<p>Division 6: <i>Working at heights</i></p>	<p>56: Prevention of falls from heights – particular control measures These regulations do not specifically refer to the use of ladders. (1) An employer must ensure that risks associated with falls from a height are controlled by use of the following measures: (a) provision and maintenance of: (i) a stable and securely fenced work platform (such as scaffolding or other form of portable work platform), or (ii) if compliance with subparagraph (i) is not reasonably practicable—secure perimeter screens, fencing, handrails or other forms of physical barriers that are capable of preventing the fall of a person, or (iii) if compliance with subparagraph (ii) is not reasonably practicable—other forms of physical restraints that are capable of arresting the fall of a person from a height of more than 2 metres, (b) provision of a safe means of movement between different levels at the place of work. (2) If a fall arrest device is provided for use by persons at work, the employer must ensure that: (a) all anchorage points for the device are inspected by a competent person before their first use and then on a regular basis so they are capable of supporting the design loads, and</p>

		<p>(b) if the load-bearing capacity of an anchorage point is impaired, the anchorage is immediately made inoperable so as to prevent its use, and</p> <p>(c) any harness, safety line or other component of the device that shows wear or weakness to the extent it may cause the device to fail is not used, and</p> <p>(d) all persons using the device have received training in the selection, assembly and use of the system, and</p> <p>(e) adequate provision is made for the rescue of a person whose fall is arrested by a fall arrest device.</p>
WorkCover New South Wales	Fact Sheet: Safe use of portable ladders	This fact sheet identifies that the potential for injury in a fall is significant and only consider using a portable ladder if other alternatives, such as scaffolding or elevating work platforms, are not reasonably practicable. Provides general advice on the selection, placement, use and maintenance of ladders. It includes a checklist that can help minimise the risks associated with their use.
	Position paper: Working off Step ladders 2003	A WorkCover guide, <i>Portable ladders</i> , gives general guidance on the use of ladders, but little specific information on using stepladders. This paper provides additional guidance.
	Position Paper: Requirements for Trestle Ladders in NSW 2006	This paper is intended to assist designers, manufacturers and suppliers (including hirers and lessors) of trestle ladders, and those responsible for their use, in meeting their obligations under the OHS Regulation 2001 in NSW to safeguard persons working at heights.
	Safety Alert: Safe use of portable ladders <i>Catalogue No: WC02780</i> May 2010	<p>This safety alert is published following two recent incidents where painters fell from ladders and suffered serious injuries, one being a fatality. In both cases the painters used portable ladders and were working at a height of approximately five metres.</p> <p>WorkCover reminds employers and those in control of the work site that the use of ladders should only be considered if other safer alternatives, such as scaffolding or elevating work platforms, are not reasonably practicable.</p>
	Poster: Use ladders safely 2012	Basic poster designed to promote the safe use of ladders in the demolition industry with some pictures demonstrating safe use.

NORTHERN TERRITORY		
<p>Work Health and Safety (National Uniform Legislation) Act 2011</p>	<p>79 Specific requirements to minimise risk of fall</p>	<p>(1) This regulation applies if it is not reasonably practicable for the person conducting a business or undertaking at a workplace to eliminate the risk of a fall to which regulation 78 applies.</p> <p>(2) The person must minimise the risk of a fall by providing adequate protection against the risk in accordance with this regulation.</p> <p>Maximum penalty: (a) in the case of an individual – \$6 000. (b) in the case of a body corporate – \$30 000. Note for subregulation (2) Strict liability applies to each physical element of this offence. See section 12B of the Act.</p> <p>(3) The person provides adequate protection against the risk if the person provides and maintains a safe system of work, including by:</p> <p>(a) providing a fall prevention device if it is reasonably practicable to do so; or (b) if it is not reasonably practicable to provide a fall prevention device, providing a work positioning system; or (c) if it is not reasonably practicable to comply with either paragraph (a) or (b), providing a fall arrest system, so far as is reasonably practicable. Examples for subregulation (3) 1 Providing temporary work platforms. 2 Providing training in relation to the risks involved in working at the workplace. 3 Providing safe work procedures, safe sequencing of work, safe use of ladders, permit systems and appropriate signs. Note for subregulation (3) A combination of the controls set out in this subregulation may be used to minimise risks, so far as is practicable, if a single control is not sufficient for the purpose.</p> <p>(4) This regulation does not apply in relation to the following work:</p> <p>(a) the performance of stunt work; (b) the performance of acrobatics; (c) a theatrical performance; (d) a sporting or athletic activity; (e) horse riding. Note for subregulation (4) Regulation 36 applies to the management of risk in relation to this work.</p> <p>(5) In this regulation:</p> <p>fall prevention device includes: (a) a secure fence; and (b) edge protection; and (c) working platforms; and (d) covers. Note for regulation 79 See regulation 5(1) for definitions fall arrest system and work positioning system.</p>

NT WorkSafe	Code of Practice: For the prevention of falls in general construction 2012	This National Code of Practice for the Prevention of Falls in General Construction, referred to in this document as the Code, is part of a package of occupational health and safety material supporting the National Standard for Construction Work [NOHSC:1016(2005)] (National Standard). The Code provides practical guidance material and advice on ways to eliminate and minimise the risk of falls from height in general construction work and prescribes circumstances in which the provision of physical fall prevention measures are required, so far as is reasonably practicable. This document identifies ladders as a Level 5 control and provides general advice on the selection, safe use and maintenance of ladders
	Code of Practice: Managing the risk of falls at workplaces 2013	This Code of Practice on how to manage the risk of falls in the workplace is an approved code of practice under section 274 of the <i>Work Health and Safety (National Uniform Legislation) Act 2011</i> (the WHS Act). It identifies ladder use as the least preferable fall control measure and provides general advice on the selection, use and maintenance of ladders.
	Bulletin: Portable ladder safety 2012	This bulletin provides general information on ladder safety. Points discussed include: <ol style="list-style-type: none"> 1. All ladders should be adequately supported at the base 2. A ladder should never be 'walked' by the person standing on the ladder 3. Set the ladder at a slope of approximately 4 in 1 4. One ladder one person 5. Always have three limbs on the ladder 6. Special care and equipment when working near powerlines 7. Never climb higher than the third rung from the top of the ladder 8. Limit the climb to allow for a secure hold while working from ladders 9. Follow these general safety precautions when using ladders 10. Extension ladders 11. Step ladders 12. Multipurpose ladders 13. Fully enclosed slip resistant footwear should always be worn when using ladders

		<p>14. Ladders should be well maintained, stored under cover, with adequate support to prevent sagging</p> <p>15. Maximum length of ladders</p> <p>16. Load rating</p>
QUEENSLAND		
The Workplace Health and Safety Regulation 2008	Part 20: Construction Work	<p>Subdivision 11: Relevant person's obligation for ladders</p> <p>325 What work may be done from single or extension ladder</p> <p>(1) This section applies if a relevant person intends to perform construction work that involves a single or extension ladder.</p> <p>(2) The relevant person must not use, or allow another person to use, the ladder—</p> <p>(a) to gain access to a place, unless the person using the ladder has at least 2 hands and 1 foot, or 2 feet and 1 hand, on the ladder from when the person is fully on the ladder to when the person is leaving the ladder; or</p> <p>(b) to do construction work, other than to gain access to a place under paragraph (a), unless the work is permitted work.</p> <p>(3) Subsection (2) is a workplace health and safety obligation for the Act.</p> <p>326 Work on a ladder</p> <p>(1) This section applies if a relevant person intends to perform construction work that involves a ladder.</p> <p>(2) The relevant person must, before the work starts—</p> <p>(a) ensure that each hazard that may result in a fall by the person who is to use the ladder or cause death or injury if the person were to fall from the ladder is identified; and</p> <p>(b) ensure that the risk of death or injury that may result because of the hazard is assessed; and</p> <p>(c) ensure that any control measures required to prevent, or minimise the level of, exposure to the risk are used.</p> <p>(3) Subsection (4) applies if the construction work is permitted work, and, in doing the work, a person</p>

		<p>could fall—</p> <ul style="list-style-type: none"> (a) for housing construction work—at least 3m; or (b) otherwise—at least 2m. <p>(4) The relevant person must not use, or allow another person to use, the ladder, if it is a single or extension ladder, unless—</p> <ul style="list-style-type: none"> (a) the person using the ladder— <ul style="list-style-type: none"> (i) has at least 3 limbs holding, wrapped around or standing on the ladder in any combination; or Example— holding the ladder with 1 hand while standing on it with 2 feet (ii) is prevented from falling by a control measure, for example, a strap commonly known as a pole strap; or (iii) is using a fall-arrest harness system that is not attached to the ladder; and (b) the ladder is secured— <ul style="list-style-type: none"> (i) at or near the top to prevent it moving; or <p>Examples—</p> <ul style="list-style-type: none"> • tying the top of the ladder to a plate fixed to the top of a wall frame • clamping the top of the ladder to structural steel <p>(ii) at or near the bottom to prevent it moving.</p> <p>Examples—</p> <ul style="list-style-type: none"> • tying the bottom of the ladder to pegs in the ground • a person, other than the person using the ladder, holding the ladder in position near the bottom of the ladder <p>(5) Despite subsection (4)(a)(i), the person using the ladder may hold a stable object with 1 or both hands instead of holding</p>
--	--	--

	<p>the ladder with 1 or both hands.</p> <p>Examples of stable objects—</p> <ul style="list-style-type: none"> • guttering • a fascia board or timber stud • a plate fixed to the top of a wall frame <p>(6) The relevant person must ensure that the ladder, if it is a single or extension ladder, and is used against a pole to do construction work, has a device that—</p> <p>(a) is fitted at or near the top of the ladder between its sides; and</p> <p>(b) helps to ensure the ladder's stability by partly accepting the shape of the pole.</p> <p>Example— a steel rope or steel hoop</p> <p>(7) Subsections (2), (4) and (6) are workplace health and safety obligations for the Act.</p> <p>327 Ladders generally</p> <p>(1) A relevant person performing construction work must ensure that a ladder, other than a trestle ladder, used for the work—</p> <p>(a) has a load rating of at least 120kg; and</p> <p>(b) is manufactured for industrial use; and</p> <p>(c) is used only for the purpose for which it is designed; and</p> <p>(d) is not used to support a weight greater than that for which it is designed; and</p> <p>(e) is no longer than—</p> <p>(i) for a single ladder—6.1m; or</p> <p>(ii) for an extension ladder used to do electrical work—9.2m; or</p> <p>(iii) for another extension ladder—7.5m.</p> <p>(2) However, subsection (1)(e) does not apply if the ladder is used for work in a confined space.</p> <p>Example of a confined space— a well</p>
--	---

	<p>(3) A ladder may be taken to have a load rating of at least 120kg if it appears to be marked by its manufacturer to show it has a load rating of at least 120kg.</p> <p>(4) A ladder may be taken to be manufactured for industrial use if it appears to be marked by its manufacturer to show it is for industrial use.</p> <p>(5) However, subsection (3) or (4) does not apply if the relevant person knows or suspects that the marking is—</p> <ul style="list-style-type: none"> (a) false; or (b) not the manufacturer's marking. <p>(6) The relevant person must ensure that—</p> <ul style="list-style-type: none"> (a) the bottom of the ladder is on a stable surface; and (b) the rungs of the ladder are approximately level. <p>(7) The relevant person must not use, or allow another person to use, the ladder to support a platform.</p> <p>(8) The relevant person must not use, or allow another person to use, the ladder, if it is a single or extension ladder, unless—</p> <ul style="list-style-type: none"> (a) it is placed so that the angle between the ladder and the horizontal is at least 70° but not more than 80° when in use; and (b) if it is being used as a temporary means of access to or from a surface—the ladder extends at least 1m above the surface. <p>(9) However, the ladder may be placed so that the angle between the ladder and the horizontal is more than 80° if—</p> <ul style="list-style-type: none"> (a) a lesser angle is impractical because the ladder is being used in a confined space; and (b) control measures are used to prevent the ladder moving when in use. <p>Example of a control measure— securing the top and bottom of the ladder to prevent it moving</p> <p>(10) Subsection (8)(b) does not apply if—</p> <ul style="list-style-type: none"> (a) it is impractical to comply with it, for example, because the work is being done from a surface attached to a pole; and (b) the person using the ladder is attached to a fall-arrest harness system before the person moves
--	--

		<p>from the ladder to the surface.</p> <p>(11) Subsections (1), (6), (7) and (8) are workplace health and safety obligations for the Act.</p>
<p>Workplace Health and Safety Queensland</p>	<p>Code of Practice: Managing the risk of falls in workplaces 2011</p>	<p>This Code of Practice on how to manage the risk of falls in the workplace is an approved code of practice under section 274 of the <i>Work Health and Safety (National Uniform Legislation) Act 2011</i> (the WHS Act). It identifies ladder use as the least preferable fall control measure and provides general advice on the selection, use and maintenance of ladders.</p>
	<p>Building and construction industry Workplace Health and Safety Guide (The Orange book) May 2011</p>	<p>Single or extension ladders</p> <p>Single or extension ladders may only be used to:</p> <ul style="list-style-type: none"> (a) gain access; or (b) carry out permitted work – where the material or equipment being carried does not restrict movement or cause loss of balance; (c) the trunk of the body remains centered on the ladder; and (d) equipment can be used with one hand (unless a control to prevent a fall is used). <p>A person using a ladder for access or permitted work must either:</p> <ul style="list-style-type: none"> (a) have three points of substantial contact with the ladder or a stable object, e.g. standing on the ladder with two feet while holding a fascia board or timber stud (b) prevent falls with a control measure, e.g. a pole strap; or (c) use a fall-arrest harness system (not attached to the ladder). <p>The ladder must have a load rating of not less than 120 kg and be:</p> <ul style="list-style-type: none"> (a) secured against movement at or near its top or bottom, e.g. by tying or clamping; (b) manufactured for industrial use; (c) used only for the designed purpose; (d) not more than 6.1 metres for a single ladder; (e) not more than 9.2 metres for an extension ladder used for electrical work or 7.5 metres for other work;

		<p>(f) on a firm and stable surface;</p> <p>(g) placed at an angle between 70° and 80°; and</p> <p>(h) extended at least one metre above a surface being accessed.</p> <p>Trestle ladder platforms</p> <p>Platforms used on trestle ladders below three metres for housing construction or two metres for other construction work must be 450 mm wide unless the work is light work.</p> <p>Examples of light work include:</p> <ul style="list-style-type: none"> • painting, installing a roof gutter, air-conditioning duct, metal fascia or lighting • placing pine roof trusses in position • performing inspections or tests • installing an electrical connection. <p>Fixing plasterboard sheeting to an internal stairwell void, fixing cladding to a gable end of a roof or using a medium or heavy duty angle grinder or circular saw are not considered light work.</p> <p>For work on a trestle ladder at three metres or more for housing construction work or two metres or more for other construction work:</p> <ul style="list-style-type: none"> • the trestle ladder must have edge protection along the outer length of the platform • control measures must be put in place where: <ul style="list-style-type: none"> - there is a risk of a person falling off the edge of each end of the platform, or - the gap between the inner edge of the platform and the face of a building/structure is greater than 225 mm • each trestle ladder must be secured to prevent it moving, e.g. tying the ladder to a sturdy wall or bracing it to the ground • the platform must have an unobstructed surface width of 450 mm; and • be not higher than five metres.
	<p>Common Hazards: Fruit harvesting and packaging Jan 2014</p>	<p>Ladders are used for most operations in tree fruit production including picking, pruning and thinning. Provides specific advice on the selection and safe use of ladders in the context of fruit harvesting and packaging.</p>

SOUTH AUSTRALIA		
Work Health and Safety Regulations 2012 (SA)		Does not directly address the use of ladders.
	Code of Practice: Managing the risk of falls at workplaces 2011	This Code of Practice on how to manage the risk of falls in the workplace is an approved code of practice under section 274 of the <i>Work Health and Safety Act</i> (the WHS Act). Identifies ladder use as the least preferable fall control measure and provides specific advice on the selection, securing of, safe use and maintenance of ladders.
	Manual: Road transport falls prevention manual	The Transport Industry recognises that the risk of injury to workers caused by falls from vehicles, plant and equipment is a significant one for the employees concerned, the employer and the industry as a whole. This document discusses how to minimise the risks associated with the use of ladders by highlighting hazards/risks and offering solutions.
SafeWork SA	Safeguard: Ladders 2007	It identifies ladder use as the least preferable plant and provides general advice on the selection, use and maintenance of ladders.
	Safeguard: Bow ladder safety 2013	To advise Persons Conducting a Business or Undertaking (PCBU) and workers about how to safely use bow ladders when picking fruit.
TASMANIA		
Work Health and Safety Act 2012		Does not directly address the use of ladders.
WorkCover Tasmania	Code of Practice: Managing the risks of falls at workplaces <i>December 2012 CP122</i>	This Code of Practice on how to manage the risk of falls in the workplace is an approved code of practice under section 274 of the <i>Work Health and Safety Act</i> (the WHS Act). Identifies ladder use as the least preferable fall control measure and provides specific advice on the selection, securing of, safe use and maintenance of ladders.

	Workplace Issues Magazine March 2014	Describes a recent incident to discuss how to minimise the risks associated with the use of ladders.
VICTORIA		
Occupational Health and Safety Act 2004	Regulation 3.3.4 of the Occupational Health and Safety Regulations 2007 (Vic)	<p>Regulation 3.3.4 of the Occupational Health and Safety Regulations 2007 (Vic) provides that:</p> <p>(1) An employer must ensure that if an employee is required to undertake a task at the workplace that involves a risk of a fall, the risk is controlled, so far as is reasonably practicable, by arranging for the task to be undertaken—</p> <ul style="list-style-type: none"> (a) on the ground; or (b) on a solid construction. <p>(2) If it is not reasonably practicable to comply with subregulation (1), or only part of a task may be undertaken in accordance with subregulation (1), and a risk of a fall remains, the employer must reduce the risk, so far as is reasonably practicable, by ensuring that a passive fall prevention device is used.</p> <p>(3) If it is not reasonably practicable to comply with subregulations (1) and (2), or only part of a task may be undertaken in accordance with those subregulations, and a risk of a fall remains, the employer must reduce the risk, so far as is reasonably practicable, by using a work positioning system.</p> <p>(4) If it is not reasonably practicable to comply with subregulations (1), (2) and (3), or only part of a task may be undertaken in accordance with those subregulations, and a risk of a fall remains, the employer must reduce the risk, so far as is reasonably practicable, by putting in place a fall arrest system.</p> <p>(5) If it is not reasonably practicable to comply with subregulations (1), (2), (3) and (4), or only part of a task may be undertaken in accordance with those subregulations, and a risk of a fall remains, the employer must reduce the risk, so far as is reasonably practicable, by ensuring that—</p> <ul style="list-style-type: none"> (a) a fixed or portable ladder is used in accordance with regulation 3.3.5 ; or (b) an administrative control is used. <p>Regulation 3.3.5 of the Occupational Health and Safety Regulations 2007 (Vic) provides that:</p> <p>An employer must ensure that a fixed or portable ladder used in accordance with regulation 3.3.4 to</p>

		<p>control the risk of a fall—</p> <ul style="list-style-type: none"> (a) is fit for the purpose; and (b) is appropriate for the duration of the task; and (c) is set up in a correct manner. <p>The Regulations therefore identify ladder use as the least preferable fall control measure.</p>
Victorian Workcover Authority	<p>Code of Practice: Prevention of falls in housing construction <i>Occupational Health and Safety Act 1985</i> No. 29, 31 March 2004</p>	<p>The Code of Practice for the Prevention of Falls in Housing Construction provides practical guidance to builders, contractors and their employees on how to eliminate or reduce the risk of falling from height in the housing construction industry.</p> <p>This document discusses the hierarchy of control measures for controlling the risk of falls. In regards to ladder use, it identifies ladder use as the least preferable fall control measure and provides general advice on the selection, use and maintenance of ladders.</p>
	<p>Compliance codes: Prevention of falls in general construction Ed No. 1: Sept 2008</p>	<p>Compliance codes provide practical guidance to those who have duties or obligations under the OHS Act. They aim to provide easy to understand information on how to comply.</p> <p>The purpose of this compliance code is to provide practical guidance to employers and self-employed persons on the prevention of falls in the general construction industry.</p> <p>This document discusses the hierarchy of control measures for controlling the risk of falls. In regards to ladder use, it identifies ladder use as the least preferable fall control measure and provides general advice on the selection, use and maintenance of ladders.</p>
	<p>Guidance note: Selection and safe use of portable ladders June 2013</p>	<p>This guidance note provides information to help determine whether a ladder is the right tool for the job, what you should look for when purchasing or selecting a ladder and how to safely use and maintain a ladder. It includes methods for reducing the likelihood and consequence of injuries sustained while using a ladder.</p>
WESTERN AUSTRALIA		
Occupational Safety and Health Regulations 1996	Regulation 3.26 Portable Ladders	(1) If, at a workplace, a person uses either a single or extension ladder then the person must ensure that the ladder –

		<p>(a) is placed so that the distance from the ladder base to the base of the support wall is about 1/4 of the working length of the ladder;</p> <p>(b) is located on a firm footing;</p> <p>(c) is secured into position so as to prevent slipping or sideways movement;</p> <p>(d) if being used to approach a platform, protrudes at least 900 mm beyond the landing for the platform; and</p> <p>(e) if being used at a workplace that is a construction site, is not suspended from a parapet hook.</p> <p>(2) If, at a workplace, a person uses –</p> <p>(a) a portable metal ladder then the person must ensure that the ladder is designed and constructed in accordance with the general requirements of AS/NZS 1892.1 and the specific requirements of that Standard in relation to the type of ladder; or</p> <p>(b) a portable wooden ladder then the person must ensure that the ladder is designed and constructed in accordance with the general requirements of AS 1892.2 and the specific requirements of that Standard in relation to the type of ladder.</p> <p>(3) A person must not use a ladder-bracket scaffold at a workplace unless the ladder-bracket scaffold is set up and used in accordance with clause 10.2.5 of AS/NZS 4576.</p> <p>Penalty applicable to subregulations (1), (2) and (3) for a person who commits the offence as an employee: \$5 000.</p> <p>Penalty applicable to subregulations (1), (2) and (3) in any other case: \$25 000.</p>
<p>WorkSafe WA</p>	<p>Code of Practice: Prevention of falls at workplaces 2004</p>	<p>This code of practice was prepared for the purpose of providing:</p> <ul style="list-style-type: none"> • practical advice on preventive strategies; and • a practical means of achieving any code, standard, rule, provision or specification relating to

		<p>occupational safety and health in Western Australia.</p> <p>This document discusses each type of ladder having specific safety requirements and considerations and provides advice on safe use.</p>
	<p>Working at height: frequently asked questions</p> <p>How do I use a ladder safely?</p> <p>2011</p>	<p>Ladders can be hazardous if they are not correctly maintained and used. Regulation 3.26 of the Occupational Safety and Health Regulations 1996 details the requirements for working with portable ladders. Your employer should make sure that ladders are properly stored and inspected regularly and only used for light work of short duration or for access.</p> <p>Your employer or supervisor should give you instructions and show you how to use a ladder safely and what safety checks to make before using a ladder. This includes checking that the ladder:</p> <ul style="list-style-type: none"> • has no damaged, loose or missing parts; • is secured against movement and be supported from a firm, level, non-slip surface; • projects at least 1 metre above the landing place; • is placed at a slope that is no steeper than 4 units of height to 1 unit horizontally; and • is rated for industrial use, not domestic use. <p>When using a ladder:</p> <ul style="list-style-type: none"> • always have two hands free to climb up and down (three points of contact); • any materials or tools (other than those held on a worker's belt) should be transferred to the work area separately; • always face the ladder while climbing up, down or working; • never place feet higher than 900mm from the top of the ladder; • never over-reach from a ladder; • never work from a ladder above another person; • never have more than one person on a ladder at any one time; • do not use a ladder in an access way or where it may be hit by a door; • do not undertake work requiring restricted vision, welding or metal cutting from a ladder; and • use a non-metallic ladder where there are electrical hazards.

Appendix B: Local Government Area (LGA) of residence for hospital-treated home ladder fall injury, Victoria 2010/11-2012/13

	ADMISSIONS		ED PRESENTATIONS		ALL HOSPITAL - TREATED	
	n	%	n	n	%	n
Alpine (S)	*	*	5	0.2	8	0.2
Ararat (RC)	*	*	0	0.0	*	*
Ballarat (C)	34	1.9	68	3.0	102	2.5
Banyule (C)	43	2.3	52	2.3	95	2.3
Bass Coast (S)	12	0.7	19	0.8	31	0.8
Baw Baw (S)	7	0.4	20	0.9	27	0.7
Bayside (C)	39	2.1	*	*	42	1.0
Benalla (RC)	*	*	7	0.3	9	0.2
Boroondara (C)	58	3.2	36	1.6	94	2.3
Brimbank (C)	67	3.7	121	5.4	188	4.6
Buloke (S)	*	*	*	*	*	*
Campaspe (S)	5	0.3	22	1.0	27	0.7
Cardinia (S)	31	1.7	29	1.3	60	1.5
Casey (C)	75	4.1	71	3.2	146	3.6
Central Goldfields (S)	*	*	*	*	5	0.1
Colac-Otway (S)	5	0.3	*	*	6	0.1
Corangamite (S)	9	0.5	*	*	12	0.3
Darebin (C)	40	2.2	67	3.0	107	2.6
East Gippsland (S)	15	0.8	27	1.2	42	1.0
Frankston (C)	56	3.1	49	2.2	105	2.6
Gannawarra (S)	*	*	0	0.0	*	*
Glen Eira (C)	55	3.0	10	0.4	65	1.6
Glenelg (S)	*	*	*	*	*	*
Golden Plains (S)	7	0.4	10	0.4	17	0.4
Greater Bendigo (C)	25	1.4	37	1.6	62	1.5
Greater Dandenong (C)	46	2.5	17	0.8	63	1.5
Greater Geelong (C)	79	4.3	74	3.3	153	3.8
Greater Shepparton (C)	13	0.7	20	0.9	33	0.8
Hepburn (S)	8	0.4	11	0.5	19	0.5
Hindmarsh (S)	*	*	*	*	*	*
Hobsons Bay (C)	29	1.6	80	3.6	109	2.7
Horsham (RC)	*	*	24	1.1	28	0.7
Hume (C)	55	3.0	69	3.1	124	3.0
Indigo (S)	*	*	15	0.7	17	0.4
Kingston (C)	54	3.0	11	0.5	65	1.6
Knox (C)	54	3.0	90	4.0	144	3.5
Latrobe (C)	23	1.3	103	4.6	126	3.1
Loddon (S)	*	*	*	*	5	0.1
Macedon Ranges (S)	21	1.1	10	0.4	31	0.8
Manningham (C)	51	2.8	44	2.0	95	2.3
Mansfield (S)	*	*	*	*	7	0.2
Maribyrnong (C)	21	1.1	37	1.6	58	1.4
Maroondah (C)	44	2.4	60	2.7	104	2.6
Melbourne (C)	*	*	14	0.6	18	0.4

Melton (S)	27	1.5	43	1.9	70	1.7
Mildura (RC)	17	0.9	28	1.2	45	1.1
Mitchell (S)	10	0.5	5	0.2	15	0.4
Moira (S)	10	0.5	7	0.3	17	0.4
Monash (C)	75	4.1	17	0.8	92	2.3
Moonee Valley (C)	50	2.7	25	1.1	75	1.8
Moorabool (S)	5	0.3	14	0.6	19	0.5
Moreland (C)	46	2.5	39	1.7	85	2.1
Mornington Peninsula (S)	61	3.3	118	5.3	179	4.4
Mount Alexander (S)	8	0.4	*	*	9	0.2
Moyne (S)	8	0.4	16	0.7	24	0.6
Murrindindi (S)	7	0.4	*	*	9	0.2
Nillumbik (S)	27	1.5	19	0.8	46	1.1
Northern Grampians (S)	*	*	*	*	5	0.1
Port Phillip (C)	24	1.3	8	0.4	32	0.8
Pyrenees (S)	*	*	5	0.2	8	0.2
Queenscliffe (B)	3	0.2	*	*	*	*
South Gippsland (S)	8	0.4	*	*	10	0.2
Southern Grampians (S)	8	0.4	17	0.8	25	0.6
Stonnington (C)	34	1.9	10	0.4	44	1.1
Strathbogie (S)	*	*	*	*	5	0.1
Surf Coast (S)	8	0.4	9	0.4	17	0.4
Swan Hill (RC)	*	*	9	0.4	11	0.3
Towong (S)	*	*	*	*	*	*
Wangaratta (RC)	8	0.4	49	2.2	57	1.4
Warrnambool (C)	13	0.7	30	1.3	43	1.1
Wellington (S)	17	0.9	40	1.8	57	1.4
West Wimmera (S)	*	*	*	*	*	*
Whitehorse (C)	71	3.9	62	2.8	133	3.3
Whittlesea (C)	58	3.2	85	3.8	143	3.5
Wodonga (RC)	*	*	33	1.5	36	0.9
Wyndham (C)	26	1.4	55	2.4	81	2.0
Yarra (C)	9	0.5	29	1.3	38	0.9
Yarra Ranges (S)	59	3.2	110	4.9	169	4.1
Yarriambiack (S)	*	*	*	*	5	0.1
Total	1,830	100.0	2,247	100.0	4,077	100.0

Appendix C: Victorian Trauma Registry summary tables n=576 domestic ladder falls cases

	Calendar year									Total
	2005	2006	2007	2008	2009	2010	2011	2012	2013	
All VSTR Major Trauma	2060	2153	2281	2386	2549	2641	2884	2883	2935	22772
All ladder falls	63	58	73	54	90	89	116	126	108	777
Domestic Ladder Falls resulting in major trauma	50	43	51	39	66	65	82	98	82	576
% of major trauma resulting from domestic ladder falls	2.4%	2.0%	2.2%	1.6%	2.6%	2.5%	2.8%	3.4%	2.8%	
Height of fall	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Low fall (≤ 1 metre or height not known)	4	6	8	6	12	11	16	16	9	88
High fall (> 1metre)	46	37	43	33	54	54	66	82	73	488
Gender	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Male	48	40	45	34	59	60	77	87	77	527
Female	2	3	6	5	7	5	5	11	5	49
% Male	96.0%	93.0%	88.2%	87.2%	89.4%	92.3%	93.9%	88.8%	93.9%	
Age groups	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Age<45	3	3	2	2	7	2	6	7	7	39
Age 45-59	7	13	18	9	17	14	15	18	20	131
Age 60-69	15	9	12	13	20	19	28	29	20	165
Age 70-79	19	13	15	9	14	21	20	32	28	171
Age 80+	6	5	4	6	8	9	13	12	7	70
Activity*	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Trimming hedge/pruning tree/picking fruit	9	5	8	8	9	6	14	16	14	89
Outdoors - Cleaning gutters/windows/roof	8	4	6	2	4	4	8	13	10	59
Climbing onto or off the roof - Activity NFS	1	3	3	5	4	2	8	6	5	37
Outdoors - Repairing roof/gutters/antenna/light	2	4	3	1	5	3	5	4	4	31
Painting	3		1	2	3	2	4	1	2	18
Indoors - Painting/repairs/changing lightbulb/changing smoke alarm batteries				1	2	4	1	3	3	14
Outdoors - Building pergola/shed	1			4		1		1	2	9
Outdoors - Retrieving things from height or			2		1		1	1	1	6

putting things up high

Other	1	1		1		2			1	6
Activity not specified	25	26	28	15	38	41	41	53	40	307

*Grouped according to free text

Injury grouping	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Multiple injuries or other	11	13	15	18	24	33	33	47	40	234
Head and other associated injuries	12	10	15	11	16	16	19	19	15	133
Extremity and/or spine injuries only	10	8	9	4	11	6	12	17	12	89
Isolated head injury	12	10	8	2	10	7	10	11	11	81
Chest and or abdominal injuries only	2		2	4	2	1	4	3	2	20
Severe spinal cord injury	3	2	2		3	2	4	1	2	19

Multiple injuries or other = includes multiple body region injuries (excluding serious neurotrauma) and other injuries that do not fit into any of the other groups

Head and other associated injuries = head injury with AIS > 2 in addition to another injury

Isolated head injury = head injury with AIS > 2 and no other injury with AIS > 1

Extremity and/or spine injuries only = extremity injury with AIS > 1 and/or spine injury with AIS 2 or 3 and no other injury with AIS > 1

Chest and/or abdominal injuries only = chest and/or abdominal injury with AIS > 2 and no other injury with AIS > 1

Severe spinal cord injury = spinal cord injury with AIS > 3 with or without other injuries

ISS groupings	2005	2006	2007	2008	2009	2010	2011	2012	2013	
1-14	21	18	21	16	28	28	34	38	28	232
16-30	22	23	27	21	35	31	40	53	50	302
31-45	5	2	2	2	3	4	7	6	3	34
46-75	2		1			2	1	1	1	8

Outcome from hospital	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Death	9	6	5	5	5	8	7	11	2	58
Rehabilitation	16	12	22	13	18	27	24	28	35	195
Home	21	21	21	19	40	27	49	53	40	291
Hospital for Convalescence	1	2	2		2	1	2	6	4	20
Nursing home	1	1			1	1			1	5
Other	2	1	1	2		1	7	7		
Survivors to discharge	41	37	46	34	61	57	75	87	80	

	2005	2006	2007	2008	2009	2010	2011	2012
Follow up 6 month available	8	28	36	27	53	51	67	72
GOSE at 6 months								
Died		2	2	1		1		1
Lower Severe Disability	4	7	13	10	17	12	15	21
Upper Severe Disability		1	1	2	3	1	2	1
Lower Moderate Disability		1	2		6	6	6	5
Upper Moderate Disability	4	8	8	8	9	13	12	12

Lower Good Recovery	3	4	2	2	4	6	9	
Upper Good Recovery	6	6	4	16	14	26	23	
	2005	2006	2007	2008	2009	2010	2011	2012
Follow up 12 months available	1	10	34	25	53	52	70	77
GOSE at 12 months								
Died	1	2					1	2
Lower Severe Disability			2	1	3	7	5	6
Upper Severe Disability		1	1	1	3	1	6	1
Lower Moderate Disability		2	3	1	1	2	4	5
Upper Moderate Disability		2	7	5	8	12	6	13
Lower Good Recovery		3	9	7	21	14	14	22
Upper Good Recovery			12	10	17	16	34	28

	2005	2006	2007	2008	2009	2010	2011
Follow up 24 months available	0	6	27	25	48	46	67
GOSE at 24 months							
Died			1		1		1
Lower Severe Disability			1		2	5	4
Upper Severe Disability			1	1	4	5	2
Lower Moderate Disability		1	1		1	1	9
Upper Moderate Disability		3	2	5	6	10	4
Lower Good Recovery		1	10	9	13	11	16
Upper Good Recovery		1	11	10	21	14	31

GOSE	Code
Died	1
Vegetative State	2
Lower Severe Disability	3
Upper Severe Disability	4
Lower Moderate Disability	5
Upper Moderate Disability	6
Lower Good Recovery	7
Upper Good Recovery	8

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Survivors to discharge	41	37	46	34	61	57	75	87	80

Working prior to injury	2005	2006	2007	2008	2009	2010	2011	2012	2013
Yes	10	11	16	11	18	22	29	33	25
No	12	10	20	18	37	32	44	47	34
N/A Not Applicable		7							

Working prior to injury	2005	2006	2007	2008	2009	2010	2011	2012	2013
Yes	10	11	16	11	18	22	29	33	25

Return to work at 6 months	2005	2006	2007	2008	2009	2010	2011	2012
No		3	5		4	5	5	7
Yes	9	8	9	8	13	15	21	22
Unknown	1		2	3	1	2	3	4

Return to work at 12 months	2005	2006	2007	2008	2009	2010	2011	2012
------------------------------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------

No		2	4	1	2	1	7	9
Yes		2	12	8	14	19	21	22
Unknown	10	7		2	2	2	1	2

Return to work at 24 months	2005	2006	2007	2008	2009	2010	2011
No		1	3		2	3	6
Yes		2	10	10	13	15	20
Unknown	10	8	3	1	3	4	3

Any data provided to you is on the condition that the Victorian State Trauma Registry (VSTR) is acknowledged as the source of the data. The suggested citation is: *The data from the Victorian State Trauma Registry was provided by VSTORM, a Department of Health and Transport Accident Commission sponsored project.*

Glasgow Outcome Scale - Extended (GOSE)

- 8 levels in the scale
- Minimum Score = 1; Maximum Score = 8
- Specific questions to determine upper or lower levels of disability are dictated by the structured interview

1 = Dead	
2 = Vegetative State	Condition of unawareness with only reflex responses but with periods of spontaneous eye opening.
3 = Low Severe Disability	Patient who is dependent for daily support for mental or physical disability, usually a combination of both. If the patient can be left alone for more than 8h at home it is upper level of SD, if not then it is low level of SD.
4 = Upper Severe Disability	
5 = Low Moderate Disability	Patients have some disability such as aphasia, hemiparesis or epilepsy and/or deficits of memory or personality but are able to look after themselves. They are independent at home but dependent outside. If they are able to return to work even with special arrangement it is upper level of MD, if not then it is low level of MD.
6 = Upper Moderate Disability	
7 = Low Good Recovery	Resumption of normal life with the capacity to work even if pre-injury status has not been achieved. Some patients have minor neurological or psychological deficits. If these deficits are not disabling then it is upper level of GR, if disabling then it is lower level of GR.
8 = Upper Good Recovery	

Domestic Ladder Use Survey

PLEASE READ THE FOLLOWING BEFORE COMPLETING THE SURVEY

This survey is part of project aimed to understand the issues surrounding injuries from ladder falls and to make recommendations to support safe ladder use in the home environment. It contains a range of questions that relate to your use of ladders around the home, your perceptions of safety, and your experiences in falling from ladders. The survey data will help to establish a more comprehensive understanding of the factors influencing safe ladder use in the home setting. Your participation is much appreciated and highly valuable.

Thank-you.

The following demographic information will not be used to identify you as an individual, but to describe the sample used for this research project. **This information is STRICTLY CONFIDENTIAL** and will only be used by the research team.

Please enter you details, or tick/circle the item that applies to you.

INCLUSION CRITERIA

Do you ever use a ladder in or around your home or someone else's home?

Yes

No

If yes: proceed to Part 1

If no: please respond to the following three questions

Why don't you ever use a ladder in or around your home?

What is your gender?

Male

Female

What is your age group?

18-29 years

60-69 years

30-39 years

70-79 years

40-49 years

80+ years

50-59 years

PART ONE: DEMOGRAPHIC CHARACTERISTICS

What is your gender?

- Male Female

What is your age group?

- 18-29 years 60-69 years
 30-39 years 70-79 years
 40-49 years 80+ years
 50-59 years

What is your work status?

- Employed full time Currently unemployed
 Employed part time Retired
 Employed on a casual basis Other
 Home worker _____

What is/was your occupation? _____

What is your current marital status?

- Married Widowed Never married
 Divorced De facto Separated
 Other, please specify _____

What is your current living arrangement?

- Living with partner Living with other family members
 Living alone Other, please specify _____

What type of dwelling to you live in?

- Separate house Retirement home / village
 Semi-detached house Unspecified
 Flat/unit/apartment Other

What is your current housing situation?

- Own your home Rental
Other _____

What is your current postcode?

PART TWO: LADDER OWNERSHIP

Do you own a ladder?

- Yes No

How many ladders do you own?

- One Two
 Three or more

What types of ladders do you own?

- Small step ladder (2-3 steps) Straight ladder (single length)
 Large step ladder (4+ steps) Extension ladder
 Platform ladder Step stool
 Permanent ladder Other _____

What is the most common type of ladder you use?

- Small step ladder (2-3 steps) Straight ladder (single length)
 Large step ladder (4+ steps) Extension ladder
 Platform ladder Step stool
 Permanent ladder Other _____

How old is your most commonly used ladder?

- One year or less 6-10 years
 2-5 years Over 10 years

Of what material is it constructed?

- Wood Metal (Steel)
 Aluminium Other
 Fibre Glass

Does it have steps or rungs?

- Steps Rungs
 Unsure

Do you also use ladders for work?

- Yes No

If yes:

Does your workplace have any safety rules and practices for ladder use?

Yes No

Do you follow the same safety rules and practices at home?

Yes No

PART THREE: LADDER USAGE

Where do you typically use ladders around the home?

Indoors Both
 Outdoors

What tasks do you typically use ladders for around the home

Cleaning gutters Changing light bulbs
 Roof repairs Reaching inside cupboards
 Cleaning house exterior Pruning trees or shrubs
 Cleaning house interior Other garden maintenance
 Painting Other _____

Have you ever used other products instead of a ladder to complete these tasks?

Yes No

If yes, please describe what you have used _____

What height do you typically have to climb when using a ladder:

Inside the house: (Enter answer in metres or feet)

Outside the house: (Enter answer in metres or feet)

Have you ever undergone safety training on how to use a ladder?

Yes No

If yes, please describe (e.g., at work, DIY class at hardware store)

Thinking about your most commonly used ladder at home, are there manufacturer's instructions for use displayed?

Yes No

If yes, did you read them before using the ladder?

Yes No

When using a ladder around the home, do you secure the top and bottom rungs?

Yes, secure top rungs only Yes, secure both top and bottom rungs

- Yes, secure bottom rungs only No securing at all

Are you aware that certain ladders are rated for different loads?

- Yes No

Thinking about your most commonly used ladder at home, do you know what load it is rated to carry?

- Yes No

Do you carry excessive loads when using a ladder?

- Never Frequently
 Occasionally All of the time
 Sometimes Don't know/not sure

How far do you think it is safe to reach with your arms when on a ladder?

- 30cm/approx. 1 ft 1 metre/approx. 3 ft 3 inches
 60cm/approx. 2 ft over 1 metre/over approx. 3 ft 4 inches

Do you ever feel that you over reach?

- Yes No

How do you position a ladder? Please describe _____

Do you ever re-position a ladder from the top while you are standing on it?

- Yes No

When using a step ladder, what is highest rung that should be stood on?

- Top rung Top plate
 Second from top rung Don't know/not sure
 Third from top rung

The next few questions relate to using an extension ladder.

When setting up an extension ladder, what is the appropriate pitch angle?

- 1:2 1:5
 1:3 Don't know/not sure
 1:4

When setting up an extension ladder, what is the minimum height a ladder should extend above the working area?

- 0.5 metres/approx. 1 ft 7 inches 2 metres/ approx. 6 ft 6 inches
 1 metre/approx. 3 ft 3 inches Don't know/not sure
 1.5 metres/approx. 4 ft 11 inches

How do you generally secure the base of the ladder when in use?

PART FOUR: USE OF SAFETY EQUIPMENT

Do you use any personal protective equipment when using your ladder?

- Yes No

If yes, please specify _____

Generally, what sort of footwear do you use when climbing a ladder?

- Leather work boots Open-toed sandals
 Non-leather work boots Thongs
 Runners Other _____

Thinking about your most commonly used footwear, is the footwear slip resistant?

- Yes No

Is the footwear secured (e.g., laced)?

- Yes No

Do you use any other safety equipment (such as ropes or harnesses)?

- Yes No

If yes, please identify or describe _____

When using a ladder are you usually?

- Along Working alongside someone else
 Working along but with someone else nearby

Do you make sure that some assistance could be provided quickly, in the event of a fall?

- Yes No
 Don't know

PART FIVE: ALTERNATIVES TO LADDER USE

Have you considered avoiding the need to use ladders by:

Fitting covers to your roof gutters so they don't become blocked

Yes No

Employing a tradesman/gardener/home handyman to do the task?

Yes No

If no, why not? _____

Asking more skilled or able family members to do the task?

Yes No

Moving to a home that requires less maintenance?

Yes No

Other?

Yes No

Please specify _____

Why is it important to you to do tasks that require ladder use yourself?

Would you approach your local council to seek assistance with such tasks?

Yes No

If no, why not? _____

Do you know the relevant unit within your local council that can provide this type of service?

Yes No

If so, please name: _____

PART SIX: PERSONAL HISTORY

Do you have any existing medical conditions?

- Yes No

Do you have any medical conditions that might possibly impair your ability to use a ladder safely?

- Yes No

If so, please indicate which conditions you have (please list)

How do you rate your current level of fitness?

- Excellent Good
 Average Poor
 Unsure

How often do you engage in moderate to strenuous exercise? (such as, fast walking, gardening, housework or organised exercise)

- Daily Three to four times per week
 Once or twice a week Once a fortnight
 Less than once a fortnight Unsure

On average, how long do you exercise per day in total?

- Less than 15 minutes 15 to 30 minutes
 30 minutes to 45 minutes 45 minutes to 1 hour
 1 to 2 hours More than 2 hours
 Unsure

Do you have difficulty with any daily living task? (e.g. walking without assistance, lifting, climbing stairs)

- Yes No

If yes, please describe _____

Are you on long-term prescribed medication for any medical condition?

- Yes No

Are you on any blood thinning medications such as warfarin?

Yes

No

Have you experienced any falls in the last year?

Yes

No

Were any of these falls a result of loss of balance?

Yes

No

Have you noticed any change in your balance control as you get older?

Yes

No

If yes, please describe _____

Do you feel anxious or scared when using a ladder?

Yes

No

If yes, please describe _____

Do you perceive using a ladder around the home to be a dangerous/risky task?

Yes

No

If yes, please describe _____

If no, please describe _____

PART SEVEN: LADDER FALLS EXPERIENCE

Have you, or someone close to you, ever been injured when using a ladder in the home environment?

- Yes, I have been injured No
- Yes, someone else has been injured

Thinking back over the last two years, how many times have you been injured when using a ladder

- None Two to three times
- Once More than three times
- Don't know/not sure

The next few questions relate to your most recent ladder injury

What task were you undertaking?

What went wrong?

Were you carrying an excessive load when you were injured?

- Yes No

How serious were the injuries that you sustained? Did you

- Do nothing about it Require admission to hospital
- See your GP Have a persisting disability
- Go to a hospital emergency department

If you suffered an ongoing disability as a result of the ladder fall, please describe what that disability was/is _____

What part of your body was injured?

- Head Upper leg
- Chest Lower leg
- Neck Hands/fingers
- Upper Arm Feet/toes
- Lower arm Other, please specify _____

What was the nature of your injuries?

- | | |
|--|--|
| <input type="checkbox"/> Intracranial bleeding | <input type="checkbox"/> Laceration |
| <input type="checkbox"/> Concussion | <input type="checkbox"/> Bruising |
| <input type="checkbox"/> Fracture/dislocation | <input type="checkbox"/> Sprain/strain |
| <input type="checkbox"/> Spinal or nerve | <input type="checkbox"/> Superficial |
| <input type="checkbox"/> Other, please specify _____ | |

Thinking about your most recent ladder injury, is there anything you think you could have done to prevent the injury? Please describe _____

Do you have any suggestions for how falls from ladders can be prevented? Please describe _____

Is there any additional information or feedback you would like to provide regarding your use of ladders in the home environment? Please describe _____

Repeat series of questions relating to fall circumstances if participants indicate that other friends or family have had a ladder fall.

Appendix E: Letter of invitation to key stakeholders

Stakeholder name

Dear

Re: Research Project: Report on the reduction of major trauma and injury from ladder falls

You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

What does the research involve?

The overall aim of this project is to understand the issues surrounding major trauma and injury from ladder falls and to provide the evidence base on which effective programs and action can be implemented to support safe ladder use in the home environment. We are interviewing key personnel in organisations that have some involvement in ladder design, regulations, retail and consumer advocacy. The interview will take approximately 30 minutes to complete and can be conducted over the phone or face-to-face, and can be completed at a time that is convenient for you.

Why were you chosen for this research?

You have been selected to participate in this project by a supervisor or manager in your organisation.

Consenting to participate in the project and withdrawing from the research

Please complete the attached consent form if you wish to participate in this study. Your participation in this project is voluntary. If you do agree to participate, you can withdraw from participation at any time during the project.

Possible benefits and risks to participants

There are no direct benefits of participation in this research project. However, this research has the potential to improve safe ladder usage practices and reduce injury involvement.

It is anticipated that you will experience minimal discomfort while undertaking this interview, however, if you have previously received an injury as a result of a ladder accident, or know someone who has been injured in a ladder accident you may experience some discomfort.

Your responses to the interview will not be provided to your manager and every attempt will be made to de-identify your information.

Confidentiality

All information collected in this study is confidential. All information will be completely de-identified. Only aggregate data will be used to report the results of this research in any reports/publications prepared from the study's findings.

Storage of data

Data collected will be stored in accordance with Monash University regulations, kept on University premises, on a secure hard drive for 7 years. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

Results

If you would like to contact the researchers about any aspect of this study, or to receive feedback on the results, please contact the Chief Investigator, Jennie Oxley
Tel 9905 4374

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the
Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800

Tel: +61 3 9905 2052 Email: muhrec@monash.edu Fax: +61 3 9905
3831

Thank you,

Dr Jennie Oxley

Monash Injury Research Institute

Email: Jennie.Oxley@monash.edu.au

Phone: 03 9905 4374.

Appendix F: Key stakeholder interview protocol

Name:

Position:

Organization:

Date:

Semi Structured Interview Questions: relevant questions to be selected for specific stakeholders

1. In what way are ladders of relevance to your work or activities?
2. For how long have you had this role and/or interest?
3. Of what safety concerns related to ladder usage are you aware?
4. Under what circumstances do these problems arise?
5. To what extent do these concerns appear in the domestic setting?
6. Which government departments and/or statutory authorities have responsibility for ladder safety in Australia/Victoria?
7. Of ladder fall related deaths reported to the Victorian Coroner, what proportion goes to inquest and what proportion of non-inquest cases has findings with detailed information/recommendations.
8. What do you think is the reason for the rate of serious ladder-related injuries increasing in Australia/Victoria?
9. Do you have any information on the numbers and types (and proportions of different types) of ladders in Australian households?
10. Are most ladders imported or manufactured in Australia?
11. Can you give me the approximate proportions?
12. Are Australian Standards for ladders mandatory? (we should have the answer to this prior to stakeholder interviews)
13. How are the Standards enforced?
14. Are Standards enforced when ladders are re-sold e.g. E-bay?
15. Are the Australian Standards based on International Standards? Which ones?
16. How often are the Australian Standards reviewed/updated?
17. What is the history of ladder re-calls in Australia and for what reasons?
18. What power does the Coroner have to improve safety associated with ladders or the accessing of heights around domestic buildings?
19. What safety initiatives have been undertaken by your sector to address ladder safety problems?

20. How is ladder safety regulated by work safety authorities?
21. Is there a consistent approach to ladder safety among work authorities throughout Australia/internationally?
22. How are relevant specific industry sectors involved in ladder safety (construction, fire, etc)
23. Which ladder safety initiatives have been successful?
 - a. How did you measure success?
24. How were the initiatives implemented?
25. Have any other methods been used to implement these initiatives?
26. Who has been involved in the initiatives?
27. What are the benefits to your organisation/department of undertaking these initiatives?
28. Have these initiatives been evaluated?
29. Are there any ways that these initiatives could be improved?
30. Does your department/organisation currently provide any information regarding the safe use of ladders in the home environment?
 - a. If so, what information is made available?
 - b. How is this information made available to the general public?
31. Are you aware of any other initiatives outside your department/organisation aimed at improving domestic ladder safety?
32. Are there any new programs or initiatives planned for the future?
33. Do sustainable ladder safety programs exist in your department/sector?
34. Why do you think older persons continue to do DIY activities involving ladders?
35. Are there realistic alternatives for them?
36. For whom are HACC services available?
37. What services does HACC provide with respect to ladder safety (e.g. advice, brochures, home handyperson services)
38. How can residents learn about these services?
39. Are HACC home handyperson services likely to be affordable/accessible (eg. waiting times) for all older residents?
40. Are there potential design solutions to reduce the need for the use of ladders in the domestic setting?
41. Are there design solutions to ladders or to the domestic buildings that they service that would make ladder use safer?

42. What do you see as the main facilitators and barriers to ladder safety?
43. Has anything changed in response to Coroners' recommendations for ladder safety since the 2008 Victorian Coroners Act (which gives Coroners greater powers for prevention)?
44. Could there be advantages in there being an inter-sectoral approach to ladder safety?
45. Would you/your department or sector be prepared to participate in an inter-sectoral approach to ladder safety?
46. Which department should lead inter-sectoral action?

