

THE RISKS, PERCEPTIONS, AND EXPERIENCES OF FIRE AMONG OLDER PEOPLE

Ian Miller PhD
Director,
Heimdall Consulting Ltd,
P O Box 22-171,
Wellington.

Judith Davey PhD
Senior Research Associate
NZ Institute for Research on Ageing,
P O Box 600,
Wellington

May 2007



Contents

Acknowledgements

Section 1: Introduction	1 - 4
1.1 Background	1
1.2 Executive Summary	1 - 3
1.3 Recommendations	4
Section 2: Methodology	5 - 9
2.1 Aims and Objectives	6
2.2 Research Methodology	6
2.3 Limitations of Study	7 - 8
2.4 Ethical Issues	8 - 9
Section 3: Literature Review and Comparative Statistics	10 - 27
3.1. Background	11 - 12
3.2. Residential Fire Risks	12 - 13
3.3. Demographic Implications of an Ageing Population	13 - 14
3.4. Comparative Fire Statistics	15 - 19
3.3. Fire and Related Risks and Older People	20 - 27
Section 4: Fire Fatalities and Older People	28 - 48
4.1 Fatal Residential Fires	29 - 44
4.1a. Defining Residential Fires	29
4.1b. Inquest Reports	29
4.1c. NZ Residential Fire Fatalities 1996-2006	30 - 34
4.1d. Demographic Features of Older Fire Victims	34 - 36
4.1e. Forensic Features of Older Fire Victims	37 - 40
4.1f. Dynamics of Fatal Fires Involving Older People	40 - 44
4.2 Fatal Fires in Aged Care Facilities	45 - 48
Section 5: Structured Interviews with Fire Victims	49 - 59
5.1 Interview Methodology	50 - 51
5.2 Interview Findings	52 - 59
Section 6: Focus Groups	60 -64

Section 7: Discussions with Housing Agencies and ACC	65 - 70
7.1 Housing New Zealand Corporation	66 - 67
7.2 Wellington City Housing	68
7.3 Accident Compensation Corporation	69 - 70
Section 8: Intervention Initiatives for Older People	71 - 75
8.1 International Initiatives	72
8.2 New Zealand Initiatives	73 - 74
8.3 Effectiveness of Fire Safety Training	74 - 75
Section 9: Discussion and Recommendations	76 -
9.1 Fire Risk Indices	77
9.1 Fire Risks and Older People	77 - 83
9.1 Fire Safety Initiatives for Older People	83
References	84 – 89
Appendix A: Subject Interview Schedule	90 - 98

ACKNOWLEDGEMENTS

This research was funded by the New Zealand Fire Service¹ Commission 2005-2006 Contestable Research Fund. The authors thank Dr Paula Beever (National Director, Fire Risk Management), Neil Challands (Information Analyst), and April Christensen (Information Centre Manager) for their valuable assistance with the project. Acknowledgement is also accorded to management and staff of the Arapawa, Eastern, Western, Transalpine, Auckland and Northern Fire Regions, and in particular Bill Butzbach, Paul Glennie, Trevor Brown, Bob Palmer, Allan Bamber, Mitchell Brown, Mark Chubb, Mike Lister, Sue Trafford, and Nella Booth, who assisted with the research in many ways.

Access to coronial reports on fire fatalities was facilitated by the Coronial Services of the Ministry of Justice. Thanks are due to Frances Marsh, Clifford Slade, and Sara Moynan, for their help with accessing inquest reports that form the substance of Section 4 of the Report. Supplementary mortality information was provided by Christine Fowler of the NZ Health Information Service.

An Accident Compensation Commission perspective of fire risks and older people was provided by Yvonne Woods and thanks are due to her for her assistance.

Housing New Zealand Corporation provided helpful comments on fire risks for older people from their perspective. Thanks are accorded to Peter Wild (National Compliance Manager), and to Sue Croft, and Wellington Regional Management team for their time. Wellington City Council City Housing also provided advice and recognition is given to Vicki McLaren and Peter Hunter for their helpful contributions.

The authors would also like to thank the focus group participants and the organisations who helped to set up the meetings, in particular Dianne Chapman, Margaret Guthrie, Pat Cummings and Raye Boyle. We are also grateful to the interviewees, who so willingly shared with us their experiences of fire.

Finally the assistance of Virginia Wilton with interviews and focus groups is gratefully recorded.

¹ Hereafter referred to as **NZFS**.

**SECTION 1:
INTRODUCTION**

SECTION 1: INTRODUCTION

1.1 BACKGROUND

New Zealand is experiencing population ageing. This is an international trend which reflects changing economic and social conditions that have reversed earlier patterns of high fertility and mortality to produce age-structural transitions that are “*unprecedented in terms of their speed and their policy implication.*” (Adioetomo *et al*, 2005). In the case of New Zealand, the share of the population aged 65 plus has increased slowly from 8% in the 1960s to 12% in 2006. This share is projected to increase significantly in the near future. From the late 2030s, the 65 plus age group will make up over one-quarter of New Zealand’s population (Dunstan & Thomson, 2006).

Population ageing is therefore one of the most significant issues facing New Zealand, with major implications for all sectors of the economy and the community. Accommodation for an ageing population is an important issue, as housing is a key element in the quality of life for older people². In particular, there are concerns about the housing needs of older people, and especially so for certain vulnerable groups within this cohort, including those on low incomes, sufferers of chronic illness or disabilities, those whose current housing is inadequate, and some ethnic groups (Davey, Nana, de Joux & Arcus, 2004).

Associated with concerns about the housing needs of older people is recognition of their vulnerability to death and injury from residential fires. Increased fire risks for older people are reported in many international studies (e.g. Elder Squires, & Busuttil, 1996; Office of the Deputy Prime Minister, 2002; Sekizawa, 2004; Hall, 2005) and are also confirmed in Australasian studies (Rhodes & Reinholdt, 1998; Brennan & Thomas, 2001; Duncanson *et al*, 2001 & 2002; Miller, 2005, 2006; Zhang *et al*, 2006). For example, in New Zealand the mortality rates for older people from fires triple for each decade beyond age of 75 (Duncanson, 2001). The consistency of these findings indicates a need to identify and focus on causal factors underlying the heightened vulnerability to fire for older people.

Accordingly, this study examines the experiences and perceptions of fire risks for older people, including analysis of fatal fires involving older people, consultation with housing agencies and ACC, and recommendations to address these risks for an increasing ageing population.

1.2 EXECUTIVE SUMMARY

This study reflects two key factors affecting older people in New Zealand. Firstly, significant demographic changes are occurring from population aging. It is projected that the 65 plus age group will increase to over a quarter of the population in next three decades. A majority of older people now live in conventional housing in the community - many on their own. This will continue in the future. Secondly, international research identifies heightened risks from residential fires for older people which greatly increase with advanced age. These findings also apply to older people in New Zealand. Therefore, it is vital to fully understand the nature of fire risks for older people in order that safety and prevention initiatives can be developed to lessen such risks for this group.

² *Older people* refers to those aged 65 or more. All New Zealand citizens who meet residence requirements are entitled to the New Zealand Superannuation (NZS) at this age.

The research investigated the nature and impact of residential fires on older people using both quantitative and qualitative methodologies. A literature review examined research on fire risks and older people. All residential fire deaths involving older people 1996-2006 were analysed to determine their causes and features. Structured interviews were conducted with older people who had experienced fires in their homes. Further information was obtained through focus groups with older people to learn of their experiences and perceptions of fire and fire risks. Discussions were held with Wellington City Housing, Housing New Zealand Corporation, and the ACC, on their experiences of fire risks and older people.

The study supports the findings of other research. It is evident that the risks from fire for older people are similar to other groups, but also reflect the vulnerabilities of very old people, and those with mobility restrictions and sensory losses. Key points include:

- In terms of residential fire deaths and property losses, New Zealand sits around the mid-range of international measures. The patterns of fire fatalities and injuries affecting older New Zealanders are broadly similar to those reported elsewhere. These show an increasing risk from fire with increasing age beyond 70. This pattern is also identified in other areas of injury risk in the home.
- A study of fire deaths shows older people are over-represented at 23% of all fatalities. Older people have higher fire fatalities in the colder months (winter and spring), and are more likely to experience fatal fires throughout the week (compared to weekends for other adults) and in mornings and afternoons (compared to the late night-early morning for other adults). Most fire deaths involving older people occurred in single houses (79%). Only 37% of properties had working smoke alarms.
- The main causes of fatal fires affecting older people are faults and misuse causing overheating in electric blankets, carelessness with heaters and fires, careless smoking, and electrical faults. Analysis of blood alcohol levels found 9% of older victims were over the legal driving limit compared to 58% of other adults. Many older victims were affected by multiple health conditions, including sensory losses, limited mobility, and cognitive or neurological conditions.
- A review of fatal fires in aged residential care facilities 1996-2006 identified eight deaths in five incidents. Naked flames were responsible for six of these deaths – three were attributed to smoking and three to the negligent burning of a frayed bedspread tassel. All smoking deaths involved unsupervised people who set fire to themselves and were unable to extinguish the flames. Most had mobility problems and complex health conditions which contributed to their deaths.
- Interviewing older people who had experienced recent fires presented a challenge. It was difficult to locate many occupants, as some had moved in with family or into residential aged care, while others had died. Those who were interviewed provided insights into their experiences of fires which ranged in severity from minor incidents to the total destruction of a home. All subjects indicated they had experienced significant financial, physical, and psychological consequences from the fires. Most fires were caused by carelessness and acts of omission, mainly from unattended cooking. A number fought the fires, or received assistance from neighbours with this. Most did not have operational smoke detectors. All viewed positively the fire service responses to their calls for assistance.

- Three focus groups with older people were arranged through community organisations. All produced useful information across a range of concerns about fire risks in the home. This included support for the idea of regular checks to assess fire and other risks in their homes, and for advice on remedial measures to reduce these hazards. Fire safety and education was seen as being valuable for older people, along with concerns about improving the design of appliances and other household items to reduce fire and other risks. Most expressed concerns over the costs of having appliances checked, on the availability of competent people to undertake such work, and transport if items had to be taken in for checking. There was support for fire safety to be encompassed into wider programmes to address all household risks affecting older people.
- Discussions with Housing New Zealand Corporation, Wellington City Housing, and ACC, provided insight into the types of difficulties these agencies experienced in housing older people (and those with disabilities). Issues of concern included: problems with heating needs and misuse of heating appliances; careless and unattended cooking; resistance to maintaining smoke detectors; overloading electrical circuits; and risky behaviours (eg. hoarding flammable materials, blocking egress from properties). All had concerns around the needs of those with disabilities (of all ages), mental health and welfare problems, and resistant beliefs that compromised safety.
- A review of fire safety schemes for older people identified illustrative programmes from other jurisdictions, and two New Zealand programmes which provide a template for further development. Research studies indicate the effectiveness of fire safety programmes is improved if older people themselves are involved in their development.

It is concluded that there is a need for national fire safety initiatives to address the risks affecting older people. This recognises that older people are vulnerable to risks from fires and are a growing proportion of the population. Effective interventions will require the collective involvement of health and social agencies, voluntary organisations, the NZFS, and most importantly older people themselves as they have a direct interest in reducing the risks from a range of hazards in their lives. The goal for such programmes must be enduring behavioural change to reduce the potential risks from fires, given the central role of human agency in fire ignition and spread, and in fatal or injurious outcomes.

1.3. RECOMMENDATIONS

Recommendation 1: That the NZFS acknowledges the demographic implications of an ageing population by developing improved fire safety and prevention programmes to address the risks to older people as a national objective.

Recommendation 2: That NZFS instigate a review of fire safety and prevention programmes for older people with a goal that that these become part of a national initiative to improve the general safety of older people. This should -

- Involve collaboration between NZFS, public health services, housing and social support agencies, and voluntary organisations to address the risks from fire, and other hazards, that impact on the safety and wellbeing of older people.
- Include older people in the development of programmes to ensure that key messages and delivery methods are relevant to their needs.
- Address general fire risks in the home, as well as specific risks identified in the current study, eg. electric blankets, heating, smoking etc.

Recommendation 3: That NZFS continue to research residential fires with a particular focus on behavioural factors that affect the attitudes and responses of occupants to fires. This research should specifically attend to risks affecting older people and other high risk groups, and the findings should be used in the ongoing improvement and development of fire safety and prevention programmes for these groups

**SECTION 2:
METHODOLOGY**

SECTION 2: METHODOLOGY

2.1 AIMS AND OBJECTIVES

The aims of the study are to identify environmental, behavioural, health, and other factors that contribute to the increased fire risk for older people, in order to improve fire safety and prevention initiatives and reduce their vulnerability to residential fires.

The project addresses six objectives –

- i. To review the incidence and impact of residential fires involving older people in New Zealand in 1996-2006³, as indicated by mortality and injury measures, and a comparison of these with international findings, including relevant national and international research.
- ii. To undertake structured interviews with a volunteer sample of older people who have experienced residential fires in 2003-2006, to obtain narrative accounts of their experiences and other aspects of the fires.
- iii. To undertake volunteer focus groups with older people to assess their perceptions of fire risks in their homes and other factors that affect their vulnerability to fires.
- iv. To undertake discussions with Housing New Zealand Corporation, Wellington City Housing, and ACC on these agencies' perceptions of fire risks for older people.
- v. To assess some current NZFS initiatives aimed at fire risk education and support for older people as a basis for improved intervention programmes.
- vi. To report on the project findings and make recommendations for appropriate fire safety and prevention initiatives aimed at reducing the fire risk for older people.

These aims and objectives are directed at supporting the advancement of fire safety and prevention knowledge affecting older people, both in New Zealand and in international contexts.

2.2 Research Methodology

The study used a mixture of quantitative and qualitative methodologies to pursue the research objectives. These methodologies were applied as follows –

Quantitative: Assessment of fire statistics, coronial data, forensic measures, injury data.

Qualitative: Assessment of structured interviews, focus groups, agency discussions, fire safety initiatives.

³ Based on NZFS Corporate Year 1 July-30 June.

2.3 LIMITATIONS OF STUDY

The research had several limitations.

a). Residential Fire Fatalities.

- i) **Incomplete Fatality Data.** In the 1996-2006 period, 212 unintentional residential fires deaths were identified from the NZFS FIRMS⁴ database, including 49 involving older people. Inquest reports were available for 44 of these fatalities with 5 yet to be completed. The information on these outstanding cases is incomplete.
- ii) **Incomplete information.** Fires are extremely variable events. Certain information may be lost because of the nature of a fire. For example some fires result in the almost total incineration of victims with no forensic or pathological information being available; the causes of other fires are not able to be determined with any degree of certainty; there may be no witnesses to fires in isolated places; and there may be limited knowledge of the activities of reclusive victims or those with no family. While inquests strive to obtain as much information as possible, some cases have incomplete details.
- iii) **Legal vs research focus.** Inquests follow a prescribed legal process. A Coroner seeks to determine relevant matters according to the Coroners Act (see Part 4.1b for discussion of coronial processes). Evidence is given under oath and usually includes the opinions of fire investigators and medical specialists, other forensic information, and witness accounts. This provides an array of information for research purposes. However, the primacy of the legal process means that pure research methodologies cannot be applied to this context and alternate methodologies must be utilised.

b). Structured Interviews.

- i) **Identifying subjects.** A draft list of people who had experienced fires in the past three years was obtained from FIRMS. Attempts to contact these people through local NZFS personnel had limited success because –
 - Many were under 65.
 - A large number had moved away or otherwise could not be located.
 - Some had since died (though not attributed to the effects of the fire).
 - Others declined to be interviewed.
- ii) **Nature of Fire.** Fires involving older people were highly variable ranging from small events involving minimal NZFS responses, to serious events involving severe or total structural damage. Therefore it was not possible to obtain a sample with experiences of common levels of fire severity. The information provided from FIRMS did not adequately identify severity measures as a basis for contacting potential subjects.

⁴ FIRMS: Fire Incident Risk Management System. This records all NZFS responses based on calls to the emergency response centres, and includes details such as callout time, incident location, nature of incident, fire service response, injuries or deaths, etc. Further information is added to each incident by responding personnel afterwards including victim details and fire outcomes information.

c). Focus Groups

Experience of Fire. Participation in the focus groups was voluntary. Those who attended were invited by the organising agencies. Many had limited experience of fires although most offered views on fire risks and precautions to minimise these risks for older people. One focus group did not proceed because of competing demands by a local fire service group involving fire safety and prevention advice.

c). Agency Comments

Tenancy Profiles. Participating agencies reported that older people were a small part of their tenancy profile. However, many tenants had disability problems which may mirror those of older tenants. It is assumed there is a similarity between problems for disabled people and for older people that allow for some generalisations.

2.3 ETHICAL ISSUES

Residential fires may have considerable consequences for victims. In the case of older people these may include the loss of cherished and irreplaceable personal items and household chattels, and result in significant financial disadvantage. There may be injuries or death involving partners or family members. There may also be losses of pets whose companionship is important for those who spend a large proportion of time at home. Fires may also signal a loss of independence causing older victims to be moved into residential or family care. Therefore, the research addressed a number of ethical issues recognising potential sensitivities, as follows –

(a) Analysis of Residential Fire Fatalities.

Information on fatal residential fires was initially obtained from FIRMS. This identified specific events that required an inquest to be held. The Coronial Services, Department of Justice, retain all relevant inquest reports. These reports contain extensive personal and sensitive information. Accordingly, it was essential that –

- Access to inquest reports was subject to an agreement with Coronial Services that the information was for solely for research purposes.
- Individual victim identities were kept confidential as far as practicable.
- Coronial rulings on publication of certain information were followed.
- Where personal information was incomplete the researchers obtained accurate data through other sources, namely the NZ Health Information Service in relation to questioned dates of birth, occupation, and ethnicity.

(b) Interviews with Older Fire Victims.

Interviews with fire victims were voluntary and participation subject to written consent. The interviews followed a schedule devised by the researchers and approved by the Victoria University Human Ethics Committee. The opinions and reports of all subjects were kept anonymous.

(c) Voluntary Focus Groups.

Participation in the focus groups was voluntary and subject to written consent. The focus group process and content was approved by the Victoria University Human Ethics Committee. The opinions and experiences of all participants were kept anonymous.

(d) Agency Discussions.

Discussions with Housing New Zealand Corporation, Wellington City Housing, and Accident Compensation Commission were of a general nature and did not identify individual cases. Each agency has approved the comments relating to input from their staff.

**SECTION 3:
LITERATURE REVIEW AND
COMPARATIVE STATISTICS**

SECTION 3: REVIEW OF LITERATURE

“On average, more than 1,000 Americans aged 65 years and older die each year in home fires and more than 2,000 are injured. In 2001 alone, 1,250 older adults died as a result of fire incidents. Moreover, the elderly are 2.5 times more likely to die in a residential fire than the rest of the population. With the U.S. Census Bureau predicting that increases in the senior population will continue to outpace increases in the overall population, the elderly fire problem will undoubtedly grow in importance.” (U.S. Fire Administration, 2006).

“Findings from the 2000 British Crime Survey suggest older people are actually less likely to experience a domestic fire than younger people. However, when they do experience such a fire, the consequences are often more serious. Approximately half of all accidental dwelling fire deaths in England and Wales every year occur amongst the over-60s. Over the past five years, the average fatality rate in accidental dwelling fires has been higher amongst the over-60s compared to the average fatality rate for the population as a whole. The population is also ageing, with the greatest increase in the 80⁺ age group, the most vulnerable to accidental dwelling fire deaths.” (ODPM, 2002).

International research on residential fire risks consistently identifies older people as having an increased vulnerability to death and injury from fire. This risk may also extend to residential care facilities, often with tragic results. The vulnerability of older people to fire reflects a complexity of causative and contributory factors. The following section examines the demographic implications of an ageing population, comparative fire statistics relating to older people, and specific risk factors affecting older people.

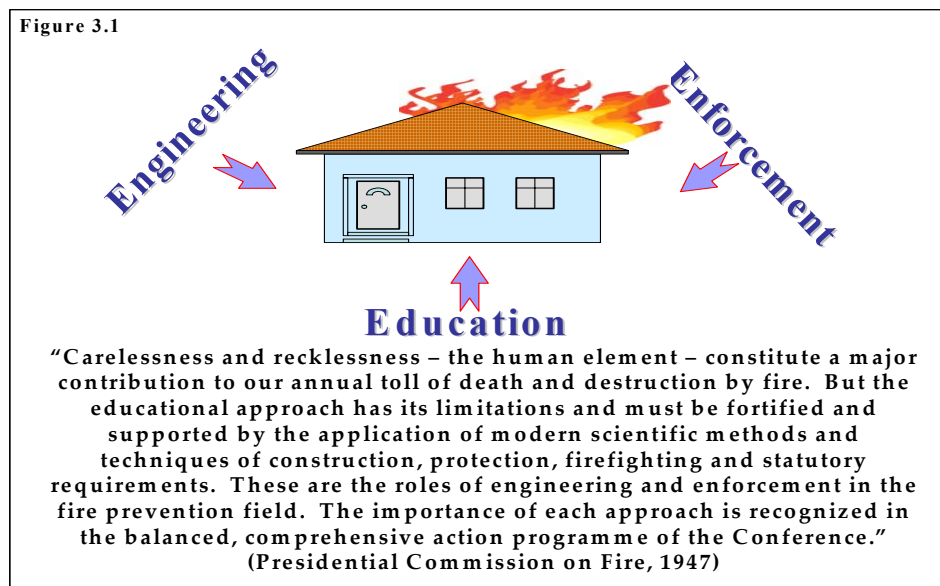
3.1. BACKGROUND

The increased vulnerability of older people to residential fires is confirmed in New Zealand (Miller, 2005; Duncanson *et al*, 2001), and Australia (Newton, 2003; AFAC⁵, 2005). This increased vulnerability is significant, eg. Duncanson found fire mortality rates for older people tripled for each decade over age 75. The matter is more pressing with demographic projections showing a marked increase of older people in the next 30 years. Therefore fire risk mitigation strategies must address the heightened fire risk for older people. This is recognised by NZFS.

A key element in residential fire risk mitigation strategies is acknowledgement of human behaviour as a major contributor to fire ignition, spread, and subsequent injuries and deaths. Miller (2005, 2006) examined the role of human agency in residential fires which directly impacts on engineering and legislative strategies as means to reduce the costs of these largely preventable events. The solution is not simple. Fire risk mitigation strategies are typically based (either explicitly or implicitly) on the **3E** model originally proposed by the *President’s Conference on Fire Prevention* in 1947. The **3E** model proposed that the key to reducing the consequences of fire involves an amalgam of **Engineering**, **Enforcement**, and **Education** strategies, recognising the central role of human agency in residential fires as is summarised in **Figure 3.1**.

⁵ Australasian Fire Authorities Council.

Figure 3.1: The 3E Fire Intervention Model



While advances have been made in fire engineering and regulatory support processes, the comparable effectiveness of education as a fire reduction strategy can be questioned. Reasons for this may reside in inherent assumptions about human behaviour and risk awareness that permeate most safety and injury contexts and not just fire prevention. There is a case to reappraise assumptions that all individuals are universally rational and risk averse, and equally responsive to fire prevention messages that endeavour to change risky behaviours (Miller, 2006). Older people are necessarily included in this reappraisal.

The vulnerability of older people to fire includes factors such as mobility and dependence on mobility aids (wheel chairs, walking frames); declining physical, intellectual, and sensory responsiveness; effects of medications that may impair judgement and alertness; inability to escape or form appropriate escape plans; difficulties in recognising fire cues and warning signals; exposure to high fire risk activities (eg. inappropriate cooking or heating practices); life-long habitual behaviours (eg. excessive alcohol consumption, smoking, careless practices); living alone; limited resources and low incomes affecting property maintenance and continued use of unsafe appliances.

3.2. RESIDENTIAL FIRE RISKS

Fire safety and prevention programmes place a strong focus on residential settings. This is driven by recognition that in most countries the majority of fire deaths occur in residential properties. From a fire safety perspective residential fires are viewed as unintentional but preventable events. For example Barillo and Goode (1996) observe –

“Many fires, and most fire-related injuries, are preventable. Fire requires the interaction of fuel, oxygen and a source of ignition, and the union of these elements is frequently a result of human behaviour. Prevention can be achieved by eliminating or reducing the risk of ignition, by removing the fuel from the site of potential ignition or by altering the human behaviour that brings the fuel and ignition source together.”

Fire Research Report

The Risks, Perceptions and Experiences of Fire Among Older People

Heimdall Consulting Ltd

May 2007

New Zealand's population is ageing and from the late 2030's it is expected that over one-quarter of the population will be over the age of 65. This paper addresses the reasons for the increased residential fire risk for older people. Information on older peoples experience and perception of fires in the home was gathered through a literature review, analysis of Coroners reports for residential fire deaths involving older people, structured interviews with older people who had recent experience of a fire in the home, and focus group discussions with older people. Finally, information was sought from agencies responsible for providing safe housing for many elderly. It is evident that the risks from fire for the older people are similar to other groups, but also reflect the vulnerabilities of very old people, and those with mobility restrictions and sensory losses. Effective fire safety interventions will require the collective involvement of health and social agencies, voluntary organisations, fire services and most importantly older people themselves as they have a direct interest in reducing the risks from a range of hazards in their lives.

Unlike activities in workplaces, public buildings and areas of entertainment, fire responses in residential properties are most likely to involve regulatory approaches (operating through building and product safety codes) rather than planned evacuation and fire response practices. Practice fire evacuation drills are common mandated features in most workplaces and schools. In other public areas individuals are assigned responsibilities as fire wardens and take charge of evacuations in the event of a fire alarm. Collectively, most people will respond to a fire alarm in a public setting and follow directions of fire wardens to achieve a safe exit. A similar responsiveness does not necessarily apply in residential settings, where responses to fires tend to be more haphazard and unplanned. Indeed, some occupant responses are contrary to fire safety training. Individual attempts to fight the fire or to re-enter burning buildings are frequently reported, often with fatal consequences (Miller, 2005).

Accordingly, interventions targeting residential settings need to pay particular attention to the role of human behaviour as a factor in fire ignition, spread and in consequential injury or fatal outcomes. In this context age-related factors are a significant consideration as these may account for the differential vulnerability of the very young and older people.

3.3. DEMOGRAPHIC IMPLICATIONS OF AN AGEING POPULATION

Ageing is frequently defined as growth in the percentage of the population aged 65 or over. At present just over 12% of the New Zealand population is in this age group. This is projected to grow to 25% by 2039 (Statistics New Zealand medium projections) as part of a historical trend, driven by declining fertility, increased life expectancy and the ageing of the baby boom generation (Dunston & Thomson, 2006). The 2006 Census recorded 495,612 people aged 65 and over. Projections suggest the total will reach 566,000 by 2011. After that, the increase will accelerate as the baby boom generation, born during the high birth rate years of the 1950s and 1960s, begins to enter this age group, so that between 2011 and 2021 the older population is expected to grow by 215,000 and between 2021 and 2031 by another 250,000. By 2051, there is likely to be 1.18 million people aged 65 and over in New Zealand, representing an increase of 165% since the turn of the century.

The older population is itself ageing. Within the 65 plus age group, the number of people aged 85 and over is expected to increase from 56,676 in 2006 to about 320,000 in 2051 – growth of between 500 and 600%. People 85 and over will then make up a quarter of the older population, as against 5% in 1956. These are significant trends in terms of fire safety, given higher levels of disability among the very old.

Living arrangements among the old and very old may also increase vulnerability to fire risk. The proportion of people living alone increases with age from 24% of those aged 65-74 to 41% of the 75-84 age group and 56% of people 85 plus, and is higher for women (Davey & Gee, 2002). At age 85 plus, a third of men and two-thirds of women live alone. This proportion has been growing steadily over recent decades. Around 80% of people aged 65 plus live either alone or with a spouse/partner only, that is, in a household likely to be composed of older people.

A study of living standards of older New Zealanders (Ferguson *et al*, 2001) also found a majority of 3,060 respondents “*owned their own home and that, as a consequence, their accommodation costs were relatively low. Three-quarters of all respondents reported paying less than \$30 per week for rental, rates, mortgage or similar costs.*” It is expected this pattern of home ownership will remain a key feature of the living arrangements for a majority of older New Zealanders in the foreseeable future.

Associated with projected demographic changes are a number of health issues that impact on the quality of life for many older people. Ferguson *et al* (2001) found health was a significant issue for this group. *“As might be expected from the age of the sample, health problems were prevalent amongst this sample with a sizeable minority of respondents reporting potentially serious health problems including cardiovascular diseases, cancer, and diabetes. Approximately 30% of single respondents and 22% of partnered respondents described their health as fair or poor.”* Mobility was an issue for older people with 47% of those 85 and over reporting they were not able to “*get about*” as much as they would like to, compared with 13% of those aged 65-74 and 24% of people 75 to 84 years old. Health problems were the most significant reason given for this, for all these age groups. The most common form of limitation among older people is physical disability, followed by sensory disabilities, both increasing with age. The same survey indicated that a sizeable minority of people living alone may have difficulty walking any considerable distance or going up stairs.

Cognitive disorders such as dementia also seriously affect the capacity of older people to live safely and independently. The extent of Alzheimers disease as a problem is illustrated by an estimate of the prevalence of dementia in developed countries, based on a number of European, North American, Australasian, and Japanese studies, conducted by Alzheimers International (1999). *“On these estimates the prevalence increases with age and ranges between 1.4% of 65-69 year olds through to 23.6% of those over the age of 85.”* Supporting and protecting people with dementia in their own homes can be particularly difficult and demanding on family and social service resources.

Overall, more than 50% of people aged over 65 and 66% of people aged over 75 have a disability (Davey and Gee, 2002); 58% of people 75 and over have some type of physical disability, 39% a sensory disability and 23.5% some other type – although some may experience more than one form of disability.

The impact of health factors, sensory impairments, and cognitive problems is further considered in 3.5 below.

3.4 COMPARATIVE FIRE STATISTICS

Fire risk statistics are commonly reported as fatality measures. Some reports contain fire injury measures; although these vary as different methodologies apply to data collection. The following provides some comparative relationships between New Zealand and international fire statistics.

a. Geneva Association Statistics

The International Association for the Study of Insurance Economics (the Geneva Association) reports annually on fire related statistics from a range of countries through the World Fire Statistics Centre. The Geneva Association recognises the high social and economic costs of fire such that in 2005 it advocated an international strategy to encourage countries “*to draft a national fire safety strategy, aimed at reducing national fire costs, with a drive similar to that shown in many countries over road safety*” (Geneva Association, 2005). In 2006 the Association presented the following comparative measures for 2001-2003.

i). Table 3.1: Direct Fire Losses as % of GDP

Country	%GDP	Country	% of GDP
Singapore	0.07	Germany	0.17
Poland	0.08	<i>New Zealand</i>	<i>0.17</i>
Slovenia	0.08	Netherlands	0.18
Japan	0.10	Italy	0.19
Czech Republic	0.12	Sweden	0.19
Hungary	0.12	Denmark	0.20
Spain	0.12	United States	0.22
Finland	0.14	Switzerland	0.23
United Kingdom	0.15	Belgium	0.24
Australia	0.16	Austria	0.26
Canada	0.17	Norway	0.28
France	0.17		

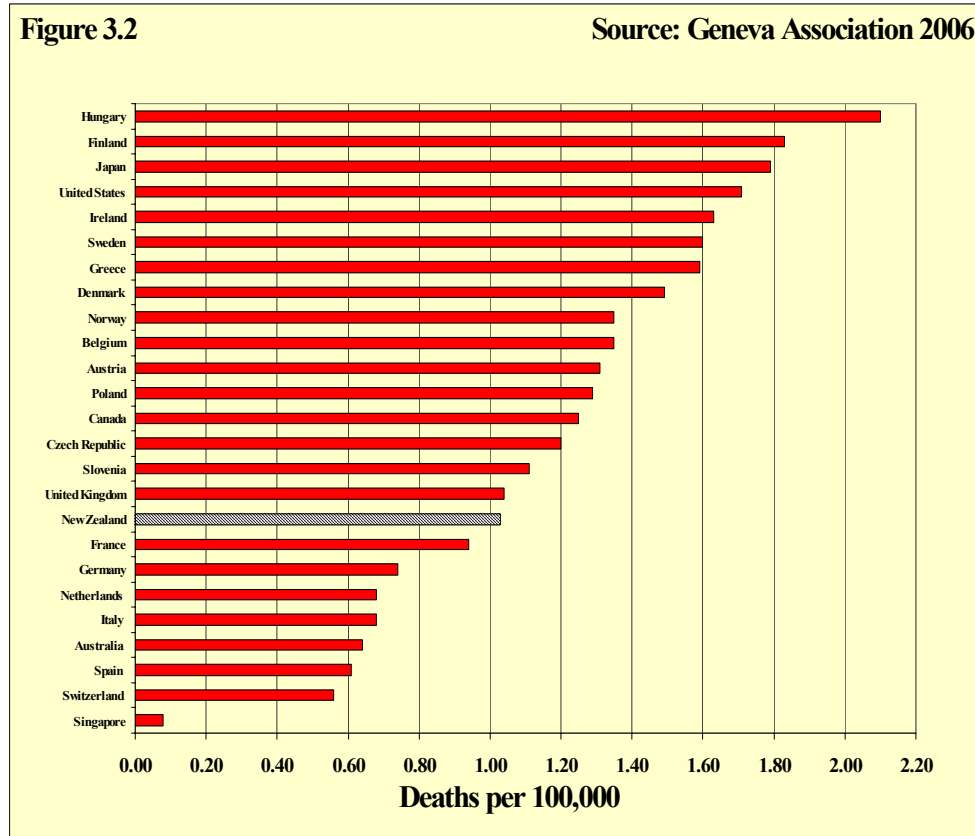
Based on these analyses the costs of fire in New Zealand are significant and fall within the middle range of the countries reported on.

ii). Table 3.2: Fire Deaths per 100,000 population

Country	Deaths/100,000	Country	Deaths/100,000
Singapore	0.08	Poland	1.29
Switzerland	0.56	Austria	1.31
Spain	0.61	Belgium	1.35
Australia	0.64	Norway	1.35
Italy	0.68	Denmark	1.49
Netherlands	0.68	Greece	1.59
Germany	0.74	Sweden	1.60
France	0.94	Ireland	1.63
<i>New Zealand</i>	<i>1.03</i>	United States	1.71
United Kingdom	1.04	Japan	1.79
Slovenia	1.11	Finland	1.83
Czech Republic	1.20	Hungary	2.10
Canada	1.25		

Based on the Geneva Association’s figures, the New Zealand rate of fire deaths appears to be mid range of nations for which data is available as is illustrated in **Figure 3.2**.

Figure 3.2: Fire Deaths per 100,000 Population 2001-2003.



b. Comparative Fire Statistics and Older People

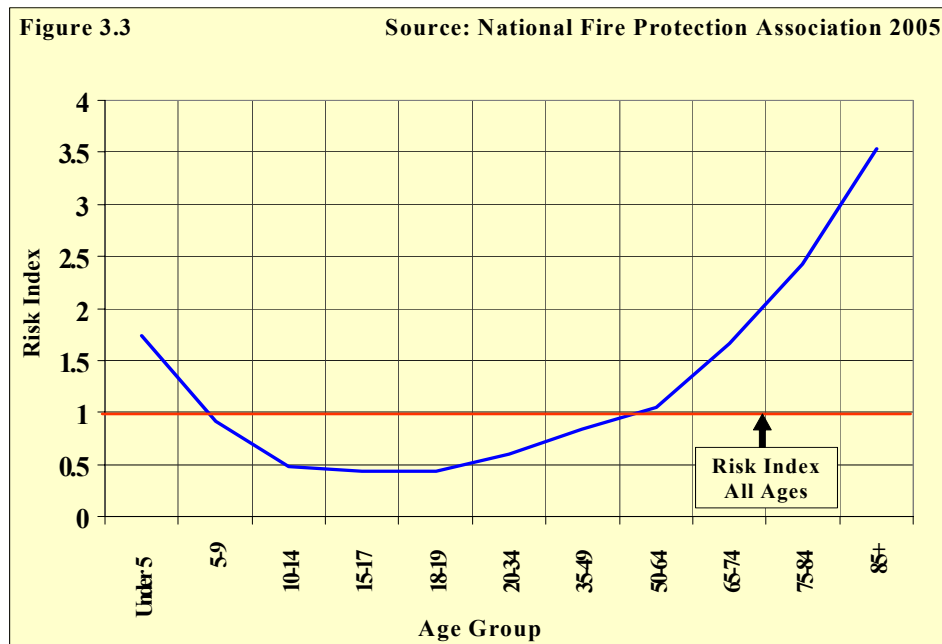
Statistics illustrating the fire risk for older people generally show a greater risk after age 65 which increases with each decade thereafter. This pattern is established across a range of developed countries. Examples include –

i). United States of America

The National Fire Protection Association (Hall, 2005) reports older adults aged 65 and over are more than twice as likely to die in home fires ‘as the average person’. Further, the share of all residential fire deaths involving those aged 65 and over increased from 19% to 26% from 1980 to 2002. Statistics for residential fire deaths for the period 1999-2002 show a significant increase in Risk Index⁶ measures with increasing age as is shown in **Figure 3.3**.

⁶ Risk index is the ratio of a given age group’s fire deaths per million of population to the collective fire death rate for all age groups per million of population.

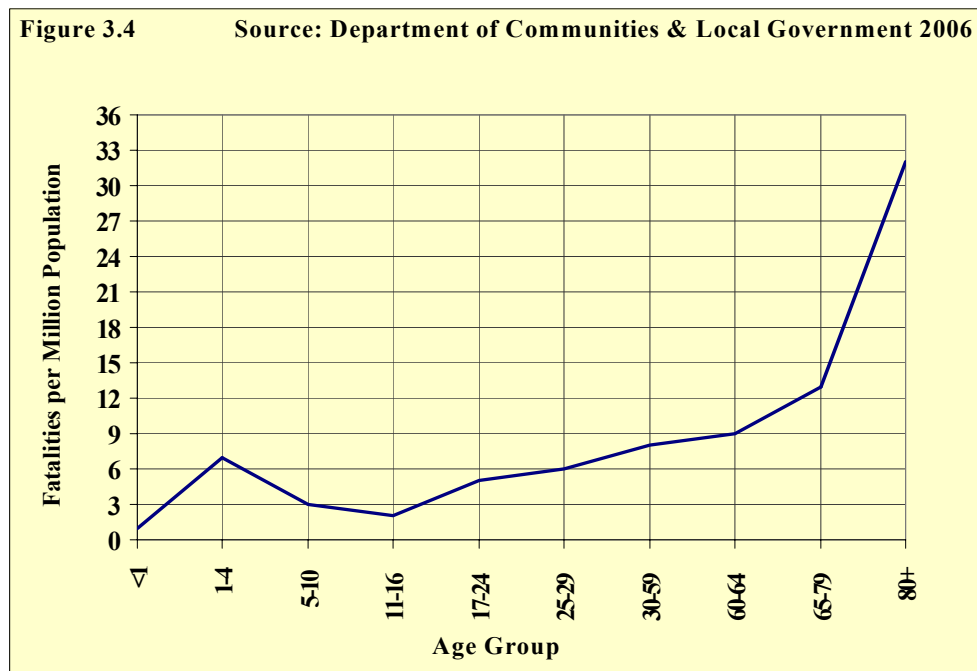
Figure 3.3: United States Fire Risk Index vs Age



ii). United Kingdom

Fire fatality and injury statistics for the United Kingdom are published annually by the Department of Communities and Local Government. Statistics for 2004 confirms that older people are at highest risk for all age groups as shown in **Figure 3.4**.

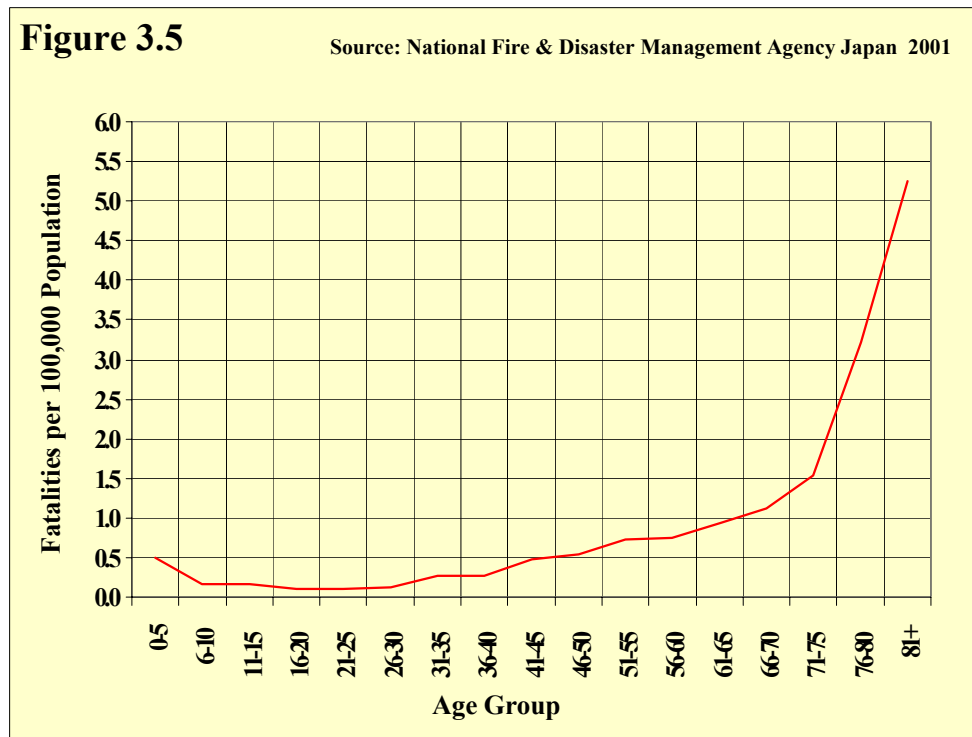
Figure 3.4: United Kingdom Fire Fatality Rate vs Age.



iii. Japan

Japanese statistics confirm that the age groups most vulnerable to residential fires are older people. Notake, Sekizawa, Koayashi, Mammoto & Ebihara (2004) observe that 78% of fire deaths occur in wooden single houses where people are markedly at higher risk after age 70. They cite data from the National Fire & Disaster Management Agency (2001) that show a similar risk pattern to that reported in the United States and United Kingdom as is shown in Figure 3.5.

Figure 3.5: Japanese Fire Fatality Rate vs Age



The authors concluded that the main cause of fatal fires affecting those over 75 was heating sources. They also observe that even in fires from other causes “it is not uncommon to see such evidence as the risk of fatality being more than five times as much in the age group over 75 as the group under 64. It is thought that because the age group over 75 have a lower physical ability compared with the younger groups, even if the cause of the fire is the same, it is more likely that they will not be able to take the appropriate response, thus leading to death.”

iv. Australia

Figures provided by the Australasian Fire Authorities Council (AFAC, 2005) for Fire Deaths in 1996-2003 further highlight the vulnerability of older people to fire in Australia. Significantly, people aged 65 and over accounted for 22% of fire fatality victims when this age group accounts for only 13% of the population.

v. Canada

While statistics on age banded fire deaths are not available for Canada, the Canadian Mortgage and Housing Corporation (2004) reports in regard to the age of fire victims *“it was found that the rates of fire deaths for persons 65 years of age or over were approximately twice what would be expected, based on their percentage of the population.”*

vi. Scotland

The Scottish Executive (2000) reported 15 fire fatalities per million population in Scotland in 2000. The age group with the highest rate of fatal casualties was *“80 and over, with 44 per million population. The second highest rate was for the 60-64 age group, with 35 per million population, followed by the 65-79 age group with 25 per million population. The age groups with the lowest fatal casualty rates per million population were the 25-29 age group with 3 per million population, followed by the 11-16 age group with 5 per million population and the 17-24 age group with 8 per million population.”*

vii. New Zealand

Research by Duncanson *et al* (2001) found that the *“mortality rates in unintentional structural fire incidents in private dwellings increased with age from 0.6 per 100,000 person years at age 65-74, 1.8 per 100,000 person years at age 75-84, to 4.4 per 100,000 person years at age over 85. There was no statistical difference in rates between men and women”*. This finding accords with other studies and re-confirms a vulnerability of older New Zealanders to fire.

3.5. FIRE AND RELATED RISKS AND OLDER PEOPLE

There is substantial research on risk factors that contribute to the vulnerability of older people, including fire-specific studies and wider research on other risk factors. A range of factors contribute to the heightened vulnerability of older people to fire and other risks, including individual circumstances, education levels, health, substance use, socioeconomic status, property characteristics, engineering and design factors, cultural practices, and the ageing process itself.

3.5a. Accidents and Older People.

In an extensive review of the literature on accidents involving older people Lilley, Arie and Chilvers (1995) observed that, although people aged 65 years and over comprised less than a fifth of the population of England and Wales, that –

- Older people accounted for more than a third of deaths from injury and poisoning.
- Accidents have more severe consequences for older people than for younger people (over 21% of those over 75 who attend Accident and Emergency are admitted to hospital, compared with 9% of those aged 65 – 74).
- Injuries for older people from traffic accidents and burns contribute to increased hospitalisation and longer inpatient stays.
- Older people experience greater disabilities and extended periods of rehabilitation, have higher risks of dying, and increased dependency needs which may result in their having to go into nursing care. Falls are a common risk for older people.
- There are often psychological and social consequences from accidents and injuries, such as loss of independence, diminished confidence and low self-esteem. These factors may heighten fears of further accidents or injuries and curtail common activities such as house cleaning, shopping, and other social activities. This increases the risk of social isolation and loneliness.

Lilley *et al* concluded that older people were over-represented among fatal accident cases compared to younger age groups and their proportion in the population. They noted that older people “*appear more likely than younger adults to have accidents because of sensory and cognitive impairments in later life and pre-existing medical conditions, which in themselves may present problems but which may also lead to an increased use of drugs. Slower reaction times in the event of a fire or car accident increase vulnerability as accident victims are unable to escape as easily and quickly. Once an injury has been sustained, the recovery process may be delayed due to slow healing, secondary infections and complications.*”

Other reports confirm similar patterns of high rates of use of hospital emergency services by older people (Hamdy, Forrest & Moore, 1997; Bridges, Spilsbury, Meyer & Crouch, 1999; Lim & Yap, 1999; Aminzadeh & Dalziel, 2002). These reports note falls were the most prevalent form of presenting injuries. Burns were identified among other presenting injuries for attending emergency departments, including flame injuries and scold burns. Downing and Wilson (2005) found injuries accounted for around 33% of all A&E contacts for older people and that this group were “significantly more likely to attend during the morning or early afternoon, during winter months, arrive by ambulance, and require admission to hospital”. This pattern of morning or early afternoon A&E contacts is also reflected in the reported times of fatal New Zealand residential fires involving older people – see Section 4.1.iv.

Lilley *et al* reported that burns were the second most important cause of accidental deaths in the home. They further noted - “*Elderly people receive more serious burns and have greater morbidity than any other age group. They may not survive burn injuries which younger people are capable of surviving.*” They also reported –

- Death rates from burn injuries increase with advancing age.
- Death from burns may be underestimated because a substantial proportion of such deaths are recorded on death certificates as pneumonia.
- Older people were more likely to sustain flame burn injuries as a result of clothing ignition.
- The ability of older people to tolerate post-burn physiological demands of the body is less than that for younger people. The loss of elastin and dermal thickness in later life makes older people especially vulnerable to burn injuries.
- Further risk factors that increase the susceptibility of older people to burn injuries include pre-existing diseases (eg. pulmonary or cardiac diseases); impaired vision; increased cognitive impairment, malnutrition, decreased co-ordination, impaired judgement and tactile sensation; lengthened reaction time; and use of drugs and medications.

The findings of Lilley *et al* are borne out in a New Zealand context by Cornwall & Davey (2003). They examined accident patterns and ACC⁷ claims involving older people and found that, while accident claims “*attributed to older people (are) not a very high percentage of current ACC spending ... there is every indication these costs will grow.*” It was also concluded that –

- The majority of accidents and injuries to people over 65 years, including fatal injuries and those related to fires, occur in and around the house.
- Falls are a particular problem for older people, involving 2 out of 3 injuries requiring medical attention. The consequences of falls, especially hip fractures, are considerable for victims and for health and disability services.
- Older people are over-represented in severe driver and pedestrian accidents, indeed motor vehicle accidents are the leading cause of injury deaths for people aged 65-74, and second only to fall for those aged 75 plus. These heighten risks from accidents on the roads are associated with slower reaction times, drug effects, restricted flexibility, deteriorating vision, cognitive impairments, and loss of muscle strength.
- Burns and scalds are recognised accident risks which are also most likely to occur in the home. Older burns victims often fare less well after injury than younger people.
- A number of medical conditions also contribute to accident risk in older people, including cognitive impairments associated with dementia, ischaemic heart disease, sensory impairments, diabetes, and the effects of medications.

These findings on accident patterns and older people are also relevant to their risks from fires; as similar contributory factors appear to be associated with both, see Section 3.5d below.

⁷ ACC: The Accident Compensation Corporation oversees New Zealand’s accident compensation scheme by providing a 24-hour no-fault personal injury insurance cover. Injury prevention is also a significant part of ACC’s mandate.

3.5b. Perceptions of Risks in the Home by Older People.

The ways in which older people perceive fire risks in their homes may provide a useful basis to develop fire safety and prevention programmes. A survey by Hodsoll and Nayak (1999) of 804 older people in the UK found that fire was not perceived as high risk in their homes and a majority did not place great emphasis on preventive measures. Findings included –

- 58% of respondents considered confrontation with an intruder to be a greater threat than fire (43%). Only 18% thought they might actual experience a fire where they lived, and only 5% reported fires in their homes in the previous 5 years. A quarter were not worried about the risk of fire at all, while 62% reported they were only worried ‘sometimes’.
- Nearly all (98%) recognised the lethal potential of smoke, and (92%) acknowledged the effectiveness of smoke alarms; however, 16% did not have smoke alarms installed in their houses. Only 21% had fire extinguishers in their kitchens, and 11% had fire blankets. Over three quarters had never received fire fighting training.
- A majority (71%) considered a fire in a wastepaper bin as ‘small’ and 41% thought a chip pan fire also was ‘small’. More than half (52%) felt confident that they could tackle a small fire themselves. Only 27% reported they would follow fire safety advice and evacuate the house in the event of a large fire. 60% believed they could easily evacuate their homes in the event of a fire.
- Less than a third (31%) had noticed any fire safety campaign in the preceding 12 months. However, 53% of those who had installed smoke detectors had done so in response to a fire safety campaign in the past.

A number of studies have examined perceptions of older people of wider risks in the home (Wells & Evans, 1996; Carter, Campbell, Sanson-Fisher, Redman & Gillespie, 1997; Mayhorn, Nichols, Rogers & Fisk, 2004). While these studies identified increasing risks with age from a range of home environmental hazards (eg. poisons and household products, electrical appliances, furniture and storage items, kitchen and bathroom items, rugs and carpets,) it is noted that fire *per se* was not rated highly as a specific risk although it was an implied consequences of failure or misuse of many household items.

Although not directly related to specific fire risks, an Australian study by Carter *et al* determined from home inspections of 425 people over 70 years that “80% of homes had at least one significant hazard and 39% had more than 5”. Typical hazards included hand rails and measures to prevent falls, uneven or slippery floor surfaces, obstacles that contribute to tripping, inadequate lighting, and inappropriate furniture. It was concluded that many older people were living in potentially hazardous environments but a significant number (30%) actually perceived their homes to be very safe. A similar conclusion was reached by Wells and Evans in a United States study. These researchers determined that neither “*design professionals who design for the elderly nor older adults themselves are particularly accurate in their home injury risk estimation*”. In both studies fire injury and mortality risk was not explicitly identified as a specific factor.

The nature of older people’s perceptions of home environmental hazards was examined by Mayhorn *et al* with particular reference to home products, using focus groups. They found the most prevalent identified hazards were burns (heat), falls, and poisons. Closer study of how hazard knowledge was acquired by those participating in the focus groups found ‘direct experience’ was reported as the main vehicle that promoted hazard awareness rather than ‘common sense’ or education. As with the previous two studies, fire was not investigated as a hazard *per se*, but was seen as an implied outcome.

Mayhorn *et al* concluded “*The findings revealed several patterns associated with older adults’ perceptions of hazards in the home that should assist safety researchers and practitioners in understanding how older adults interact with products and warnings. Only with an increased understanding of these behavioural issues will manufacturers and designers be able to facilitate home safety for older adults.*”

Relating these findings into perceived fire risks in the home for older people involves recognition of powerful attachments that affect people’s desires to remain in their homes into very old age. These attachments extend beyond obvious factors such as housing functionality to wider cognitive and emotional domains which relate to what is meant by “home” for older people. This was examined by Oswald *et al* (2006) in a study of perceived housing needs in older people. They identified four factors that appear to influence older peoples’ views of desirable housing that includes “*personal links to the home (meaning), perceived functional activity possibilities at home (usability), a global evaluation perspective (satisfaction) and the perceived agency related challenges of housing in later life (control).*” The essence of this formulation involves recognition of the strength of attachments by older people to their homes and to the importance of this to healthy ageing.

An example of a programme to develop healthy ageing is illustrated by the European ENABLE-AGE Project (Enabling Autonomy, Participation, and Well-Being in Old Age: The Home Environment as a Determinant for Healthy Ageing). This acknowledges the demographic imperatives of an ageing population and societal and housing planning needs that result from this (Iwarsson *et al*, 2007). The project has implications for fire risk for older people in that it highlights –

- Daily activities for older people are predominantly performed in the home and its close surroundings. For the very old, about 80% of their time is spent at home (Baltes *et al*, 1999).
- Strong cognitive and affective ties are formed with the home environment as people age which militates against relocation to other living arrangements (Gitlin, 2003). These ties are related to the alleviation or prevention of illness and declining health.
- Maintaining independent daily activities is important to healthy ageing; however, older people living alone may become sensitive to changes in their environment (Lawton, 1999) as a result of sensory, mobility, and cognitive decline that increases their vulnerability to social isolation. Social isolation is an identified fire risk factor for older people and the disabled (Rhodes and Reinholdt, 1997; Brennan, 1998; Miller, 2005)

A challenge for initiatives like the ENABLE-AGE Project is to ensure the home environment is adequately designed to reduce fire risks. The reduction of fire and other risks is likely to have a foundation not only in good environmental and hazard prevention design, but also in addressing human behaviour which is the most likely agency that causes fire ignition and spread (Miller & Beever, 2005). The objective of ensuring the benefits for older people of remaining in their homes must be balanced against a demonstrable increase in fire risks with increasing age.

3.5c. Medications and Older People.

The use of prescribed and over-the-counter medication by older people is a particular issue in relation to fire risks. The extent of the problem is highlighted in a New Zealand study by Urban Research Associates (1978) in which examined recent consumption of prescribed and non-prescribed medication in the 24 hours prior to a face-to-face interview. The sample included 1,506 people matched for age and gender with the general population. A key finding was that the proportion of subjects who had recently used medication increased with age, as did the number of medications taken, and the proportion of medications which had been prescribed by a doctor. The leading medications for people 65 plus were drugs acting on the cardiovascular system (blood pressure and heart conditions), diuretics (water retention), analgesics (for pain), tranquillisers and hypnotics (including sleeping aids), and anti-asthmatics (for emphysema, asthma and chronic bronchitis). In most cases, these were courses of medication which had been taken for over 2 years. Overall 22% of people aged 65 plus had taken 3 or more medications. One man aged 70 took 7 prescribed remedies and said his health was 'good'. A woman aged 82, living alone, took 6 prescribed and 2 non-prescribed types of medication in the 24 hours before she was interviewed. There is no reason to believe the current consumption of medications by older people is substantially different from these 1978 findings. Most significantly, the use of medications individually, or in combination, are very likely to have adverse effects on arousal levels and affect responsiveness to emergencies in the home, including behaviours that contribute to fire ignition and the ability to escape safely.

The magnitude of this problem is identified by the UK Social Care Institute for Excellence (2005). In a review of people aged 65 and over living at home it was found –

- 45% of medications prescribed in the UK are for people over 65. Of those over 75 years, 36% take four or more prescribed drugs (Department of Health, 2001).
- Older people are prone to having several conditions which require multiple and complex drug regimens. However, up to 50% may not be compliant with the prescribed drug taking regimens, especially where these are complex (Lowe, Raynor, Purvis, Farrin & Hudson, 2000). Failure to comply with prescribed regimens has a number of consequences, including adverse effects and reactions for the patient which may affect their ability to detect and respond to fire cues or other threats in the home.
- Older people who live alone may have difficulties complying with their prescribed drug regimens for a number of reasons. These include - forgetting the appropriate timings and sequences for medications, disruption to routines, consequences of confusion or impaired memory, difficulties in reading instructions, problems with opening some containers, not having anyone to remind them to take the drugs, concerns about medication effects or fears of dependency, reactions to side effects, and socio-economic and educational background.

Similar concerns have been voiced by the US Food and Drug Administration (2007) who report high levels of prescription and counter medication use by older people. The consequences of adverse drug interactions are noted, along with side effects (which may reflect metabolic differences in older people compared to younger people). Conditions such as arthritis, poor eyesight, and memory lapses are cited as factors that contribute to difficulties with drug taking by older people. The risks for those living alone are again reinforced. A further consideration is the consequences of taking combinations of drugs which may produce dangerous interactions, and these may include behavioural reactions that affect responsiveness and cognitive performance in an emergency situation. A typical concern is levels of drowsiness and deep sleep engendered by medication which impede or prevent responsiveness to fire cues and timely escape actions.

3.5d. Fire Risks and Older People

Several studies have examined specific fire risks affecting older people through analysis of fire injury and death statistics (Petraglia, 1991; Barillo & Goode, 1996; Elder Squires & Busuttil, 1996; Kose, 1998; Williams, 1998; Graham, 1998; Loveridge, 1998; Leth, Gregersen, & Sabroe, 1998; Warda, Tenenbein, & Moffat, 1999; DiGuiseppi, Edwards, Godward, Roberts, & Wade, 2000; Istre, McCoy, Osborn, Barnard, & Bolton, 2001; Istre, McCoy, Carlin, & McClain, 2002; Office of the Deputy Prime Minister, 2002; Sekizawa, 2004; US Fire Administration, 2004, 2006). General risk factors for older people identified from these studies include –

- **Mobility:** This includes limitations on mobility and a requirement for mobility aids (eg. wheel chairs, walking frames). These factors impede movement away from fire threats; affect the ability to crawl beneath smoke and toxic fumes; limit agility required to escape through windows and other means of exit. For bed-ridden people mobility may be totally compromised.
- **Age-related Decline:** This includes declining physical and cognitive capacities, and sensory acuity. Among cognitive considerations is failing memory and age-related dementia, including Alzheimer's disease.
- **Medications:** As noted in 3.5c above, the effects of some medications are known to impair judgement, alertness, and coordination of responses.
- **Failure to Appreciate Risks:** In this risk grouping is an inability to form appropriate escape plans in the event of a fire; lack of appreciation of age-related limitations affecting escape behaviours; difficulties recognising fire cues and warning signals resulting in delayed responses to fires.
- **Risky Behaviours:** These include high risk behaviours typically associated with cooking, heating, and use of electric blankets. Examples include heaters placed in close proximity to flammable items or surfaces, leaving cooking unattended and unsafe use of fires and fuels required for heating purposes.
- **Substance Use:** The effects of life-long maladaptive behaviours associated with alcohol consumption, drug abuse, and smoking are risk factors for older people. The potency of nicotine addiction is noteworthy, especially given the widespread prevalence of smoking as an activity in the past.
- **Living Alone:** Social isolation may be associated with living alone, especially for older people with limited resources, poor safety practices and use of unsafe or faulty appliances.

Electric Blankets: The misuse of electric blankets is a recognised fire risk. This includes using faulty blankets. The problem relates to faulty wiring in old or sub-standard blankets, and blankets being left on for extended periods (usually under bedding causing dangerous heating levels). Elder, Squires and Busuttil (1996) commented on the specific risks from electric blankets as a factor in fatal fires involving older people, while the UK Department of Trade and Industry (2004) found old or damaged electric blankets caused over 5,000 fires per year including around 20 fatalities.

Cooking Fires: Unattended or uncontrolled cooking is recognised as a major fire risk across the general population. For older people this risk is particularly associated with igniting of clothing while cooking, and development of fires from unattended cooking. Scolds and general burns may also cause injuries with complications that contribute to fatal outcomes (US Fire Administration, 1999). In the United States cooking fires are the leading cause of fire-related injuries in older people (Cornell University, 2007).

The US Fire Administration Summary

In a major review of fire and the older adult the US Fire Administration (USFA) identified fire risks for older people as falling into four primary categories –

i. Sensory and Cognitive Impairments

Smell is a key sensory response to smoke, especially in the waking hours. However, it is noted that smell may not be as effective in detecting smoke during sleep in younger adults (Carskadon & Herz, 2004) and that older people usually have a weaker sense of smell (Dulay & Murphy, 2002). This has implications for detecting smoke cues for older people as research indicates 30% of individuals have some olfactory impairment by age 60 which rises to 60% at age 80 (Murphy *et al*, 2002).

Touch is important in detecting whether something is hot or not, such as whether an appliance or a doorknob is overheating. Older people experience a decline in this sense which may result in difficulties in performing common tasks such as unplugging appliances, and detecting whether items are hot. Associated with a decreased sense of touch are: skin changes which result from natural thinning of the epidermis; exposure to sun; fragility of blood vessels; reduced skin elasticity and strength; side effects of medications; and dehydration (National Library of Medicine, 2005). These also contribute to a longer healing of burns in older people and a higher risk of infection.

Vision impairments increase with age, particularly the loss of focus, declining colour sensitivity, and a need for more light. Wearing glasses may assist in reducing these impairments but a number of other problems may impact on visual acuity including macular degeneration, glaucoma, cataracts and diabetic retinopathy (VisionConnection, 2005). These conditions are found in younger people although they are more common with advancing age. All impact on visual responsiveness in an emergency such as a fire.

Hearing is a primary sense involved in responding to fire cues. Smoke detectors usually rely on auditory signals although flashing lights and vibration alarms are available for the hearing impaired. Hearing impairment is also associated with aging and is attributed to exposure to loud noises over long periods of time, effects of smoking, history of middle ear infections, and certain chemicals (Yablonski, 2003).

Memory Impairment, Dementia, and Alzheimers Disease is associated with aging with an increasing prevalence with increasing age. It is noted the “*because memory impairments directly affect reasoning and basic memory, they are substantial fire risk factors for older adults. With dementia and Alzheimers Disease, such mental impairments make out-of-the-ordinary behaviours possible, including dangerous actions and fire-risky behaviours.*” (USFA, 2006)

ii. Disabilities and Mobility Impairments

The USFA observed that “*the ability of older people to react to situations, respond to fires, and escape is hampered when their movement is slowed or impaired.*” Mobility impairments range from general slowness in movement to complete disability. Individual performance is usually considered against two activity criteria: activities of daily living (ADL) and instrumental activities of daily living (IADL).

- ADL’s include dressing, eating, getting in and out of bed, getting around inside the home, bathing, and toileting.
- IADL’s involve more detailed tasks such as light or heavy housework, laundry, preparing meals, shopping, getting around outside, travelling, money management, and using communication equipment.

In a context of fire risk, those who have restricted ADL’s are generally more vulnerable than those with good levels of IADL’s, although sensory and cognitive impairments, substance use, and medications, also have an impact on this and other risks.

iii. Alcohol and Medication

The relationship between alcohol consumption and fire risk is recognised across the adult population. In the case of older people it is noted that over-consumption of alcohol compounds fire and other risks because of more pronounced effects. This is related to such factors as lower body water content which reduces the time for older people to experience the effects of alcohol, consequences of historic alcohol consumption that may result in organic damage, and increased risks of falls and fractures engendered by alcohol consumption.

The relationship between medications and fire risk has been considered in 3.5c above. It is further noted that the effects of medications can be adversely affected by alcohol and may greatly increase fire risks. This relates to alcohol affecting drug metabolism causing adverse drug reactions. “*More importantly, the interactions between alcohol and drugs often heighten the side effects of both substances, especially drowsiness, making the fire risk for drug and alcohol mixing substantial*” (USFA, 2006).

iv. Economic and Social Factors

The relationship between socioeconomic status and deprivation and differential risks of fire mortality and injury is well recognised (Istre *et al*, 2001; DiGuseppi *et al*, 2002; Lyons *et al*, 2003; Shenassa *et al*, 2004; Miller, 2005). This relationship is complex and co-varies with a range of other factors including - smoking, alcohol or drug use, gender, education levels, employment status, residential location, and ethnicity. The USFA observed “*Lower income and impoverished older adults often cannot complete necessary home repairs, buy medications essential for maintaining their physical health, or replacing aging electrical appliances, placing them at higher risk for fire. Additionally, educational or social factors can interfere with an older adult’s ability to understand the details regarding fire prevention and safety*”.

**SECTION 4:
FIRE FATALITIES AND OLDER PEOPLE**

SECTION 4: FIRE FATALITIES AND OLDER PEOPLE

As in other developed countries, most fire deaths in New Zealand occur in residential settings. In 1996-2006 the annual average of such deaths was 21.2. These include disproportionate numbers of children and those aged 65 and over. **Part 4.1** examines details and comparative features of residential fire fatalities involving older people in 1996-2006. **Part 4.2** reviews fire fatalities in aged care residential facilities.

4 1: FATAL RESIDENTIAL FIRES

4.1a. Defining Residential Fires

All NZFS responses to callouts are recorded in FIRMS and include descriptions of the properties involved in fires. Residential fires are defined as ‘structure fires’ to include houses, apartments, flats, garages, sheds and buildings used for residential purposes, and other structures such as tents, house buses, and caravans situated in fixed locations. Collectively this involves all residential structures where fires occur, and in the case of fatalities the nature of residential structures is identifiable enabling a detailed analysis of these deaths.

4.1b. Inquest Reports

Fatal fires in New Zealand are subject to coronial investigation. The investigations are conjointly undertaken by Police and NZFS to determine the cause of the fire and whether any criminal intent was involved. The Coroners Act 1988⁸ grants Coroners wide discretion to enquire into, and investigate, any deaths in any questionable circumstances. The key purposes of such inquiries are specified in Section 15(1) (a) of the Act, namely to establish as far as possible - *that a person has died; the person’s identity; when and where the person died; the causes of death; and the circumstances of the death.*

Sections 15(1) (b) of the Act further specifies a Coroner can hold an inquest for the purpose of “*making any recommendation or comments on the avoidance of circumstances similar to those in which the death occurred or on the manner in which any person should act in such circumstances, that, in the opinion of the Coroner, may have drawn to public attention, reduce the chances of the occurrence of other deaths in such circumstances*”.

Inquests are formal judicial hearings in which a diversity of information is presented to a Coroner about a fatality or fatalities. Accordingly, inquest reports are a valuable source of information on investigations into, and determination of, causes of death, and behavioural and other matters associated with such fatalities.

Coronial Services, Ministry of Justice records all deaths referred to Coroners (whether subject to an inquest or not), and retains all inquest reports until these are transferred to National Archives. Access to inquest files is subject to formal agreement with Coronial Services, which includes agreements affecting confidentiality and adherence to specific coronial orders.

⁸ The Coroners Act (1988) has been replaced with a new Coroners Act (2006) with effect from 1 July 2007.

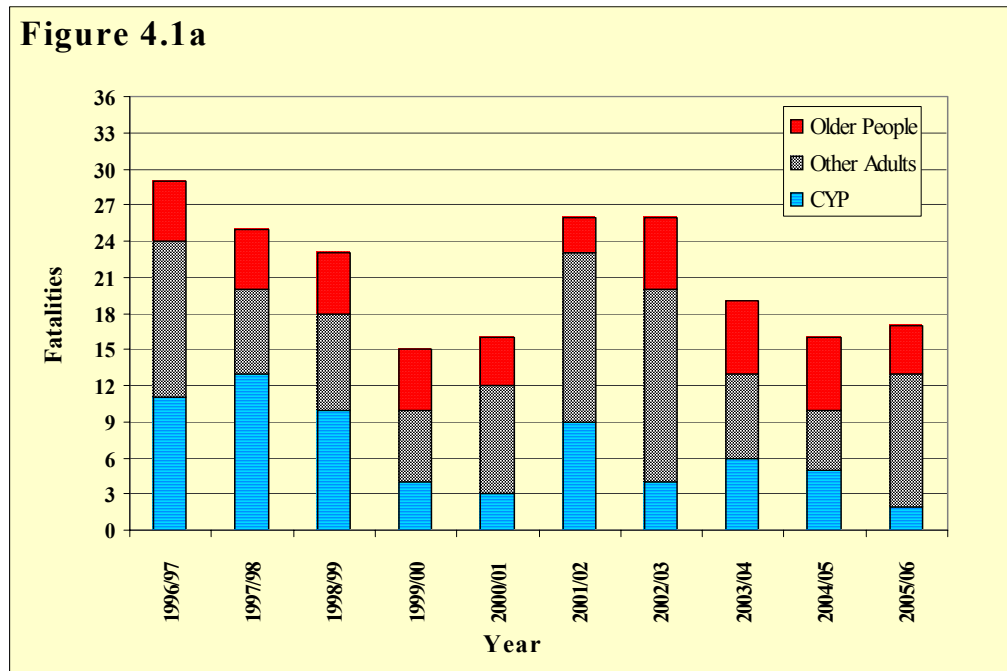
4.1c. NZ Residential Fire Fatalities 1996-2006

The following are key features of **212** unintentional residential fire deaths 1996-2006⁹ -

i). Annual Residential Fire Fatalities

Figure 4.1a presents all residential fire deaths 1996– 2006, grouped as **Children and Young People**¹⁰ (0 to 16.9 years), **Other Adults** (17 to 64.9 years), and **Older People** (65 and over).

Figure 4.1a: Unintentional Residential Fire Deaths 1996-2006.



This figure highlights the vulnerability of children and young people and older people to fatal residential fires. Children and young people comprised **31.6 %** of deaths, older people **23.1 %**, and other adults **45.3%**. On a proportional basis older people are over-represented in these fire fatalities.

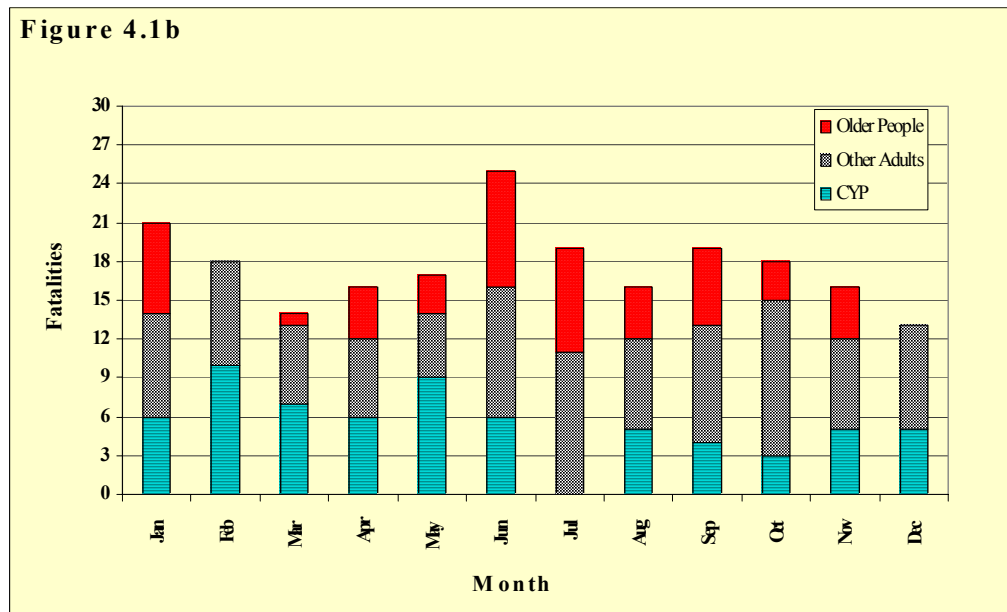
ii). Season of Fatalities

International literature suggests seasonal patterns to residential fire fatalities, with a peak in winter. This is attributed to greater heating demands which contribute to higher fire risks in the home. Monthly unintentional residential fire fatalities 1996-2006 are presented in **Figure 4.1b**.

⁹ NZFS Corporate Reporting Year 1 July -30 June.

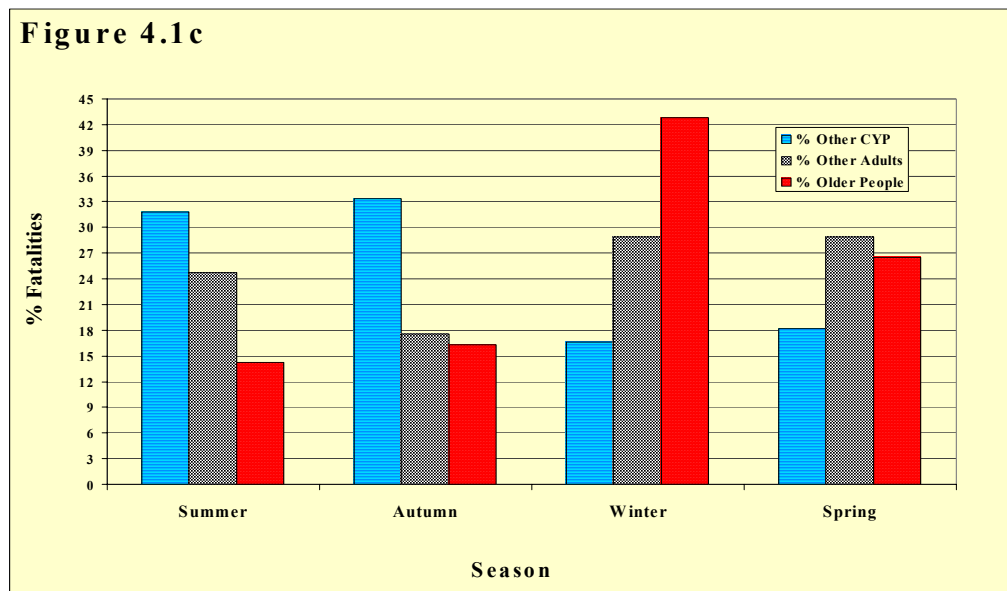
¹⁰ Referred to as CYP in figures and tables for brevity.

Figure 4.1b: Residential Fire Fatalities by Month.



It is apparent that there is no strong monthly pattern to these fire deaths, although June has the highest fatalities. For older people the greatest numbers of deaths occurred in June, July and October which suggests a relationship with colder weather. No particular seasonal relationship is apparent for children and young people. The relationship between seasonality and fire fatalities is better illustrated by reference to the seasons as comparative percentage measures (**Figure 4.1c**).

Figure 4.1c: Percentage Fire Fatalities by Season.



It is apparent from **Figure 4.1c** that older people have higher fire fatalities in the colder months (ie. Winter/Spring) compared to other adults where no seasonal pattern is discerned. Children and young people appear more vulnerable in summer and autumn.

iii). Day of Fatal Fires

Miller (2005) found a greater number of fatal residential fires occurred in the weekend period, with 45% reported between 6 pm Friday and 6 am Monday. This pattern is confirmed in the current study (Table 4.1a).

Table 4.1a: Fire Fatalities by Day

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
CYP	8	3	11	5	11	12	17
Other Adults	14	5	7	11	20	18	21
Older People	1	13	8	6	5	5	11
Total	23	21	26	22	36	35	49

It is apparent that while the weekend period is a high risk time for children and young people, and other adults, this is not so for older people (with the exception of Sundays). It is noted the highest numbers of deaths of older people occur on Tuesdays involving **26.5%** of all fatalities. The reason for this is not clear. It is also evident that **61.5%** of fatal fires involving other adults and **59.7%** involving children and young people occur in the Friday to Monday period (ie. they are largely weekend phenomena). In the case of older people the pattern of fatalities is more evenly spread across all week days.

iv). Time of Fatal Fires

Miller (2005) found most fatal residential fires are reported¹¹ at night (ie. **72%** between 7pm and 7am, **45%** between 11pm and 3 am). Analysis of residential fire fatalities for 1996-2006 confirms this pattern (Table 4.1b see following page).

Over half of all fatalities (**54.2%**) occur in fires that are reported between 9 pm and 5 am. However, when this is broken down into data for children and young people (**52.2%**), other adults (**62.9%**), and older people (**38.8 %**), it is evident that older people are less likely to die in fires that start during this time. Rather, their risk is spread more evenly across the day. This distribution probably reflects a number of factors, including lifestyle and economic constraints, cause of fire, and lower incidence of risky behaviours such as alcohol consumption.

Downing and Wilson (2005) found that older people in the United Kingdom were significantly more likely to attend Accident and Emergency services during the morning or early afternoon. The pattern of fatal fires involving older people in New Zealand reflects a similar trend and suggests a relationship between involvement in fires and other emergencies that require medical assistance or intervention.

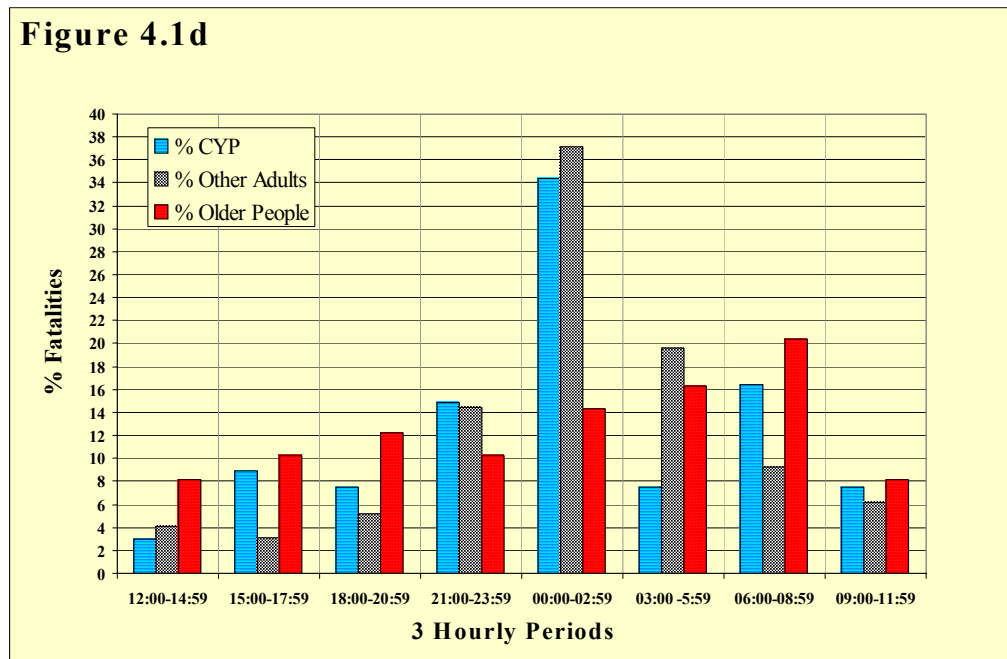
¹¹ Based on the time a fire is reported to NZFS call centres as identified by FIRMS.

Table 4.1b: Reported Time of Fatal Fires.

Daily Time Period	CYP Deaths	Other Adults Deaths	Older People Deaths	Total Deaths	% CYP Deaths	% Other Adults Deaths	% Older People Deaths
12:00-12:59	1	0	1	2	1.5	0	2
13:00-13:59	0	1	0	1	0	1	0
14:00-14:59	1	3	3	7	1.5	3.1	6.1
15:00-15:59	2	0	2	4	3	0	4.1
16:00-16:59	4	2	1	7	6	2.1	2
17:00-17:59	0	1	2	3	0	1	4.1
18:00-18:59	3	0	0	3	4.5	0	0
19:00-19:59	0	1	3	4	0	1	6.1
20:00-20:59	2	4	3	9	3	4.2	6.1
21:00-21:59	1	4	1	6	1.5	4.2	2
22:00-22:59	5	1	4	10	7.5	1	8.2
23:00-23:59	4	9	0	13	6	9.4	0
00:00-00:59	12	10	0	22	17.9	10.4	0
01:00-01:59	9	18	4	31	13.4	18.8	8.2
02:00-02:59	2	8	3	13	3	8.3	6.1
03:00-03:59	1	5	4	10	1.5	5.2	8.2
04:00-04:59	1	6	3	10	1.5	6.3	6.1
05:00-05:59	3	8	1	12	4.5	8.3	2
06:00-06:59	2	5	3	10	3	5.2	6.1
07:00-07:59	9	3	5	17	13.4	3.1	10.2
08:00-08:59	0	1	2	3	0	1	4.1
09:00-09:59	1	1	2	4	1.5	1	4.1
10:00-10:59	2	3	0	5	3	3.1	0
11:00-11:59	2	2	2	6	3	2.1	4.1

For greater clarity the percentage of fatalities compared to times of reported fatal fires are presented in three hourly blocks (**Figure 4.1d**).

Figure 4.1d: Reported Time of Fatal Residential Fires-



4.1d. Demographic Features of Older Fire Victims

i). Age and Gender

Table 4.1c: Older Victim Ages.

Age Band	Male	Female
65 – 69.5	3	2
70 – 74.9	5	2
75 – 79.0	5	8
80 – 84.9	5	8
85 – 95 ⁺	3	5
Total	22	27

Table 4.1c suggests a disproportionate representation of older people among fire victims and that this increases with age, as noted by Duncanson (2001). Females have a slightly higher representation than males reflecting the increasing proportion of females with increasing age.

ii). Ethnicity¹²

Victim ethnicity is coded according to coronial reports or from NZHIS records. Because of small sample size, ethnicity has been summarised into four groupings (**Table 4.1d**)

Table 4.1d: Ethnicity of Older Fire Victims

Ethnicity	Description	Male	Female	Total
European	European, whether NZ born or immigrant.	16	22	38
NZ Maori	NZ Maori.	3	3	6
Pacific Islands	Pacific Island. eg. Samoa, Cook Islands, Fiji	0	0	0
Other	Indian, Asian, Chinese, or other descent.	0	0	0

Europeans comprise 86% of fire fatalities of older people and 92% of the total population aged 65 and over (2001 Census figures). Older Maori are therefore over-represented, consistent with findings from the wider population where Maori fire fatalities equate to nearly three times their representation in the general population (Miller, 2005). However, small numbers make analysis by ethnicity uncertain.

iii). Occupation

All 44 older victims were described as *Retired* except for one who was described as *Farmer*.

iv). Deprivation Index

The Deprivation Index¹³ is a measure derived from census mesh block records for all New Zealand addresses. The measure is adjusted with each census to provide an ongoing picture of relative deprivation. It provides a score derived from nine variables reflecting eight dimensions of material and social deprivation including – income, employment, communication, transport, support, qualifications, living space, and home ownership¹⁴.

The Deprivation Index measures use a decile scale of deprivation ranging from 1 (least deprived scores) to 10 (most deprived scores). These measures provide *indicative* information about properties where fatal fires have occurred rather than *absolute* measures. They give some objective indication of the socio-economic status of the people living in the residences involved in fatal fires. (Note: the deprivation scores apply to *properties* rather than *individual people*.)

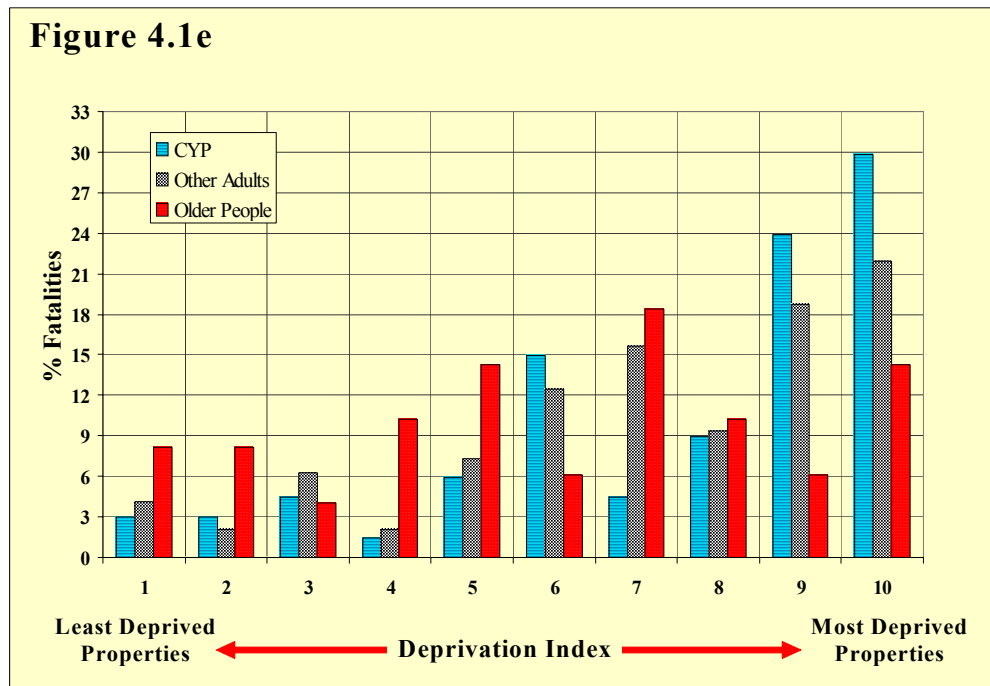
Deprivation Index measures, by age groups, expressed as percentage measures for comparative purposes are presented in **Figure 4.1e**.

¹² Based on incomplete data n=44

¹³ Source Ministry of Health website <http://www.moh.govt.nz/moh.nsf>

¹⁴ For more detailed information on the Deprivation Index see Salmond & Crampton (2002)

Figure 4.1e: Percent Deprivation Index of Fire Fatalities



The figure shows that 74% of all deaths occur in properties in the decile 6-10 range. However when fatalities involving older people are compared with those for other adults and children and young people, it is apparent that more older people experienced fatal fires in deciles 1-4 properties than the other two groups. Overall, deaths of older people are spread more evenly across all deciles. This may reflect differences in home ownership, with more older people having title to their properties and owning other assets. It may also reflect the physical vulnerabilities of older people – in all SES levels older people are more likely to have physical, sensory and cognitive disabilities than younger people. Their vulnerability may have more to do with their own capabilities than with environmental factors – such as using candles, etc – which affect lower SES people in other age groups.

4.1e. Forensic Features of Older Fire Victims

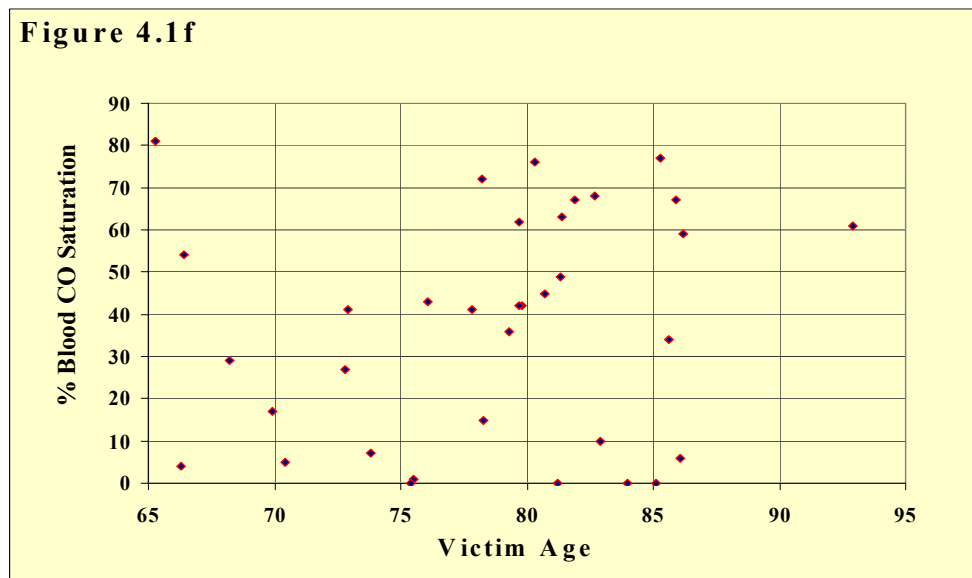
i). Proximity of Death to Fire

The majority of older victims died during the fire (36 of 44 deaths), usually soon after the fire became established. Only 8 (18.2%) survived the fire, by escaping or rescue, to later die of their injuries. The longest periods of survival post-fire were 26, 23, and 13 days. This pattern also applies to other fire victims where only 14 victims surviving the fires to later succumb from their injuries and the effects of fire.

ii). Blood Carbon Monoxide Saturation

Percentage blood carbon monoxide saturation is a quantitative measure that reflects exposure to a lethal by-product of combustion. Post mortem measures of % CO saturation in older victims¹⁵ are presented in **Figure 4.1f**.

Figure 4.1f: Percentage Blood Carbon Monoxide Saturation



This shows high percentage carbon monoxide saturation levels for older people, with 19 cases (54%) having levels above 40%. Saturation levels above 40% are considered life-threatening (Ellenhorn & Barceloux, 1988), although caution is advised in extrapolating from % blood saturation measures, as other factors may also influence mortality (eg. pre-existing conditions). It is important to note that fire victims may also inhale other toxic products (eg. hydrogen cyanide, sulphur dioxide) along with carbon monoxide. There is great variability in the chemical constituency of smoke depending on the materials involved in combustion and their levels of flammability.

A further risk is posed by high levels of carbon dioxide produced from combustion. High level of carbon dioxide quickly causes physical and mental impairment, and asphyxiation.

¹⁵ Based on 44 cases where % carbon monoxide saturation levels are known.

The levels of carbon monoxide saturation shown in Figure 4.1f indicate that most victims were alive and exposed to toxic fumes for some time. Even small levels of exposure to toxic fumes are likely to produce impairments to mental and physical functioning and thus contribute to fatality. Only a few victims had minimal levels of carbon monoxide saturation. In these cases the primary fatal agents were burns and pre-existing cardiac conditions.

iii). Alcohol and Drug Use

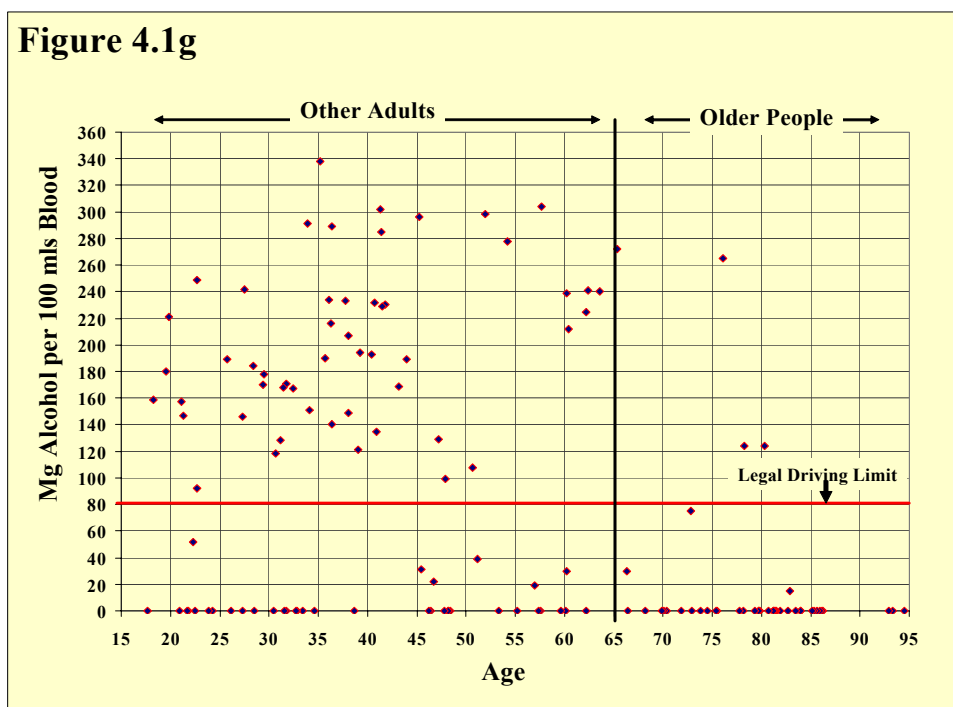
Analysis showed that few older victims had consumed alcohol prior to fatal fires. Previous findings relating to adult fire victims have noted high blood alcohol levels determined by post mortem analysis (Miller, 2005). In the present study, comparisons between older people and other adults show marked differences in recorded levels of blood alcohol, using the legal driving limit of 80mg/100ml¹⁶ as comparative reference point (Table 4.1e).

Table 4.1e: Comparative Blood Alcohol Levels.

	Fatalities	Number Over 80mg/100 ml	Percentage Over 80mg/100 ml
Older People	44	4	9.1%
Other Adults	89	52	58.4%

This difference is graphically illustrated in Figure 4.1f.

Figure 4.1f: Blood Alcohol Levels



¹⁶ This threshold is somewhat arbitrary but is adopted on the basis it is an established legal level relevant to driving a motor vehicle and therefore may apply to safety issues in the home.

Lower blood alcohol levels in older fire victims reflect a number of factors including consequences of a lower income, declining recreational drinking, health considerations, and issues of access and mobility, among other considerations. No older fire victims were found to have consumed illicit drugs, although one victim was on licit methadone.

iv). Cause of Death

Determination of cause of death is a key objective of an inquest. This relies on findings of post mortem examinations and other analyses. Post mortem examinations of fire fatalities use many clinical indicators including - presence of soot and other debris in the respiratory system, blood and body fluid analysis, burning, muscular-skeletal injuries, extent of exposure to fire and fire products, and co-morbid health conditions that may contribute to death. Miller (2005) found that there are three main fatal effects –

- Consequences of exposure to fire, (ie. burns, thermal injuries to airways, and incineration of all or part of the body),
- Inhaling toxic products and consequences of combustion (ie. smoke, carbon monoxide, carbon dioxide, other poisonous gases, hypoxia and asphyxia),
- Shock effects that precipitate death from pre-existing health conditions such as cardiac failure and respiratory disease.

In the cases of 44 older victims where coronial information is available, the causes of death are reported in **Table 4.1f**. (Note: more than one fatal effect may apply to any victim.)

Table 4.1f: Causes of death – older fire victims

Cause of Death	Number
Smoke Inhalation	20
Burns/Thermal Injuries	20
Cardiac Failure	7
Carbon Monoxide Poisoning	6
Respiratory Failure	5
Hypoxia, Asphyxia	3
Incineration	1
Multi-organ Failure	1

The finding that smoke inhalation and burns/thermal injuries were equal causes of death shows a difference from other research. Hall (1995) reported smoke inhalation was the leading cause of all fire deaths in the United States, exceeding burn deaths by 7 to 3; however, no age comparisons were provided in that study. The reasons for the differences with the current study are not clear.

v). Pre-existing Health Conditions

Coronial reports indicate that many victims had pre-existing health conditions that contributed to their involvement in the fire or to fatal outcomes. Many were affected by conditions including physical disabilities, sensory losses, respiratory and cardio-vascular conditions, and consequences of strokes and neurological conditions. Several had more than one condition. A summary of victim health conditions is presented in **Table 4.1g**.

Table 4.1g: Pre-Existing Health Conditions

Pre-existing Health Condition	Number
Physical disabilities – limited mobility, frailness, arthritis	22
Cardiovascular conditions – heart disease, hypertension	13
Sensory disabilities – hearing or vision impairment	7
Dementia – Alzheimer’s disease	5
Respiratory disease/conditions	5
Stroke/cerebral haemorrhage	5
Diabetes	3
Neurological conditions – Parkinson’s Disease, epilepsy	3
Mental disorder/psychological problems	3
Drug/Alcohol dependency	2

In some cases pre-existing health conditions resulted in victims being unable to escape fires (eg. those confined to wheelchairs or bed, dependent on walking frames). Others appeared to have had a limited appreciation of the risks of fire, which may have been related to neurological conditions, cognitive deterioration and sensory losses that prevented appropriate escape responses.

4.1f. Dynamics of Fatal Fires Involving Older People

i). Property Type

Most victims (79.5%) lived in single houses (**Table 4.1h**). No information is available on property ownership, rental status, or length of residence in these properties. Home ownership is an established pattern among older New Zealanders and it is likely a majority of properties were owned by the deceased.

Table 4.1h: Property Type.

Property Type	Number
Single House	35
Flats (1-2 Units)	3
Flats (3-10 Units)	3
Caravan/Tent	3

One victim had lived in a tent for many years. The caravan casualties involved one person who used a caravan as a permanent residence and another as a casual residence.

ii). Smoke Detectors

The NZFS strongly recommends the installation of smoke detectors in all residential properties, and especially so for those occupied by older people and people with disabilities. Analysis of fire investigation reports found that, of 33 fatal fires involving older people where information was available, operational smoke detectors were installed in only 8 (37%) of these properties (**Table 4.1i**).

Table 4.1i: Property Smoke Detector Status.

Property Type	Number
Detector installed and operational	8
Detector installed but inoperative	4
No Detectors installed	21
Not Known	11

iii). Cause of Fatal Fires

The cause of fires is a central determination for fire investigations. Miller (2005) highlighted the significant impact of unattended cooking and careless smoking as causal factors in unintentional residential fire fatalities (together these accounted for 30% of all deaths). Analysis of residential fire deaths for 1996-2006¹⁷ permits a wider analysis to include differences between older people, other adults, and children and young people (**Table 4.1j**).

Table 4.1j: Causes of Fatal Fires.

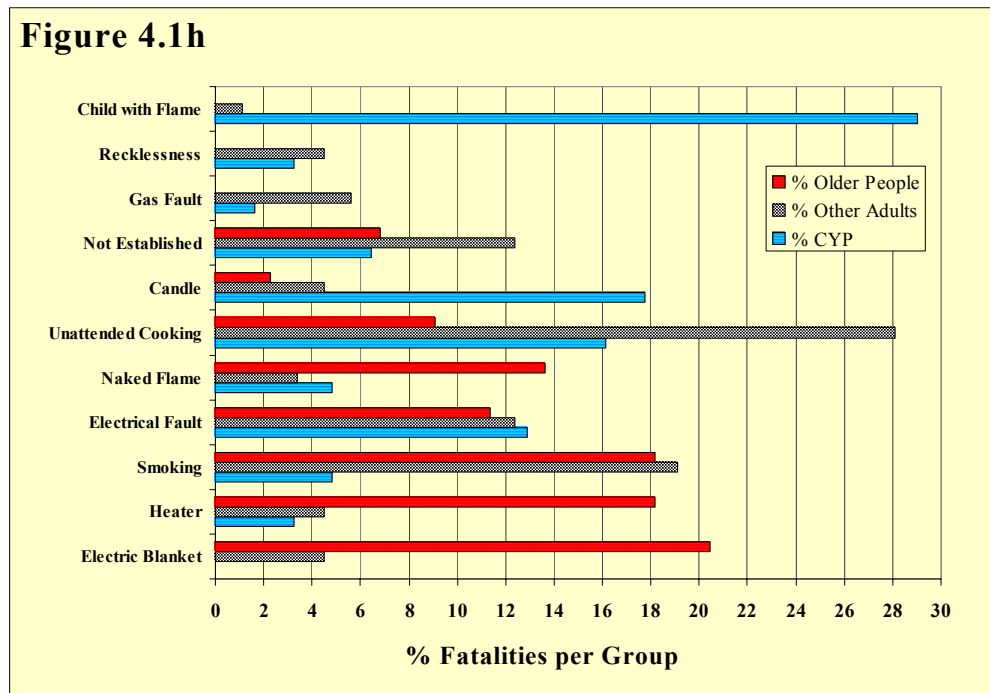
Cause of Fire	Number CYP	Number Other Adults	Number Older People	% CYP	% Other Adults	% Older People
Electric Blanket	0	4	9		4.5	20.5
Heater	2	4	8	3.2	4.5	18.2
Smoking	3	17	8	4.8	19.1	18.2
Electrical Fault	8	11	5	12.9	12.4	11.4
Naked Flame	3	3	6	4.8	3.4	13.6
Unattended Cooking	10	25	4	16.1	28.1	9.1
Candle	11	4	1	17.7	4.5	2.3
Not Established	4	11	3	6.5	12.4	6.8
Gas Fault	1	5		1.6	5.6	
Recklessness	2	4		3.2	4.5	
Child with Flame	18	1		29.0	1.1	

It is apparent that older people are most vulnerable to fires caused by electric blankets, heaters, and naked flames. Other adults are most at risk through unattended cooking fires, and children and young persons from children playing with flames. Both older people and other adults have similar percentage of deaths attributed to careless smoking and to electrical faults.

These data are presented in **Figure 4.1h** as percentage measures for clarity.

¹⁷ Includes 195 cases where information is available.

Figure 4.1h: Cause of Fatal Fires



iv). Location of Fires

The point of ignition of a fire may significantly influence the ability of occupants to detect fire cues and make a safe escape. If the fire is quickly detected before it develops or produces heavy smoke and toxic fumes, occupants may have time to contain the area of the fire and to escape. Activation of smoke detectors may also be an important factor in early fire detection. However, escape is affected by factors such as whether occupants are asleep when the fire ignites, the degree of exposure to toxic products that affect responsiveness, and availability of escape routes. Analysis of the initial location of victims relative to the seat of fire¹⁸ shows little difference between older people and other adults - both are more likely to be initially located in the same room as the seat of the fire. Children and young people are more likely to be initially located in another room than the seat of the fire as is shown in **Table 4.1k**.

Table 4.1k: Victim Location Relative to Seat of Fire.

Victim Initial Location	CYP	Other Adults	Older People
Seat of Fire in Same Room	24 (38.7%)	50 (56.2%)	27 (61.4%)
Seat of Fire Other Room	38 (61.3%)	37 (43.8%)	17 (38.6%)

The rooms where the fires started show some differences between older people, other adults, and children and young people (**Table 4.1l**).

¹⁸ The seat of fire is the location where investigators determine as the point of fire ignition.

Table 4.1m: Seat of Fatal Fires.

Seat of Fire	CYP	Other Adults	Older People
Bedroom	20 (32.3%)	22 (24.7%)	16 (36.4%)
Kitchen/Dining Area	15 (24.2%)	35 (39.3%)	7 (15.9%)
Lounge/Living Area	13 (21.0%)	21 (23.6%)	15 (34.1%)
Other Internal Area	5 (8.1%)	4 (4.5%)	3 (6.8%)
Housebus/Caravan/Tent	4 (6.5%)	6 (6.7%)	3 (6.8%)
Outside Structures	5 (8.1%)		
Not Known		1 (1.1%)	

The differences between these groups reflect the causes of fires. The higher percentage of fires involving older people that started in bedrooms involved electric blankets and heaters as ignition sources, while lounge fires often involved faulty, or the misuse of, heaters and appliances as primary factors. For other adults the consequences of cooking fires is evident by the high percentage of fires starting in kitchens. Children and young persons are most vulnerable to fires starting in bedrooms (largely related with their playing with fire). This latter cause is also noted in fires starting in outside structures which occurred mainly in this group.

v). Responses of Victims to Fire

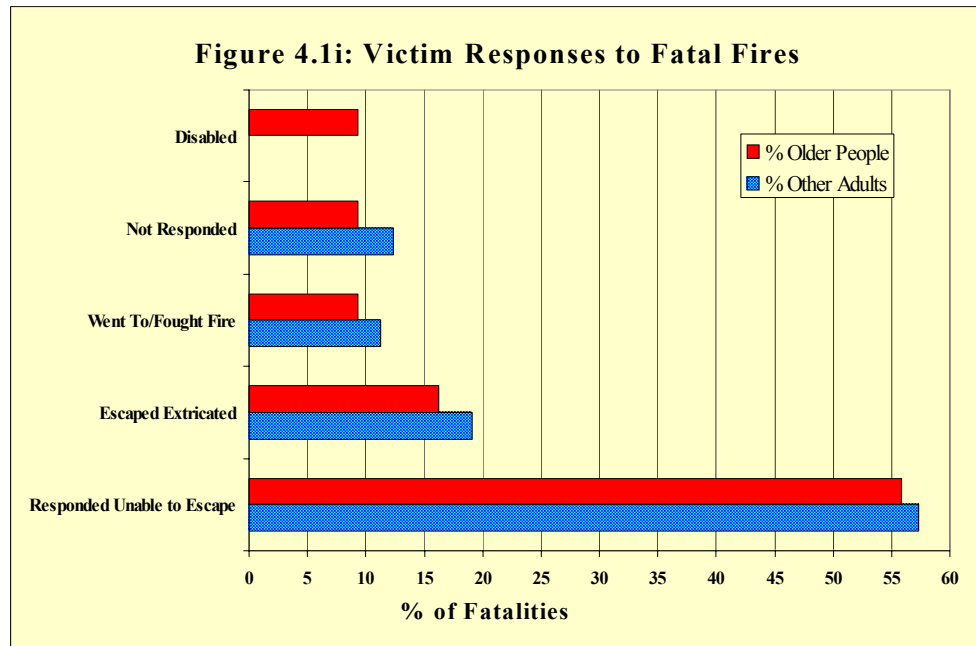
Inquest reports contain some information on victim responses after fires had become established, providing an indication of the extent to which victims may have attempted escape or engaged in other actions that contributed to fatal outcomes.

As children and young persons are frequently too young to form or execute escape plans, or are reliant on others to assist them escape, they have been excluded from the following analysis. For summary purposes, victim responses to fire have been summarised into the following categories –

Response	Details
Escaped/Extricated	Escaped fire themselves, or were extricated by others including family, neighbours, or rescue personnel.
Not Responded	Did not to respond to fire cues due to being asleep, unconscious, affected by alcohol or medications etc.
Went To/Fought Fire	Responded to fire cues and went to fire to investigate or to fight the fire and were then overcome.
Responded – Unable to Escape	Responded to fire cues and made some attempt to escape from fire before being overcome.
Disabled - Unable to Respond	Unable to respond due to disability – confined to bed, required walking frame, support, wheelchair etc.

Victim responses to fires for other adults and older people is summarised in **Figure 4.1i**. This is based on 132 fatalities where information is known.

Figure 4.1i: Victim Responses to Fatal Fire



This figure shows only small differences in responses to fire between other adults and older people. The majority of victims (around 55%) became aware of the fire but were unable to escape for various reasons. Around 15% were extricated or escaped. Significantly, around 10% went to investigate or fight the fire with fatal consequences, while similar percentages did not appear to respond to fire cues at all.

4.2. FIRE FATALITIES IN AGED CARE FACILITIES

The focus of the study is on fire risks for older people in residential settings; however, it is useful to review fire risks in aged-care facilities and the contribution of human agency to fires in this environment. The fire risk in aged care facilities is well documented and has resulted in the imposition of strict building and safety codes for such properties in most countries. The necessity for these codes is driven by a high risk of deaths and injury in a population characterised by high needs for care and dependency, declining mobility and sensory functioning, levels of disability, and the effects of age-related conditions, including those affecting cognitive performance.

The potential risk of fire deaths and injuries in aged care facilities are evident from the following lists of the most deadly incidents in aged care facilities in the past 60 years in the United States and elsewhere, provided by the National Fire Prevention Agency (2006).

a). United States of America

Location	Date	Fatalities	Total Residents	% Fatalities
Warrenton, Missouri	17/02/57	72	149	48.3
Fitchville, Ohio	23/11/63	63	84	75.0
Largo, Florida	29/03/53	32	45	71.1
Marietta, Ohio	9/01/70	31	46	67.4
Keansburg, New Jersey	9/01/81	31	n/k	
Chicago, Illinois	30/01/76	24	83	28.9
Bradley Beach, New Jersey	26/07/80	24	36	66.7
Hoquiam, WA	30/01/51	21	29	72.4
Hillsboro, AR	31/10/52	20	70	28.6
Hartford, Connecticut	26/02/03	16	148	10.8

b). Other Countries

Location	Date	Fatalities	Total Residents	% Fatalities
Kingston, Jamaica	20/05/80	146	211	69.2
Yokohama, Japan	17/02/55	98	143	68.5
Notre Dame du Lac, Quebec, Canada	2/12/69	40	67	59.7
Virrat, Finland	22/01/79	26	n/k	
Mississauga, Ontario, Canada	14/07/80	25	198	12.6
Saint Jean de Losne, France	23/04/80	24	n/k	
Grandvilliers, France	9/01/85	24	180	13.3
Gander, Newfoundland, Canada	26/12/76	21	n/k	
Nottinghamshire, United Kingdom	15/12/74	18	n/k	
Higashimurayama, Japan	6/06/87	17	74	23.0
Unidentified Town, Costa Rica	19/07/00	17	41	69.2
Pointe aux Trembles, Quebec, Canada	14/04/57	17	27	62.9

While there are marked historical and geographical differences in these examples, the high percentages of fatalities illustrate the vulnerability of those in aged care.

The development of fire safety codes for New Zealand aged-care residential facilities reflects the consequences of a tragedy on 26th July 1969 at Sprott House in the Wellington suburb of Karori. This gave impetus for a major review of safety codes for aged-care residential facilities. Seven elderly women perished when a blaze overwhelmed a wooden two storey building in the early morning. The investigation found six victims were overcome in or proximate to their rooms on the first floor. All were badly burned. The other victim was found on the ground floor, fully clothed and not burned. Autopsies determined all died as a result of carbon monoxide poisoning and asphyxia due to the inhalation of products of combustion. The cause of the fire was not established other than it appeared to have started in the ground floor matron's office.

The fire resulted in a Committee of Inquiry which made a number of recommendations and led to revised fire safety regulations and the establishment of a fire safety inspectorate. The Committee of Inquiry Report (1970) identified significant human behavioural elements in the fire along with other factors in aged residential care facilities. The Report noted *inter alia* –

“Some old people (known as “frail ambulant”) may be able to walk on 10 or 15 ft a minute. This slow progress, however, is not the only difficulty faced in the evacuation of the elderly. In the Sprott House fire one lady who might well have saved herself died because she decided to get dressed before leaving her room. At one old people's home visited by the Committee the matron spoke of a resident who sat down on the floor during a drill rather than be hustled from the building. Because their dignity and appearance are so important to the elderly, early warning of a fire by automatic alarms is valuable in providing time for a quiet, unflurried withdrawal from the premises. ...

...

Two submissions stated that fire drills in old people's homes were unnecessary, or even harmful because of their disturbing influence on residents. The Committee agrees rather with the nine witnesses who favoured regular fire drills in old people's homes. How often they should be held is a moot point but it is relevant that many old people have difficulty remembering instructions for long. On the other hand an Auckland organisation reported an old people's home where drills were held so frequently that the off-duty staff ignored one alarm call which turned out to be genuine. ...

Because of the circumstances in which it was set up, the Committee tended to receive submissions concentrating heavily on the special nature of old people's difficulties – their slow movement and forgetfulness of instructions, sensitivity about dress and dignity, nervousness at heights and obstacles, and the problems of failing senses and aged bones. Even Mr J. M. May, the Acting-Director of the Foundation for the Blind, said that in the foundation's hostels it was not blindness which caused the greatest anxiety as to fire safety but age and that the residents are old people first and blind second” (p 27-28)

Although the language of the report differs from contemporary usage, the concerns identified by the Inquiry remain valid and reflect on human behavioural factors in fires. The report placed great weight on the lethal risks of smoke and fumes as hazards in residential care facilities and elsewhere, and focussed on the safety of building and furnishing materials as sources of smoke and poisonous fumes. The results of a demonstration simulating a burning cigarette butt on a standard kapok mattress were included in the report. This inclusion acknowledged the risk of smoking as a significant fire hazard in residential settings. The fire risks from smoking continue to be recognised as a major cause of fire deaths (Miller, 2005).

A second tragedy occurred on 10th July 1989 at the Terwindle Rest Home, Herne Bay, Auckland. Seven residents died from a fire in a private rest home which housed long term psychiatric and psycho-geriatric cases. The fire was reported just after 10 pm and was well established when the Fire Service arrived. Most residents were evacuated from the building, but four could not be revived. Two more were found dead within the structure. Another died five days later from pre-existing conditions aggravated by smoke inhalation. The deceased were aged between 48 and 78. The fire originated in a wall mounted heater in a lounge which had combustible materials placed in it. The investigation concluded ignition was probably deliberate, as a resident with a history of fire lighting was strongly believed to be involved; however, no charges were laid, on legal advice.

In the period 1996-2006 five fatal fires have occurred in aged-care residential facilities involving eight deaths. Analysis of these shows a significant role of human agency in the fire causation, and in fatal outcomes.

Date	Location	Deceased	Cause of Death	Comments
04/08/96	Fielding	<i>(a).</i> Female (81) <i>(b).</i> Male (70)	<i>(a).</i> Carbon Monoxide poisoning & burns. <i>(b).</i> Carbon Monoxide poisoning & burns	Fire caused by a bedside lamp falling on floor of (a)'s bedroom which ignited the fabric shade and then bedding. The body of (b) was found in (a)'s room; apparently he was trying to rescue her. A smoke stop door was found wedged open which contributed to the spread of smoke in the building.
13/08/96	Kaikohe	<i>(a).</i> Male (76)	<i>Smoke inhalation & extensive upper body burns.</i>	The deceased was asleep in a chair in the day lounge. Embers from his pipe ignited the chair. He called for help and was taken to hospital with significant burns but died later that day.
21/06/97	Collingwood	<i>(a).</i> Female (90) <i>(b).</i> Female (88) <i>(c).</i> Female (89)	<i>(a).</i> Burns to body & respiratory failure secondary to acute thermal injury to the airway. <i>(b).</i> Severe burns to body & smoke inhalation leading to cardiovascular collapse. <i>(c).</i> Burns to body & smoke inhalation leading to bronchopneumonia.	The fire was apparently caused by a staff member negligently using a gas lighter to burn off a severed tassel on a bedspread. The tassel base smouldered for some time before igniting bedding. Smoke alarms were activated but no sprinklers were installed. Two victims died 2 days later, the third 23 days later. All deaths were attributed to the results of the fire.
25/02/03	Kurow	<i>(a).</i> Female (82)	<i>Burns sustained when her clothing ignited whilst she was smoking.</i>	The deceased regularly smoked unsupervised on a veranda. She had previously singed her hair with a gas lighter and was given a safer lighter. She set fire to her clothes and died later that day. The care facility had a policy requiring smoking by residents to be supervised. The deceased insisted on being independent so staff tended to accede to her demands.

26/10/04	Hawera	(a). Male (86)	<i>Burns with contributive diseases</i>	The deceased was in poor health with limited mobility. After dinner he was taken to the smoking room and left to smoke a cigarette. He set himself on fire and was unable to escape. The facility was fined under health and safety legislation for inadequate supervision of the deceased.
----------	--------	----------------	---	---

In considering these fatalities a number of points are noted –

- Six deaths resulted from the misuse of a naked flame associated with smoking (3 deaths) and the negligent burning of a frayed bedspread tassel (3 deaths). Two others are attributed to a bedside lamp being knocked over starting a fire.
- All fatalities involved ignition of clothing or bedding materials. Consequently, burns were a significant cause of death, with some consequences from smoke inhalation.
- In the smoking deaths, each victim was unsupervised when the fire ignited. All were unable to extinguish the fire because of frailty and limited mobility. The fire risk from smoking clearly extends into residential care settings and remains a significant factor affecting older people (as it is for residential fire risks in the wider community).
- Concurrent health conditions and disabilities were significant factors affecting victims' abilities to escape a fire, or to survive consequent injuries to those who were rescued from fires.

Narayanan and Whiting (1996) analysed New Zealand fire risk data from 1986-1993. They concluded that rest homes (ie. aged-care residential facilities) had a “*higher relative fire risk*” compared to other places of occupancy. They argued that most deaths resulted from flashover when fires spread beyond the room of origin, and where there was an absence of early fire detection or suppression systems. While these conclusions are well supported by conventional knowledge, the weighting of their findings is questioned against the comparatively small number of cases on which the statistical analysis is based. Further, their conclusions do not apply to the three individuals whose deaths resulted from smoking.

Nonetheless, it is apparent that aged-care residential facilities must address the specific risks of fire given the aggregation of physical, medical, and psychosocial factors that characterise many residents, especially those in the oldest age groups, those with declining health and disabilities, and those whose habitual behaviours directly contribute to fire risks (eg. smoking).

**SECTION 5:
STRUCTURED INTERVIEWS
WITH OLDER FIRE VICTIMS**

5.1 INTERVIEW METHODOLOGY

The interviews followed a three step process with the objective of interviewing a sample of older people who had experienced a fire in the past 3 years. The defining criterion for 'experienced a fire' was that it involved the dispatch of a fire appliance following an emergency call.

Step 1: Subject Identification.

Fire information recorded in FIRMS from five Fire Regions¹⁹ was reviewed to identify residential fires involving those believed to be 65 or older in 2003-2005. Key points were –

- The study was restricted to 2003-2006 on the basis that earlier fires were likely to present difficulties in locating victims and they may have had problems recalling the event with any clarity.
- A short list of potential cases was produced for each Fire Region and regional management was approached to assist with the next stage.

Step 2: Initial Contacts.

With assistance from regional management, the short list of potential cases was given to nominated local fire personnel. Identified victims were then approached to see whether they were interested in participating in the study and to confirm they met the study criteria (ie. were age 65 or over). Each was advised from the outset that participation in the study was voluntary. Fire personnel making these approaches were mainly Fire Safety Officers with some others involved if there was local knowledge of an incident. Key points were –

- A number of fire events identified from FIRMS were minor and where the NZFS response was largely precautionary (eg. small fires in rubbish or grass).
- Many subjects were not aged 65 or older which raised questions of the reliability of the source data.
- A large number of subjects could not be located. Many were reported as having moved away, gone into family or residential care, or had died in the intervening period. The deaths were not directly attributed to effects of the fires.
- A small number declined to participate.
- A small number agreed to participate but were located in distant areas that limited access by the researchers.
- The most positive responses resulting in participation in the study came as a result of direct contact by experienced NZFS personnel.
- In total only 11 subjects were interviewed involving 8 fire incidents - 6 of these were couples.

¹⁹ These were - Arapawa, Eastern, Western, Trans Alpine, and Auckland Fire Regions

Step 3: Interviews.

The researchers contacted each subject and arranged to meet with them in their homes. Only one researcher was involved in each interview. The interviews took up to 2 hours. All interviews were recorded for later review. Subjects were advised of their right not to answer any questions they did not wish to, that their identities would be kept confidential, and that all notes and recordings would be destroyed at the end of the project. Each signed a consent form agreeing to their participation. Key points were –

- There was variability in the severity of the fires, with some experiencing minor events that were easily contained, while others had major fires that resulted in total destruction of their home, and a fatality in one case. It was not possible to reliably select subjects on the basis of fire severity from FIRMS information.
- All subjects were willing to discuss their experiences, with many retaining detailed information about the fire and its consequences for them.
- Recording the interviews was not seen as intrusive and was a useful method for later review purposes.

The interviews were structured around a series of questions to elicit detailed information from the subjects (see **Appendix A** for the Interview Schedule). The main interview themes were –

1. **Context of recent fire incident.** This sought information about the time, place, and those involved in the incident.
2. **Experience of fire.** This examined who was present, where the fire started and was first detected, the spread of the fire, reactions and responses to the fire, exposure to smoke and flames, injuries, and fire service response.
3. **Consequences of fire.** This explored the consequences for each subject of the fire including property loss, injuries and treatment, pets and special items, effects on regular activities, and personal consequences.
4. **Looking back at the experience of fire.** Retrospective views of the fire were traversed including the way people responded to it, fire service responses, current thoughts on risks of fire, consequent changes to behaviour, and ways in which others might consider the risks of fire.
5. **Personal details.** This included a range of personal details relating to work status, income, ethnicity, health status, smoking, and mobility.

Presentation of Interview Findings

The interviews guaranteed all subjects confidentiality. Accordingly each interview is summarised as a vignette in which key experiences are highlighted, but identities and locations are disguised. The letter assigned to each subject does not have any relationship to their identity. The use of vignettes reflects the variability of the experiences of those who participated in the study and the different features of each fire. The nature of narrative accounts lends a particular context to the experiences of the fire victims which is not apparent in fire incident report summaries.

5.2 INTERVIEW FINDINGS

Interview 1: Mrs J

Mrs. J is a widow, aged 71, who lives with her adult son in a semi-detached brick bungalow on a corner section in a suburb in a major city. She has lived there for 20 years. In mid-2005, at 3 pm, while she was out shopping locally (she said she was out for only 20 minutes), a fire broke out in her kitchen. She returned to find a fire engine and police car at her house and quickly telephoned for her son. A neighbour took her in and gave her a cup of coffee as she was “*freaking out*”. Her son arrived within a half an hour but no one was allowed inside as the fire had spread to the whole house. Fortunately no one was hurt as the house was unoccupied. It appears that a neighbour or people passing must have seen the smoke as a window blew out. There was a great deal of smoke but not many flames.

At first Mrs. J had no idea what could have caused the fire, but the fire officer said that a pot on the stove had exploded. Mrs. J remembered that she had been melting lard on the stove, preparing to roast a chicken, and thought she had turned the element off. She said:

“It was the only thing I could think of (as a cause). I thought I was alert for my age, but my son said I was getting old. I realised that age was affecting me.”

Looking back on the fire, Mrs. J says that the fire service and the police were very good and kind and did a good job.

Two insurance companies were involved (for the house and contents). They came and arranged a motel for Mrs. J and her son and then an apartment, where they stayed for four months. The claims process went on for a long time. The house was not quite finished when they moved back in, and Mrs. J found all this very stressful. Most of the household contents were replaced, but precious souvenirs from overseas were lost, as well as treasured family photos – especially those of Mrs. J when she was young - and sports trophies.

Mrs. J is feeling some long-term effects of the fire. Although she has no significant sensory or physical impairments, there have been psychological effects. She feels she has lost confidence and slowed down. *“I think a lot more now before I do anything and take more time”*. Her son tells her to check everything, which she does. She always tries to stay close when the stove is on. She cut down on her voluntary work, keeping it on once a week for a while to take her mind off her worries, but has now ceased altogether. *“I feel I aged a lot – I feel really old now – mentally.”* Her main occupations now are reading and gardening.

Interview 2: Mr and Mrs S

Mr and Mrs S, both in their mid-seventies, live in a detached, brick and tile 1950s suburban house in a major city. They have been there 33 years. They both consider their health is very good, although Mrs S has arthritis and some mobility problems. They have a grandson staying with them frequently and he (then aged 3) was there when the fire began, at 3 pm on a day in mid-2005. They were in the living room, but there was a pan of fat on the range, ready for cooking to start. Mrs. S went to the kitchen and saw flames and smoke. She grabbed a towel and threw it over the flames, but missed. Meanwhile, their neighbour's son had seen the flames from the outside. He came in and told them to get out. He brought a hose and put out the fire, which had spread up through the range hood to the ceiling and back wall of the kitchen.

The door to the living room was closed so the smoke only affected the kitchen and back porch – no one was affected by it or by the flames and no one was hurt. Their neighbour called the fire brigade, who came in about seven minutes. The fire had been put out by the neighbour's son, who had been outside saying goodbye to his mother when he saw the fire. The fire service checked the roof and brought a fan to suck the smoke away. They later cleaned up the water and generally gave excellent service, in the opinion of the couple.

Mr and Mrs. S were able to stay in their home. They lost kitchen equipment, the stove and range hood and the microwave oven was blistered. These were all replaced under their insurance and they were also invited to replace their curtains, which had been smoke damaged. They are now a lot more careful and watchful in the kitchen, and have acquired a fire extinguisher, but there have not been any long-term effects on their lives. (Their grandson was affected for a while, becoming afraid when he heard fire sirens.) They are very appreciative of having good neighbours.

Interview 3: Mrs R

Mrs R, aged 89, and her husband, acquired their detached bungalow in 1946 when he returned from the war, but she has now been a widow, living alone, for 20 years. The fire happened only a couple of months before the interview.

That afternoon Mrs R had been in the garden, came in for tea about 4.30 pm and noticed nothing amiss until she opened the cupboard next to her enclosed wood fire, to get a tissue. There was a puff of smoke and the smoke alarm in the hall went off. She didn't try to put the fire out, but closed the cupboard door and rang 111 for the fire brigade. There did not appear to be any flames and she didn't smell anything, but the smoke was beginning to spread. Nevertheless she remained standing in the kitchen. When the fire service arrived she went outside so she didn't know in detail what they did, but she saw a device which sucked out the smoke. Mrs R was very pleased with their service and glad that she lives so close to the fire station.

No one was hurt and there was little damage except to the inside of the cupboard door and to a hearth brush which was hung up in the cupboard. Mrs R didn't make an insurance claim. It appears that a spark from the hearth must have been picked up by the brush and had been smouldering in the cupboard. It was amazing that a stack of newspapers in the cupboard, used to light the fire, had not caught alight.

Mrs R is now very much more aware of how easily fires can start and is very careful to always check the brush, by running her hand over it, before she puts it away. She also takes care to turn off all heaters before she goes to bed. Mrs R is subject to diabetes and has had several small strokes. She recently ceased to drive because of her health and receives some assistance to go shopping. She has difficulty hearing and is limited in her ability to walk and do anything strenuous.

Interview 4: Mr F

Mr F is 84 and lives alone. His detached house is in a major city suburb where he has lived for 55 years. It is not well kept and cluttered. He moves slowly, walking with two sticks and is blind in one eye. His very severe physical limitations may be related to a childhood illness.

In early 2003, Mr F was in his living room after tea, about 6 pm, when there was an explosion and mass of flames in his adjoining kitchen. A pot of oil, which he had used to make chips, was on fire. He threw water on the fire, from bowls in the sink and dragged the curtains down over the pot. He *“had just about had it”* when the fire was out. *“I was lucky I never fell over”* he added. It appears that instead of switching the element off, as he had thought, it had gone further and was on high again – *“It should only be able to go one way”* said Mr. F. His neighbour saw the fire from his window and called the fire service. They came within 5-6 minutes, but the fire was then out.

In the course of putting the fire out Mr. F was affected by the smoke and was burned on his hands and wrists and the top of his head. He was taken to hospital and was away from home for nine weeks. He required skin grafts and developed an infection in his leg from where the grafts were taken. Later he stayed with his daughter and had care from a visiting nurse.

By the time he returned home the kitchen was *“fixed up”*. The range and kitchen curtains required replacement and a cell phone was destroyed. Mr F didn't have insurance so he replaced only the range and paid for it himself. Now he has no telephone. He was most concerned about the loss of his RSA badge, which was on the window sill – *“I don't know what happened to it.”*

Even before the fire Mr F was limited in his mobility. He gave up driving after an accident, because of poor eyesight, but uses a mobility scooter for local trips. He used to go to a club, but it is too far away for the scooter. His daily life has not changed although he is more cautious now and checks the stove more thoroughly. His new stove has lights which show when the element is on (but he says this is not why he chose it). Mr F's daughter bought him a 'safe fryer' which he uses to make his chips now. He thinks that if he had another fire he would *“just get out”* rather than trying to extinguish it. He can exit the house only through the kitchen via the back door. He cannot use the front door because the steps outside are too high and it is blocked up inside.

Interview 5: Mr and Mrs C

Mr and Mrs C live in a well-appointed house on a hillside section on the outskirts of a major city. They are both in their mid-seventies and have been in residence 10 years after working overseas.

In early 2006, mid afternoon, Mr and Mrs C were getting ready to go to the airport and away on holiday. A plastic buckle on a suitcase strap would not fit, so Mr C used a heat gun on it. When it still didn't work he threw it into a rubbish bag in his garage. They were both upstairs in their bedroom when they heard a bang. It was the rubbish bag falling into the recycling bin. Then they saw smoke coming from under the house, where the garage was located. There were flames spreading up into the garage walls and ceiling. Mr C took a nearby hose and extinguished the fire. He was helped by a plastic water main above the fire which melted. In the garage there was a petrol can, three-quarters full, a weed-eater with petrol in the tank, and two gas bottles, as well as the car itself. Luckily none of this ignited. He had been advised against having a smoke alarm in the garage because he had been told it could be activated by exhaust fumes.

Mr. C threw out the red hot petrol can and badly burned his hand in the process. Smoke came up into the house but neither was affected by it, as by then both Mr and Mrs C were down in the garage. A neighbour saw the smoke and called the fire service which arrived within five minutes. They opened the garage and house lining to check that the fire was out. An ambulance was called and Mr C's burns were attended to. All the services "*were great. You could not fault them.*"

Mr and Mrs C remained in the house but cancelled their trip until the next day. Nothing major was lost in the fire "*the weed eater was the most expensive thing and two old deep freezes*", although wiring and plumbing had to be replaced. This was all done under insurance. Since then Mr C has bought a fire extinguisher and moved the gas bottles. He says he has learned lessons about putting hot things in rubbish bags and also grabbing things that may burn. In a less serious vein he has had to "*live down the reputation of being a fire bug.*" On reflection, he felt he was distracted by having to catch a plane. On the other hand, he and his wife were physically capable, with no significant limitations, which might not be the case for other older people.

Interview 6: Mrs K

Mrs K is 75 and lives with her son, who is in his forties, in a detached brick bungalow in an outer suburb of a major city. She has been in this house for 50 years. In mid 2004 about 2 pm, she was alone, in her sitting room reading, when there was an explosion and the smoke alarms went off. She wasn't sure what to do. There seemed to be a fire in the heat pump, spreading to the ceiling. Mrs K used her fire extinguisher but this didn't put it out, so she called a neighbour in and he said to ring the fire brigade, which they did, from Mrs. K's phone.

Mrs K stayed in the house but was not affected by the smoke or flames, although her neighbour was, and he went out. The fire service came quite soon (Mrs K was not sure how long it was), and told her to get out. They used hoses to extinguish the fire. It appears that the fire was the result of faulty repairs to the heat pump, which had only recently been attended to.

As a result, Mrs K and her son had to vacate the house and stayed in a nearby motel for a fortnight. The living room carpets, curtains, lights, a book case, TV and the heat pump all had to be replaced which was done through insurance. Mrs K “*went funny*” and had a fall after the fire and had to go to hospital once or twice. She thought this was the result of the fire although she had suffered a stroke several years before and her speech, hearing and mobility have been affected. Her health had therefore limited her activities even before the fire and she didn’t perceive any long-term effects from it. She was grateful for the help forthcoming from her neighbours, the fire service and the insurance company. The fire was clearly not the fault of Mrs K and the only advice she has for other older people is to “*use their common sense.*”

Interview 7: Mr and Mrs L

Mr and Mrs L, aged 70 and 64 respectively, live, with their adult son (then aged 39), in a single storey wooden house in a southern suburb of a main centre. About 10 pm one evening in mid 2005, the son cooked himself a “fry-up” in the kitchen, which is an extension to the main house. Smoke from the cooking set off the alarms and Mrs L came in and opened the windows to let the smoke out. The three of them went to bed. At 1.20 am, the smoke alarms (2 of them) went off again and woke Mrs L who roused her husband (who is hard of hearing) and son. They saw a “*wall of flame*” in the kitchen. Mr. L ran for the hose which he put in through a window but this didn’t produce much water and he then telephoned for the fire service. The son threw buckets of water on the kitchen wall and cupboards and succeeded in putting out most of the visible flames.

The fire service arrived within 5 minutes of the call coming in (Mr L quoted this from documents he had been given), as the station is close by. They took off the roof iron in the kitchen and hosed it down. There were apparently two ‘hot spots’ still smouldering and the cause of the fire appeared to be sparks from the cooking, which had gone up the flue. The fire was contained by fibre cement boards on the outside of the kitchen so that it did not spread to the conservatory or the rest of the house.

The son, who was nearest to the fire felt some effects of the smoke a while afterwards, even though he had covered his nose with his jersey. Mrs L was concerned for her cat, which had fled under the house, but was unhurt. Mr L tripped over the hose and fell outside, but it was “*only a scratch*” which didn’t need further attention. All three of them left the house when told to by the fire officers. It was only afterwards that they realised that all of them had walked past the fire extinguisher and had not thought of using it!

Mr and Mrs L had insurance and the fire officer advised them to inform the company as soon as possible. There was an inspection the next day and cleaners and other trades people moved in to help put things right. For a while the family had to manage without a kitchen, but they were resourceful and used an outside gas cooker, as well as eating at the daughter’s house for several days. They lost the stove, microwave, sandwich maker and kitchen fittings (bench top, cupboards, blinds). All were replaced under insurance. Mr L joked that “*it was a good way to get a new kitchen*” (the previous one dated from 1965). Mr and Mrs L had great admiration for all those who worked on the renovations as well as the fire service. They were also thankful for the smoke alarms “*they were worth their money in gold*” said Mr. L.

Looking back, the fire gave them “*a wake-up call*” and they are now aware of fire risks and less complacent. They would advise other older people to have smoke alarms, avoid radiant heaters, to be very careful not to leave cooking unattended and to shut off electric blankets and heaters.

Interview 8: Mr V

Mr V is aged 86 and lives alone in a detached bungalow in a provincial city. He had lived with his wife in the property for over 26 years. In 2005 Mr V and his wife had just prepared their evening meal when she saw flames coming through an entrance to the kitchen. Mr V got a fire extinguisher but found it would not work. The fire continued to grow and he told Mrs V to call the fire brigade. *“All of a sudden it went up boom – it chased me out - burned the top of my head and arm”*. The fire spread very rapidly and trapped Mrs V in the room. Mr V was unable to get back into the house as the flames were too fierce. Shortly afterwards the roof cavity exploded. He heard his wife cry out from inside but was unable to assist.

The fire service responded quickly and extinguished the fire. Mr V was taken to hospital by ambulance with burns and was later released into the care of his son. Sadly Mrs V did not survive the fire and was found inside the house near to where the fire was first noticed. Mr V was unable to return to the house as it was totally destroyed and a replacement house had to be built. He moved into the new house seven months later which was rebuilt through an insurance claim. Mr V specified the new house had to have two doors for safety reasons. *“If there’s a fire you have got to get out. If you haven’t got two ways out you’ve had it!”*

Mr V reports several health problems for which he takes a number of medications. He also has difficulties with his eyesight and moves about with some difficulty. He suffers from diabetes and has had problems with anaemia. He says he sometimes has trouble remembering the sequence of medications he must take, and that some make him feel *‘funny’* after he has taken them. He reports ongoing psychological reactions to the fire including recurring memories and difficulties with sleeping. He said *“My nerves are shot since the fire”*. He greatly misses his wife and harbours remorse that it was he who left the frying pan on an active element on the stove. He reported two previous incidents with small fires in cooking pots prior to the main fire. One caused burn marks on the linoleum floor of the kitchen.

The fire destroyed nearly everything in the house including photos and family mementos. A work shed at the back of the property was spared; however, Mr V now reports little interest in the hobbies he used to pursue in the past. While he finds the new house comfortable it does not seem as homely as the old one to him. While a wall mounted heat exchange unit is very efficient he says the noise it makes affects his hearing and requires him to have the TV on at a louder level. He derives pleasure from a neighbour’s cat which spends most days with him – he says the company is very welcome.

There was a smoke detector in the old house but it failed to activate when the fire ignited. Mr V said he was not sure that detectors are very reliable although there are two installed in the new house. He reports the response of the fire service to the fire was very good, and that of the ambulance.

SUMMARY OF INTERVIEW FINDINGS

The interviews highlight several fire risk factors. Many of these are not unique to older people. However, some features of these eight fires parallel circumstances and outcomes identified in the study of fire fatalities in Section 4.

Time of Fire: All except one fire occurred in the mid afternoon-early evening. The exception occurred at 1.20 am but resulted from an earlier cooking incident that took place about 10pm. Significantly, at the time these fires started most subjects were engaged in routine activities in their homes when a majority of the population were at work, school, or otherwise away. As Iwarsson *et al* (2007) note, the daily activities of older people are predominantly performed in the home and its close surroundings and this suggests that the potential for fires may be more evenly spread throughout the day (as is noted in Section 4).

Cause of Fire: Seven of the fires were attributed to actions of occupants (including a son in one case). One fire resulted from faulty repairs to a heat pump after recent servicing. Like most residential fires, human agency was apparently the prime causal feature in fire ignition arising from carelessness or acts of omission. Five fires resulted from unattended cooking and involved ignition of oil or fat. One arose from a spark smouldering in a brush, while the other was caused by careless disposal of a smouldering plastic buckle. The causes of these fires are not unique to older people, as unattended cooking is a major fire risk, with overheated oil or fat as the principle ignition agents (Miller, 2005).

Appliance Faults: Two fires apparently involved appliance faults. The ignition of a heat pump was attributed to poor servicing and could cause a fire in any residence. One cooking fire was believed to be the result of an element control which was unintentionally advanced from the '*off*' position to the '*full*' position. This appears to be a dangerous design feature which was also noted in a Focus Group. A product standard review may be appropriate to prevent accidental turning on of electric stove elements.

Neighbours Actions: Neighbours played significant roles in five fires by assisting the occupants, or calling emergency services on seeing smoke/flames. Assistance included putting out the fires in two cases. If the occupants had been reclusive, or lived in isolated settings, there may have been different outcomes due to minimal interactions with others as is noted in studies of fire fatalities (Miller, 2005).

Occupant Responses to Fire: In five cases the occupants fought the fires to varying degrees. This involved them remaining in close proximity to the fire for some time. The potential for dangerous exposure to smoke and other toxic products was thus heightened. One occupant did not fight the fire but remained in the house until the Fire Service arrived. Another fought the fire and put it out but reported he was exhausted by the effort. Contrary to fire safety advice, a significant number of occupants (and neighbours) acted to put out the fires using extinguishers, hoses, buckets or other means. In two cases the fire extinguishers were not operative, and in another the occupants overlooked an apparently functional extinguisher. The extent that occupants fought the fires supports Brennan and Thomas's (2001) view that human responses to fire are interactive, rather than reactive, in which fire fighting is common despite fire safety advice to the contrary.

Smoke Alarms: The value of smoke alarms is highlighted in these cases. Alarms were activated in three fires, rousing three sleeping occupants in one case. One alarm failed to activate, while in four cases no alarms were installed or information is not available. The alarm which roused the sleeping occupants very likely saved their lives given the high potential for the spread of the fire to the roof and wall cavities.

Occupant Injuries: The severity of the fires varied from minor damage in contained areas to the total destruction of a house, which also resulted in a fatality. Even relatively minor fires resulted in burn injuries in two cases. There were some reports of occupants and neighbours being affected by smoke. One older occupant reported falling over a hose though without injury. These fires all contained a potential for serious injuries, which could have occurred regardless of the age of those involved. The significance for older people is the risk that burns or smoke inhalation may require a substantially longer recovery period, as one occupant reports, with skin grafts and an infection in the area from which the grafts were taken.

Property Loss: The severity of the fires resulted in considerable property loss in some cases. In the worst case the whole house had to be demolished and rebuilt. In other instances property damage was confined to household items located at the seat of the fire. Losses were largely covered by insurance although one occupant was not insured and suffered material loss as a result. A particular factor in two cases was the loss of treasured personal items – photographs, trophies, souvenirs and the like – as these were irreplaceable.

Psychological Consequences: The accounts of occupants suggest there were significant psychological impacts from the fires. These ranged from concerns about future recurrences to losses of confidence, ongoing feelings of responsibility, post-traumatic symptoms, reduced interests in previous activities, and greater vigilance around routine daily activities like cooking. Many report generally becoming much more careful in their day to day routines.

Fire Service Responses: There was a universal approval for the way the Fire Service responded to the emergencies and in the clean up that followed. Most commented on the promptness of the Fire Service response.

**SECTION 6:
FINDINGS OF FOCUS GROUPS
OF OLDER PEOPLE**

SECTION 6: FOCUS GROUPS WITH OLDER PEOPLE

Three focus groups were held with older people. These were arranged through organisations for older people in the Kapiti Coast, Porirua, and Masterton²⁰. In the following discussion the groups are referred to by these place-names. Each focus group followed a structured format in which participants were asked to consider questions relating to fire risks and older people in general, moving into the specific risks which they can identify in their own homes and well as initiatives which they themselves have taken.

i. What are the main risks for older people in relation to fires at home?

Most of the responses related to risky behaviour on the part of the older people themselves. All groups mentioned forgetfulness or carelessness, giving examples such as leaving cooking unattended on active rings on stoves, getting distracted while cooking, leaving heaters on or putting heaters close to flammable material (for example, when drying clothes). Porirua added tripping over the cord causing the heater to fall, covering lampshades and drinking too much, hence not being aware of what is going on. Kapiti and Porirua both mentioned smoking in bed and not putting out butts properly.

Worn, faulty, and dangerous electrical appliances were identified as risks by Masterton, commenting on defective electrical circuits, faulty electric blankets and excessive loading on multi-plug boxes. Many of the risks related to home heating (Masterton giving an insightful list) – portable gas heaters causing clothing to catch fire, open and log fires with loose coals and sparks, doors left open on enclosed solid fuel heaters.

Other points raised were difficulties encountered by older people in reading safety warnings on appliances (Masterton) and using candles when people are unable to afford electricity (Porirua).

ii. In what ways are older people especially susceptible to fire risk?

Reduced physical, mental and sensory capacities among older people (usually referring to people much more advanced in age than the focus group participants!) made them more susceptible. Specific conditions included:

Physical limitations:

- difficulties with reduced mobility;
- slower movement making it more difficult to escape from fires;
- older people may not be able to crawl out because of disability, even if they know the “get down low” message, and not everyone does know this;
- many old people would not be physically able to escape through windows, especially given problems with locks, blinds and curtains.

²⁰ The focus groups were held in late 2006, with WOOPS, Masterton (Wairarapa Organisation of Older People) on 29 November, an invited group at the Kapiti Community Centre, Paraparaumu (4 December), and the Porirua City Council’s Older Persons Advisory Group (5 December). In all there were 24 participants, 16 women and 8 men, including some community workers/organisers.

Mental limitations:

- failing memory leading to risky actions;
- forgetfulness or confusion, for example being easily distracted when cooking.

Sensory limitations:

- failing eyesight and hearing (they may not hear smoke alarms).

These three can come together to create difficulties in escaping fires. Masterton noted that older people may be more susceptible to smoke and Kapiti that medication may impact on their being able to hear an alarm or get out. Environmental factors were mentioned by Porirua – older people living alone, with no one else to keep an eye on or help them and also lack of support, which may mean that their homes are not cleaned adequately – aggregated rubbish can produce a fire hazard.

iii. What can older people do to protect themselves from fires?

Many eminently practical and useful suggestions were forthcoming, although participants' replies suggested that they had not always acted on their own advice. There were also qualifications to the advice, noting that many of the suggested initiatives required expenditure, which might cause problems for older people.

- Ensure appliances are checked. But there is the cost of checking and finding someone to undertake this work, especially if appliances are large or bulky.
- Electric blankets should be turned off when people go to bed, never be used when no one is at home, and regularly checked or replaced.
- Have regular safety checks in the home by someone who can suggest improvements or who can identify other risks. Advice on safety and operating costs of heaters would help to lower fire risks.
- Older style heaters are cheaper to purchase even if they have a higher fire risk. Costs of under floor heaters are a barrier to this form of heating even though it is a safer option. Place infra red heaters on walls to reduce contact risks.
- Check on the storage of firewood to ensure ease of access. The cost of firewood is a consideration for older people.
- Fire blankets were identified as very good for small kitchen fires.

Other initiatives require mobility or knowledge about technology, which may be a problem for older people:

- Smoke alarms in the right place (not just kitchens) and check batteries regularly. Install more than one smoke detector, with a minimum of two. There can be problems with having batteries checked, as this usually requires ladders and mobility to do so. In some areas the Fire Service will come and change the batteries if people are unable to. All the Porirua group members had smoke detectors, some linked into the main security alarm, but this was not the case for all other participants.
- Several people mentioned that having fire extinguishers was a good idea but only a few participants had them, many had never used one, some were not sure if they would be able to. One man pointed out that there are different extinguishers for different types of fires and not everyone knows this.

Other initiatives were suggested, which older people could usefully take up:

- Have a plan of your exits and how you can get out.
- Build good relationships with your neighbours as they may notice a fire first and be able to help you to get out (this advice was borne out by stories related in the interviews).
- Have a phone next to your bed.
- Place guards around fires and heaters to prevent clothing catching fire and as additional protection in the event of a fall.

iv. Can you identify any fire risks in your own home and what steps have you taken to prevent fires?

Although none of the focus group participants had had personal experience of fire (except for the Porirua woman who had left a pot on the stove while she was on the phone), they showed awareness of risks, some of which have already been mentioned, such as forgetting to turn heaters and the stove off. Other instances included:

- Sunlight masking a burning flame on a gas ring, risking burns;
- Placing too large pieces of wood on open or log fires;
- Faulty plugs (one woman had hers replaced after a friend's experience with old wiring);
- Poor or worn wiring in electrical appliance leads;
- Toaster set too high;
- Lack of an exit from all areas of house;
- Design of stairwells impeding egress.

In Kapiti, one woman told how, when her smoke alarm went off, she rushed to find the source of the fire and tripped. Her point was that it could have been more serious and she could have been injured and not able to get out safely. A man in Kapiti gave the story of how use of a magnifying glass can cause a fire. This had happened to a woman known to him and a patch of her carpet ended up burnt. The Porirua group noted a tension between the desire for security and being able to get out if needed. People had installed deadlocks and window locks and then wondered about a plan of escape.

The participants had taken a range of initiatives, many of which they recommended to others and which are listed in a previous section. They are summarised below, by area.

Masterton:

- Have electric blankets checked yearly;
- Ensure fire wood is the correct size for the fire place;
- Check each night before retiring that all appliances are off and heating is safe.

In one case, a participant had discussed fire safety with his very old father, resulting in his open fire being removed and replaced with a safer heating system.

Kapiti:

- Have smoke alarms (one woman had taken out the batteries because they made a noise. The rest of the group encouraged her to contact the Fire Service to look at the problem);
- Become confident about using fire extinguishers and have them checked regularly;
- Have a fire blanket in the kitchen for small fires;
- Remove cordless phones from bedrooms as they rely on electricity and in a fire they may not work (a man had done this on the advice from the Fire Service);
- Plan escape routes (this caused a great deal of discussion as many people were more concerned with someone breaking into their home than with fire risk);
- Turn stove off at the wall when not in use;
- Dispose of oily rags carefully.

Porirua:

- Have smoke detectors;
- Have fire extinguishers (many in this group were confident in using them);
- Have a household plan of escape;
- In this group the majority did not use electric blankets because of the risk of fire.

Recommended solutions to reduce the fire risk affecting older people

The focus groups came up with a wealth of suggestions for community and government action which are well worth listing in detail.

- Arrange for home inspections to check for fire risks, perhaps organised through a local age support organisations and/or in conjunction with community-based home support and health services. This might extend to checks of electrical appliances, especially electric blankets. Fire safety checks in the home might also be linked with assessment of wider risks to prevent falls (loose carpets and rugs, dangerous electrical leads, etc).
- Develop education campaigns and information about fire safety in homes. Older people may need information and training on the safe use of appliances and equipment, planning escape routes and about what to do in case of small localised fires, such as on stove tops.
- Design with safety in mind. This would include design of appliances, such as stoves (front located controls are better than rear located controls to prevent burns and spills). There may also be design solutions to address difficulties in getting out of the home in an emergency, especially in relation to locked deadlocks and door and window latches. This could also include improving building materials and home furnishings, so they are more fire resistant.
- Building up neighbourhood networks to support and help protect older people.

**SECTION 7:
DISCUSSIONS WITH HOUSING
AGENCIES AND ACC**

SECTION 7.1: DISCUSSIONS WITH HOUSING AGENCIES AND ACC

The experiences of housing agencies and ACC provide an insight into the nature of behavioural problem in residential settings, including those with older people. These agencies fulfil an essential social function in providing accommodation for disadvantaged groups such as the homeless, disabled, low income, unemployed, and immigrant communities. Housing and social agencies have insights into the types of problematic behaviours exhibited by tenants, including fire risks. Approaches to two housing agencies (Housing New Zealand Corporation and Wellington City Council City Housing) and the Accident Compensation Corporation, Wellington Region, resulted in discussions around generalised areas of fire risks.

a). Housing New Zealand Corporation

Discussions with the National Compliance Manager and Wellington Region managers traversed a range of problem issues. It was noted that only a small number of HNZC tenants are older people. In general it was believed fires were a problem although few incidents requiring NZFS responses were noted. This observation raises the question of the extent and nature of minor fires in tenancies and the likelihood that the tenants themselves were instrumental in extinguishing these before they reached a magnitude that required NZFS involvement. Several key themes were identified as problem issues -

Heating Needs: This was a significant problem because-

- Some tenants were often disconnected from power supply as a result of unpaid accounts. This contributed to the use of candles for lighting and inexpensive gas burners for cooking with commensurate increases in fire risk.
- Others were prone to inefficient use of electricity such as using electric ovens and cooking rings as heating sources, extending to using these to dry clothes and bedding with consequent implications for increased fire risks.
- The misuse of stoves for heating resulted in one fatality when a tenant suffered crush injuries to the chest when a stove fell on her after she sat on the open oven door to warm herself. This tragedy has resulted in all stoves being anchored at the back to prevent tipping over.
- Older tenants were often set in their ways and persisted in using open fires as heating sources, often with concurrent unsafe practices that increased fire risks. Examples included using oversized firewood that was not contained within a firebox/grate.

Cooking Fires: This was a problem where –

- Tenants with disabilities persisted in cooking on their own as an expression of their independence despite advice to the contrary.
- Unattended cooking fires were noted, although most did not result in Fire Service attention. Tenants often put these out on their own despite this being a risky activity. Housing managers often learned of these incidents weeks after the event when clearly evident fire damage was detected during inspections.

Smoke Detectors: Although HNZC policy is to install smoke detectors in all properties there are problems with these.

- Tenants frequently disable smoke detectors because of poor cooking techniques that produce smoke which results in recurrent (and annoying) activations. This problem was considered more prevalent in younger tenants rather than older ones.
- Some groups, particularly immigrants, were not aware of the purpose and functions of smoke alarms and did not recognize the significance of their activation.
- Removal of HNZC smoke detectors is considered a problem across all tenancy areas requiring vigilance on the part of managers to ensure adequate levels of protection are available. Non-replacement of flat batteries has been noted also in properties which use this form of smoke alarm.

Misuse of Electrical Circuits: There were concerns expressed over the potential for tenants to misuse electrical circuits such as -

- Overloading wall sockets with multi-plug boxes causing a high fire risk through effects on fuses and circuit breakers. This risk suggests an increase in electrical sockets in each property as a remedial consideration with a minimum of two wall sockets per room as a standard. The problem is most frequently associated with younger tenants rather than with older people.
- Some tenants use electric rings to light cigarettes, either directly or with lengths of paper as tapers.

Mental Health and Behavioural Issues: These were identified as a particular area of concern, especially as managers often encountered problems when they visited properties. Issues of concern included -

- HNZC has a significant number of tenants with disabilities. These include those who previously were in institutional care and have now moved back into the community.
- Problems with alcohol abuse causing carelessness and poor judgement and increasing fire risks.
- A small number of tenants who were pathological hoarders and whose properties required regular clearing to reduce the fire loadings from stacked materials such as boxes, paper, and wood. While few in number these tenants exhibit persistence in this habit and are highly resistant to efforts to make them desist.
- Some tenants appeared to have little insight into their own contribution to their problems, with little recognition of ownership of their wellbeing. A small number exhibited anti-social behaviour from time to time.
- Other tenants showed poor control in response to emergencies, for example throwing a burning mattress down a stair well thus blocking egress and spreading the fire risk.

Smoking: It was generally believed that smokers were becoming more careful, with many going out doors to smoke. The most problematic smokers appeared to be older tenants who were resistant to change life-long habitual behaviours.

Fire Responses: The National Compliance Manager noted a common tendency for tenants to fight fires in their properties. This included requests for fire extinguishers and hose reel in properties. Tenants appeared to have beliefs that they have the ability to fight fires contrary to NZFS advice to exit as soon as possible.

b). Wellington City Council City Housing

WCC City Housing provides significant amounts of accommodation for disadvantaged people in Wellington. It has a portfolio of around 2,500 properties with some 4,000 tenants, including about 500 with disabilities. There are a number of older tenants, with those over 60 comprising 18.4% of the total. They are considered “fit elderly” who do not require levels of care associated with age residential care facilities. The accommodation portfolio varies from individual single properties to large tenements housing a substantial number of tenants. Problems with fire risks mirror those reported by HNZA, with some differences as WCC City Housing provides a service to the disadvantaged in particular, including those who have come from residential mental health backgrounds and now live in the community.

Mental Health/Welfare Issues: Several tenants are considered to have particular mental health and welfare needs -

- Many are described as “reclusive” and live alone in bed-sit accommodation. These are not seen as being high fire risks.
- Hoarding is an issue with a small number of individuals who add to the fire risk in their tenancies and who require active management to reduce the risks from their activities.
- Alcohol abuse is noted as a problem, especially in middle-aged tenants of both sexes, which adds to considerations of fire risk.
- Many tenants have life skills problems, especially those from institutional backgrounds, including behaviours that contribute to fire risks. Some require supervision and support to enable them to cope, including all aspects of safety in the home.

Fire Risks: The nature of the tenant population has resulted in attention being directed at fire risks, such that -

- All properties are fitted with hard-wired mains smoke alarms to prevent problems with deliberate disabling and flat batteries.
- There are problems with motivating tenants to respond to fire alarms, with many choosing to remain in their flats. This problem is noted with evacuation drills as well as actual incidents. Older tenants feature within this group of problematic responders.
- Cooking fires are noted as a problem, with fires being attended to by tenants themselves. Typically, fire damage is found after an event when properties are inspected.
- Problems with retaining electricity supply are noted with some tenants, which impacts on fire risk, similar to the situation in HNZA properties. Older tenants are included in this group.
- City Housing offers a regular contact service with individual tenants, including daily contact if requested. Older tenants have not taken up this offer to any extent.
- It is proposed to make all tenancies smoke free in the future on a gradual basis, in recognition of smoking as a fire risk.

c). Accident Compensation Corporation Wellington Region

Discussions with an ACC Injury Prevention Consultant provided further background on safety and health issues affecting older people. These included reference to wider issues than just fire, although it was felt they were inter-connected.

In particular, concerns were expressed about the following –

Home Heating: This was a problem for older people as -

- Many lived in older homes where insulation was poor. ACC is concerned that poor insulation leading to cold houses, which encourages risky behaviours such as using ovens for heating, reliance on open fires and older, less safe, heaters. These concerns recognise restrictions imposed by low incomes resulting in poor heating maintenance and non-replacement of inefficient and less safe heaters.
- Although not restricted to older people, there are concerns for those with disabilities affecting mobility. These people require safety screens around fires, heaters, and stoves to reduce the risk of fires and burns.

Risky Behaviours: A variety of risky behaviours were identified -

- Some people tend to accumulate and hoard materials that added to the fire loading in their homes. Hoarding was also noted in other age groups and related to reclusive life styles. Such behaviour not only increases fire loadings but also restricts egress in emergencies.

Restricted Egress: It was noted that the living arrangements of older people often resulted in problems with egress in emergencies -

- Many older people have accumulated possessions in their homes that cause problems with egress and contribute to the risks of tripping and falls. For example, many place rugs over carpets to reduce wear, but in so doing increase the chance of falls and restrictions on egress in the event of a fire.
- Individual assessment procedures consider egress needs for individuals to ensure they are able to escape in an emergency. In some cases this is problematic, with individuals not adopting recommended arrangements about placement of furniture and other items.

Electrical Risks: Those who live in older homes, and in some newer properties, tend to have significant fire risks associated with electrical systems -

- Overloading sockets is a specific fire risk, exacerbated by older people lacking financial resources to have additional sockets installed.
- Using a multiplicity of cords to feed electrical appliances contributes greatly to risks of falls, and from fires due to wear on cords and overloading of wall sockets.
- The use of electric blankets can be a problem for older people. Many go to bed to keep warm. If electric blankets are in poor repair, or are left on for extended periods, this adds to the risk of fire.

Smoke Detectors: ACC supports the use of smoke detectors, especially for older people and those with disabilities. Assessment processes for these people address issues of vision, hearing, and appropriate footwear to mitigate risks in the home.

Resistant Beliefs: Many older people retain resistant beliefs that affect their safety in the home –

- Many believe that open fires are better and more efficient than modern closed door wood fires, despite risks from sparks and coals. These beliefs persist even where the financial cost of substitution with closed door wood fires was not an issue.
- Those affected by dementia and cognitive decline are special cases with respect to safety in the home. In such circumstances resistant beliefs may be associated with the nature of the condition, and require careful consideration. Safety may be a prime driver for people moving into residential care.

Cooking Fires: ACC did not express any particular concern that cooking fires are a common problem for older people although they noted that using fat and oil posed a risk, as with other groups in the community.

**SECTION 8:
FIRE SAFETY INITIATIVES FOR OLDER PEOPLE**

SECTION 8: FIRE SAFETY INITIATIVES FOR OLDER PEOPLE

The vulnerability of various groups to fires in the home is recognised by fire agencies through the provision of fire prevention and safety advice. This is usually offered through dedicated fire safety officers and information programmes. Typically such initiatives use education as a primary strategy with intended outcomes such as - improved fire prevention in the home, installation of smoke alarms, and the encouragement of safe fire evacuation practices. This approach also applies to advice targeting specific at risk groups such as children, young people, those with disabilities, and older people.

8.1: International Initiatives

Most fire agencies provide fire safety and prevention advice. Some promote specific programmes to reduce vulnerability to fire, including older people as a target group. It is not intended to provide an exhaustive list of advice, fact sheets, or programmes from international fire agencies. The following references provide illustrative examples of initiatives in this area:

United States of America

NFPA at - www.nfpa.org/Public%20Education/Remembering%20When

National Safety Council at - www.nsc.org/library/facts/fires.htm

Burn Institute at - www.burninstitute.org/fbp/programs/seniors.html

Poulsbo Fire Department at - www.poulsbofire.org/safety/older-citizens.htm

Burn Prevention Foundation at - <http://www.burnprevention.org/Programs-Services-Burn-Foundation-OlderAdultsFireBurnSafetyProgram.html>²¹

United Kingdom

UK Fire Safety at - www.firekills.gov.uk/handbook/pdf/handbook-english.pdf

Canada

Fire Marshall of Ontario at - www.firesafetycouncil.com/english/pubsafet/older.htm

Union Fire Co at - www.unionfireco.org/Prevention/Seniors/

Troutville Volunteer Fire Department at - www.tvfd.org/retire.htm

Australia

FPPA at - http://www.fpa.com.au/information/docs/safety_seniors.pdf

²¹ These last three are specific to older people.

8.2. New Zealand Initiatives

The NZFS has developed a *Fire Safety in the Home* kit to support fire safety initiatives such as smoke alarm installation and schools-based *Firewise* projects. This kit is available as a general *Get Firewise* programme in addition to specific *Firewise Kids* and *Seniors Firewise* versions. Responsibility for delivery of these programmes is largely devolved to Fire Safety Officers in each fire region acting in concert with stakeholder groups, and support agencies.

Some regions have developed specific fire safety initiatives for vulnerable groups in their areas. Two illustrative examples include:

a. Eastern Fire Region:

The Eastern Region has introduced a *Fire Awareness and Risk Reduction Programme* directed at older and disabled people. It has two objectives –

- To train caregivers to recognise and mitigate any potential fire hazards in the homes and lives of the people they care for.
- To offer specialist advice and an intervention programme to at risk people within this group.

The programme works closely with groups who are associated with older people and the disabled (including organisations with general and specific responsibilities for at risk people). In particular, it has a working relationship with Bay Home Support which is part of the Hawkes Bay District Health Board. The interventions involve two phases –

- Training for caregivers involves around 1-1.5 hours on how to recognise and eliminate potential fire hazards, which is seen as a first line of approach involving those with direct contact with the target groups.
- Individual interventions on the advice of caregivers which address fire hazards in the home and appropriate fire safety responses according to individual needs. These interventions usually include other risks in the home and may also cover assessments of physical, social and cognitive functioning by Bay Home Support.

The programme is collaborative with caregivers and support organisations where fire risks are but one area of assistance to older and disabled people. It has developed specific training materials and does not depend on the *Seniors Firewise* kit.

b. Northern Fire Region:

The Northern Region²² introduced the *Te Kotahitanga Smoke Alarm Project* in response to a high fire death rate in the region which was the highest in New Zealand in 2001. Special characteristics of the region included – that children are the most prominent group in fire deaths, it has the highest rating for the social deprivation index, and at-risk communities are 57% Maori. Therefore the project was specifically designed to address the diverse range of issues that arise when working with communities with strong cultural protocols.

²² Source information was provided by the Northland Region website at http://northland.fire.org.nz/promotions/Te_Kotahitanga.htm

The Kotahitanga has evolved from an NZFS safety focus to incorporate multiple support services to educate low-income/at-risk groups. "Fire Safety Ambassadors" deliver the project as many of the target communities have little infrastructure or access to regular services. These ambassadors are employed through WINZ, based on a 6-month Task Force Green contract. Their main role is to

- provide advice and education on basic fire safety skills
- provide education on fire escape drills and establishing a 'safe place'
- install domestic smoke alarms.

The project has been successful on many levels. Most importantly, fire deaths and injuries in the targeted communities have been reduced considerably. Since the project's inception in 2001, it has led to installation of 115,251 domestic smoke alarms, delivered fire safety information in 34,540 homes (67,963 people). The success of project is based on an innovative collaborative approach, in which multiple agencies aim to engage the communities to improve quality of life and fire safety. Project partners include a number of government and private sector agencies. The project does not use the Elders Firewise kit but rather locally developed materials.

These two examples illustrate the advantages of involving multiple agencies in targeted fire safety and prevention work. The vulnerability of older people is recognised in both, although other groups are also included within their scope. These programmes demonstrate that fire safety can be encompassed within wider initiatives to address other hazards in the home such as falls prevention, sanitation, improved security, insulation to make homes warmer, etc.

8.3. Effectiveness of Fire Safety Training

Fire safety training is an established method of attempting to reduce deaths, injuries and property losses from fire. Typically this takes the form of dedicated programmes for schools and workplaces, television and newspaper campaigns around particular fire safety themes, and general advice in response to specific incidents. Logically there should be advantages from increased public knowledge of fire risks and improved responses that achieve a reduction in fire related casualties. Many reports advocate this position (Brennan, 1999; DiGuseppi *et al*, 2002; Halpern & Hakel, 2003; Proulx, 2003; Huseyin & Satyen, 2006). However, despite relatively long-standing fire safety training initiatives there are reports that *"indicate a lack of fire safety knowledge, delayed threat recognition, and delayed evacuation among the general community, especially among younger and older persons"* (Huseyin & Satyen, 2006). These authors cite a number of studies that highlight this shortfall in fire safety knowledge (eg. Brennan, 1999; CFA & MFB, 1999; Melbourne Metropolitan Fire Brigade, 2001; Proulx, 2003).

The central issue is the perceived importance of fire safety knowledge to prevent, and appropriately respond to, fires. There is wide support for education and training initiatives to increase the community's fire safety knowledge which includes retention of *"an adequate level of knowledge about the importance of maintaining functional fire safety equipment."* (Huseyin & Satyen, 2006). These authors cite several studies which reveal *"that the general community does not retain an adequate level of fire safety knowledge and acts dangerously (e.g., leaving cooking unattended or placing flammable material too close to the heater), which puts them at greater risk of being involved in a fire."*

In particular, Huseyin & Satyen report “*younger and older persons especially lack sufficient fire safety knowledge and act in ways which puts them at greater risk of fire-related burns and deaths (CFA & MFB, 1999). This has eventuated in these individuals having a higher fatality rate than other age groups (National Safety Council, 2002). These age groups could have a greater risk because of their reduced ability to respond accurately in the event of a fire which could be because of their limited cognitive capacity, information processing ability, and ability to conceptualise information correctly (Kose, 1999; Satyen, Sosa, & Barnett, 2003; Sternberg, 2001). This risk further accentuates the importance and effectiveness of fire safety training.*”

There are a number of difficulties with these conclusions. While studies demonstrate that fire safety training is effective (Walker et al, 1992; McConnell *et al*, 1996; Gamache, 2001; Satyen et al, 2003), no follow up studies appear to have been conducted to determine the long-term durability of this training. A further assumption is that in the case of older people their higher risk from fires is simply attributed to cognitive deficits which are seen as being similar to those of young people. This may apply to those with age-related dementia but it is questionable that it applies to all older people, as it takes no account of such factors as the effects of age-related limitations in mobility, health conditions and medication use, the consequences of being on low incomes, and lessened social contacts, see Section 3.

Huseyin & Satyen’s approach contains an implicit assumption about human behaviour and risk awareness which permeates other safety and injury contexts and not just fire prevention. This assumes that all individuals are universally rational and risk averse, and equally responsive to fire prevention (or other) messages that endeavour to change risky behaviours. The veracity of this assumption is questioned as a complexity of psychological, experiential, educational, economic, and cultural factors apply to the ways in which individuals and groups respond to risks in their environments (Miller, 2006). It is argued that fire safety and prevention training should recognise that a complexity of values and beliefs affect knowledge transmission and acceptance among target groups and individuals. This applies to all groups and avoids simplistic assumptions including the assumption that heightened fire risks simply reflect cognitive deficits in older people.

Improving the effectiveness of fire safety training is discussed by Gamache (2001). This describes the development, testing, implementation, and evaluation of National Fire Protection Association fire safety programmes designed to reach young children, older people, and low income communities. The approach adopted includes several core principles including -

- Identification of key leaders and networks.
- Conducting focus groups to help identify key issues and appropriate ways to reach and involve the target audience.
- Using materials and methods appropriate to the target audience.
- Adapting programmes to the language of the target audience.
- Engaging the target audience in all stages of programme development and delivery.
- Evaluating and modifying programmes as needed.
- Training a diverse group of trainers to reach target areas.

For older people, Gamache noted the importance of engaging with them through focus groups to determine the best ways of delivering information and to determine the barriers to participation and ways of overcoming these. This includes understanding the types of activities that older people find engaging and effective. Presentations should be interactive and entertaining, should not involve long lectures, and presenters should be older and trustworthy, such as a fire fighter.

**SECTION 9:
DISCUSSION AND RECOMMENDATIONS**

SECTION 9: DISCUSSION

This study highlights a range of fire safety issues affecting older people. In some cases these issues are not distinct from issues affecting other groups in the community, while in other cases the risks for older people are more specific. The vulnerability of older people to fire is one facet of a range of health and safety factors which are challenging at the beginning and end of the life cycle. With increasing numbers of people living longer, and many living alone, the need to address and ameliorate these age-related risks becomes apparent, including recognition of wider health and safety implications.

9.1. Fire Risk Indices

In terms of fire losses and fire fatalities, the New Zealand rates fall around the mid range compared to other nations surveyed (Geneva Association, 2006). This that suggests fire safety and prevention initiatives, along with regulatory controls and fire service responses are contributing to achieve the NZFS mission “*To reduce the incidence and consequence of fire and to provide a professional response to other emergencies.*” However, the basis for statistical data collection varies across jurisdictions and absolute comparisons are therefore limited; rather, these findings should be seen as *indicative* measures of comparative national performance.

International research on fire risks and older people consistently shows a pattern of increasing vulnerability with increasing age, particularly beyond 70. This also applies in New Zealand. Demographic projections of a significant increase in the 65 plus age group to over a quarter of New Zealand’s population by the late 2030’s suggests that mitigation of fire risks for older people should become a specific NZFS objective. This includes programmes for those who are currently in the 65 plus age group, as well as general fire safety and prevention initiatives that target those who will join this age group within the next two decades.

Recommendation 1: That the NZFS acknowledges the demographic implications of an ageing population by developing improved fire safety and prevention programmes to address the risks to older people as a national objective.

9.2. Fire Risks and Older People

There is a consensus on a range of factors that contribute to the fire risk affecting older people. While some factors are associated with ageing processes, it is evident that older people also share many of the same fire risks as the general population. This is especially so for risks arising from unsafe behaviours. However, many older people are particularly vulnerable to risk from fire (and other threats in the home) and not only may find it more difficult to escape from fire, but may suffer more serious consequences if they are exposed (not only physical but also psychological consequences and loss of independence). Hazards in the home extend beyond fire to other risks, such as falls, tripping, and accidental poisoning. Consequently, older people experience higher levels of attendance at A&E services, greater hospitalisation rates and longer treatment times. While older people more may be vulnerable a range of hazards, it cannot be assumed that all older people will be affected by these simply because of their age.

In common with other adults, older people do not always accurately identify fire or other risks in their homes. Typically, they perceive themselves as being relatively safe from hazards. Studies indicate that older people have greater concerns about intruders and robberies in their homes than they do about the potential for fires, even though the risk from fires is markedly higher (Hodsoll & Nayak, 1999). Moreover, their hazard awareness in the home is more likely to have been acquired from ‘*direct experience*’ than from ‘*common sense*’ or education (Wells & Evans, 1996; Mayhorn *et al*, 2004). These findings have considerable implications for fire safety and prevention programmes for older people.

The present study confirms that older people in New Zealand are vulnerable to similar fire risks as those identified in other countries, with some variations. In many cases these vulnerabilities appear no different to the rest of the adult population. Consideration of fire risks reflects the findings of the analysis of fire fatalities, interviews with older victims, focus groups involving older people, and the views of the housing agencies and ACC.

a. Heating: Fires caused by heaters are second equal with smoking as a fire risk factor for older people. However, if fires caused by naked flames (often associated with cooking or heating fires) are combined with this factor these become the greatest fire risk for older people. Analysis of fire fatalities, the views of housing agencies and ACC, and the findings from the focus groups all highlight the risks in this area, which also apply to other groups. It is also important to relate heating risks to the quality of housing, including levels of insulation, draught proofing, and general habitability of properties. Considerations around fire risks and heating for older people include –

- There are marked risks from sparks and burning embers for those with limited mobility around open fires and wood burners. This risk is exacerbated if oversized logs are used, as is identified in some fatalities, and commented on by focus groups and housing agencies alike. This applies to all age groups and especially the disabled.
- Those on low incomes may use older or cheaper heaters which may not be as stable as higher quality appliances. They may also contribute to falls or tripping up.
- Locating small heaters close to furniture or bedding is a further risk. This relates to the low energy capacity of these appliances, especially if they only provide radiant energy. Fan powered convective heaters present a lesser risk in this regard. There appears to be a need to emphasize the fire safety message concerning the ‘1 meter rule’.
- Housing agencies noted problems with inappropriate types of heating, such as using stove or oven elements for heating which is inefficient and unsafe. One non-fire fatality involved the deceased sitting on an oven door for warmth and being crushed when the stove fell on her.

b. Electric Blankets: Faulty electric blankets, and their misuse, are the highest single cause of fatal fires for older people (20% of deaths compared with 4.5% for other adults). The main points of note are –

- Electric blankets are often seen as a convenient and economic means of heating by older people, who retire to bed early for warmth, or use them as wrap-around warmers (which damages wiring and greatly contributes to the fire risk).
- Some fatalities involving electric blankets resulted from careless actions on the part of older victims. These included placing a disconnected smouldering blanket under a bed in one case, and disconnecting a smouldering blanket and sleeping in another room in two cases.

- General advice is that electric blankets should be checked annually to ensure they are safe for use. Many of the fire fatalities involved old blankets that had not been checked in some time, if ever. The focus groups commented that this risk reflected three issues –
 - Many older people do not appear to appreciate the need for regular checks of their blankets, or to avoid leaving them on for extended periods.
 - Locating a competent person to perform checks is a problem, which is compounded by transport difficulties and the cost of having blankets checked.
 - Many older people have concerns over replacement costs if their electric blankets are found to be unsafe or dangerous.

c. Smoking: Smoking is the second largest cause of fatal residential fires. It is responsible for 18% of deaths of older people and 19% of other adults. Although the numbers of smokers are declining it remains a prevalent habitual behaviour. Older people have lived through a time when smoking was socially acceptable and commonplace, and many continue to smoke. Issues of note include –

- Nicotine is an addictive substance which helps maintain the smoking habit and makes cessation difficult. Many smokers continue the habit, even when it has adverse health consequences such as emphysema, asthma, and heart disease.
- Fire deaths involving older people caused by smoking resulted from fires in clothing, furniture, or bedding. Ashes and lighted matches were the main sources of ignition.
- Many victims were bed-ridden or had limited mobility which affected their ability to escape from the fire. Some had experienced previous fires caused by smoking.
- Some were also affected by alcohol, which is often associated with smoking as a recreational activity.
- Three of eight fire fatalities in residential care facilities were as a result of smoking. All the deceased set fire to themselves while smoking and died later from burns. One institution was fined for failing to provide adequate supervision of the victim.
- One housing agency believed the most problematic smokers appeared to be older tenants who were resistant to change life-long habitual behaviours. This may reflect the potency of nicotine as an addictive substance.

d. Unattended Cooking: This is the largest cause of fatal residential fires; however, it ranks sixth for older people, causing 9% of deaths compared to 28% for other adults. Points of note include –

- The housing agencies noted cooking fires were generally a problem in their tenancies. Overheated oil or fat seemed to be the main ignition factor; however, older people did not appear to feature higher than others in this regard.
- Interviews with fire victims and reports of housing agencies indicate occupants and neighbours fight cooking fires typically without NZFS involvement. This appears to be a common response to cooking (and other) fires, and raises concerns that there is a disjunction between NZFS advice ‘to get out’ and the actual responses of most people when dealing with fires. Accordingly, the true level of these fires is likely to be higher than fire statistics indicate because so many incidents are not reported.
- The focus groups identified poor memory and becoming distracted were largely the causes of cooking fires. This observation may equally apply to other groups as well.

- Design features of stoves was a common concern, including –
 - Switches without stops at the ‘off’ position to prevent inadvertent turning back to the ‘on’ position.
 - Difficulties in seeing gas flames in bright light.
 - The need for safety rails on stove tops to prevent spillages and burns, especially for those with disabilities and mobility problems.
 - Locating stove switches at the front to prevent the operator from reaching over active elements or gas rings thereby risking burns or scolds.
- The use of aluminium pots was not identified by any groups as a risk factor. However aluminium pots pose a risk with oil/fat fires as the melting point is much lower than that of stainless steel or enamelled vessels.

e. Risky Behaviours: The role of risky habitual behaviours as fire risk factors applies across all groups and not just older people. Some of these behaviours may be linked to mental health issues while others apply to any groups. The housing agencies were particularly concerned about high risk behaviours as they noted these appeared resistant to change and were often life long in character. Concerns include –

- Hoarding of newspapers, boxes and other flammable materials, and other risky behaviours, were identified from the study of fire fatalities and by the housing agencies as problems. Many properties had high fire loadings as a result of hoarding, which also posed problems with egress in the event of an emergency. In some cases there had been previous fires but these incidents did not change the behaviour of the occupants (sometimes with fatal consequences).
- More common-place problems involve risky activities such as routinely lighting fires or cigarettes with burning tapers, throwing burning or hot items into the rubbish, and misuse of inflammables near naked flame. These behaviours were not restricted older people and were noted across the socio-economic spectrum.
- Those affected by dementia and cognitive decline were seen as special cases with respect to safety in the home. In these cases risky behaviours may reflect the nature of the condition and require careful consideration.

f. Substance Use and Medication: Alcohol plays a significant role in fire fatalities and injuries. Analysis of fire deaths shows the degree of intoxication in older people is less than in other adults; however, some high blood alcohol levels are reported. Associated with alcohol consumption is a related risk from smoking, and for older and disabled people, falls and other injuries.

No data on the role medication plays in fire fatalities is available. However, information from other studies suggests this has an impact on fire risks and is a daily problem for some older people. Some of those interviewed commented on the complexity of their medication regimens and the effects these had upon their activities.

g. Electrical Faults: This includes fires caused by poor maintenance or misuse of electrical appliances, and excessive demands placed on electrical sockets. The dangers from electrical faults were identified by the focus groups and supported by the views of the housing agencies. The focus groups and housing agencies saw multi-plug boxes as a fire risk. It was noted that excessive cords connecting with multi-plug boxes also pose a risk of tripping and falls in older and disabled people, especially in an emergency.

h. Smoke Detectors and Fire Safety Equipment: While installation of smoke detectors is strongly advocated by NZFS, especially in the homes of older and disabled people, there appears to be resistance to this technology. Problems with fire safety equipment were also reported. It is noted that –

- Only 8 of 33 properties involved in fatal fires and occupied by older people had operational smoke detectors. Nearly two thirds either had no detectors installed, or these were disabled or had no batteries.
- The use of battery powered smoke detectors was reported as problematic by housing agencies as tenants removed batteries to prevent activation by poor cooking practices or other social activities. A move to mains wired systems appears to be the only practicable solution to redress such behaviours.
- Older people reported difficulties testing smoke detectors and replacing batteries. The focus groups indicated having fire extinguishers was a good idea although few had them. Concerns were raised over having the knowledge to use an extinguisher, and over the physical demands of doing so if the extinguisher was too heavy.

i. Living Alone: Social isolation may be a problem for those who live alone, especially for older people with limited resources, poor safety practices and who use unsafe or faulty appliances. The issue is not simple, as many who live alone reasonably act to protect their independence and express a desire to remain in their homes for as long as possible. However, with the onset of deteriorating health and physical problems, the consequences of low income affecting maintenance and habitability, and the effects of age-related cognitive or sensory decline, their circumstances may lead to increased risks in a number of areas including from fire. At this point there may be a requirement for residential care or closer community support. This outcome is often the main fear expressed by older people, which is often resisted by further reclusiveness and denial of their needs. In particular it is noted -

- Reclusiveness and social isolation may be a problem for some older people. They may experience extreme difficulties in coping, suffer privations, and be at risk in many areas, including fire. The causes of reclusiveness include the consequences of mental disorders, trauma, low self concept, poor coping skills, and, for some, absent, or estranged, family relationships.
- Support agencies may not be aware of an isolated person's plight. Thus a progressive deterioration in health or living standards may not be identified until a crisis occurs. The study of fire fatalities identifies a number of older people (and some other adults) whose situations had declined to a point they required immediate care but who did not come to attention in time before the fire. Often these people had been living with minimal basic necessities but their plight had not been identified by social agencies.
- The interviews highlight the value of ongoing contact with neighbours, who played significant roles in some fires by coming to the occupants' assistance and by calling the emergency services. If the occupants had been reclusive, or lived in isolated settings, the outcomes may have been more serious.

j. Socio-economic Status: While a relationship is recognised between socio-economic status and fire risks, this is complex and correlates with many other factors, eg. income level, employment status, educational attainment, social isolation, ethnicity, marital status, smoking, alcohol and drug abuse etc. It is apparent that socio-economic status in itself is not a causal factor of fire risks; rather, it describes an aggregation of economic, cultural, experiential, and deprivation factors that contribute to characteristics of groups who are over-represented in fire statistics.

Points of note include –

- There are socio-economic characteristics which are typical of many (but not all) older people which may indirectly increase their risks from fire. In particular, living alone and low incomes are significant considerations.
- Analysis of fire deaths involving older people shows that these are more evenly spread across the socio-economic range as measured by the Deprivation Index than is the case with other adults. This may be explained by the fact that –
 - More older people have title to their properties, and own other assets, which means to their Deprivation Index measures are rated as less deprived,
 - Older people are more likely to have physical, sensory and cognitive disabilities than younger people across all SES levels. Their vulnerability may relate more with their own capabilities than with environmental factors – such as using candles, etc – which may differentially affect lower SES people in other age groups

Summary: The fire risks affecting older people are similar to other groups, but also reflect the vulnerabilities of very old people, especially those with mobility restrictions and sensory loss. Projections indicate a marked increase in the numbers of very old people, many with significant disabilities, who will continue to live in the community in conventional housing. A high proportion of these will be living alone, especially older women, and most will also be receiving home-based services provided through health agencies and voluntary organisations. Therefore there is a need for attention to reduce fire risks for older people, including -

- Attending to design factors to improve fire protection for older people and others. Examples include the design of stoves, cooking equipment, heaters, bedding and clothing to improve fire protection and safety, reliable fire extinguishers which are easy to use, and alarm systems that accommodate sensory limitations.
- Involving older people in all stages of designing fire safety programmes as reported by Gamache (2001) to ensure key issues, materials, and methods are relevant to the target audience, use appropriate language, and ensure the best ways of delivering this information.
- The relationship between fire and other risks for older people suggests that fire services and fire protection agencies need to continue to work closely with other agencies delivering services to dependent older people. This should include the delivery of messages about fire risks, encouragement of safe practices (especially with respect to cooking and heating), development of workable escape plans (including seeking help from neighbours) and ensuring that appropriate equipment, such as smoke alarms and fire extinguishers (specially designed for use by older people) are available

Recommendation 2: That NZFS instigate a review of fire safety and prevention programmes for older people with a goal that these become part of a national initiative to improve the general safety of older people. This should –

- Involve collaboration between NZFS, public health services, housing and social support agencies, and voluntary organisations to address the risks from fire, and other hazards, that impact on the safety and wellbeing of older people.
- Include older people in the development of programmes to ensure that key messages and delivery methods are relevant to their needs.
- Address general fire risks in the home, as well as specific risks identified in the current study, eg. electric blankets, heating, smoking etc.

Recommendation 3: That NZFS continue to research residential fires with a particular focus on behavioural factors that affect the attitudes and responses of occupants to fires. This research should specifically attend to risks affecting older people and other high risk groups, and the findings should be used in the ongoing improvement and development of fire safety and prevention programmes for these groups

9.3: Fire Safety Initiatives for Older People

There is a need to continue to develop fire safety and prevention programmes for older people and other vulnerable groups. The two examples of fire safety programmes described in Section 8.2 provide a useful basis for further developments. Given the projected increases in the numbers of older people these programmes should be developed as national initiatives. Programme effectiveness can only be judged by the extent to which these programmes effect enduring behaviour change in the target population and produce a decreased fire risk. Accordingly, it is proposed that fire safety and prevention programmes recognise –

1. Population ageing and the vulnerabilities of older people to fires suggests a potential for higher casualties if new fire safety and prevention initiatives are not developed. These vulnerabilities extend beyond fire hazards to other areas of safety and health and indicate a need to integrate programmes with other agencies. Close liaison with health, community support, and voluntary agencies is central to ensuring that the range of risks is addressed to improve the wellbeing and safety of older people.
2. Although some will require residential care, a majority of older people are best placed in their own homes which afford a high degree of familiarity and independence. This suggests a need for new initiatives to improve levels of safety in the home for older people, and that they themselves have a role in assisting in the development of safety and prevention programmes to ensure recommended practices and assistive technologies are relevant and appropriate to their needs.
3. Appropriate fire safety and prevention programmes for older people must address general fire risks in the home, and specific risks identified by research. Where new risks are identified these should be encompassed into these programmes, and may also require regulatory or design improvement responses to further reduce the risks.
4. Central to the effectiveness of fire safety and prevention programmes is recognition that target audiences are heterogeneous and therefore multiple strategies are required to promote key safety messages. This encompasses differing socio-economic, cultural, educational, experiential, and behavioural characteristics, as well health and disabilities as contributive factors. The core issue is a need to ensure the content and presentation of the programmes effect enduring behavioural change over the longer term, including the later stages of life.

In conclusion, it is apparent that there is a need for a national fire safety initiative to address the risks affecting older people. This is driven by recognition that older people are vulnerable to risks from fires and are a growing proportion of the population. Effective interventions will require the collective involvement of health and social agencies, voluntary organisations, the NZFS, and most importantly, older people who have an interest in reducing the risks from a range of hazards in their lives, including that posed by fire.

REFERENCES

- Adioetomo, S.M., Beninguisse, G., Gultiano, S., Hao, Y., Nacro, K., & Pool, I. (2005).** Policy Implications of Age-Structural Changes. *CICRED, Paris*.
- Alzheimers Disease International (1999).** The Prevalence of Dementia, Fact Sheet 3, www.alz.co.uk
- Aminzadeh, F. & Dalziel, W.B. (2002).** Older Adults in the Emergency Department: A Systematic Review of Patterns of Use, Adverse Outcomes, and Effectiveness of Interventions. *Annals of Emergency Medicine. 39:238-247*.
- Australasian Fire Authorities Council. (2005).** Accidental Fire Fatalities in Residential Structures: Who's at Risk? *AFAC: Melbourne*.
- Baltes, M.M., Maas, I., Wilms, H., Borchelt, M.F., & Little, T (1999).** Everyday Competence in Old and Very Old Age. In **Baltes, P.B. & Mayer, K.U.** (Eds). *The Berlin Ageing Study. Cambridge: Cambridge University Press*.
- Barillo, D.J. & Goode, R. (1996).** Fire Fatality Study: Demographics of Fire Victims. *Burns. 22: 85-88*.
- Brennan, P. (1998).** Victims and Survivors in Fatal Residential Building Fires. (*In Human Behaviour in Fire: Proceedings of the 1st International Symposium, Belfast. Belfast: Textflow*).
- Brennan, P. (1999).** Victims and Survivors in Fatal Residential Building Fires. *Fire and Materials. 23:305-310*.
- Brennan, P., & Thomas, I. (2001).** Victims of Fire? Predicting Outcomes in Residential Fires. (*In Human Behaviour in Fire: Proceedings of the 2nd International Symposium, Boston. London: Interscience Communications*).
- Bridges, J., Spilsbury, K., Meyer, J. & Crouch, R. (1999).** Older People in A&E: Literature Review and Implications for British Policy and Practice. *Review of Clinical Gerontology. 9:127-137*.
- Canada Mortgage & Housing Corporation. (2004).** Canadian Housing Fire Statistics. See: ftp://ftp.cmhc-schl.gc.ca/chic-ccd/Research_Reports/Housing%20Fire%20FINAL.
- Carskadon, M.A. & Herz, R.S. (2004).** Minimal Olfactory Perception during Sleep: Why Odor Alarms will not Work for Humans. *Sleep. 27(3):402-405*.
- Carter, S.E., Campbell, E.M., Sanson-Fisher, R.W., Redman, S. & Gillespie, W.J. (1997).** Environmental Hazards in the Homes of Older People. *Age and Ageing. 26:195-202*.
- Cornell University. (2007).** Fire Risks for Older Adults. www.environmentalgeriatrics.com/home_safety/fire_risk_series.html
- Cornwall, J., & Davey, J.A. (2003).** Implications of an Ageing Population for the ACC: A Scoping Paper. *NZ Institute for Research on Ageing: Victoria University, Wellington*.
- Davey, J. and Gee, S. (2002).** Life at 85 plus: A Statistical Review. *New Zealand Institute for Research on Ageing, Wellington*.

Davey, J., Nana, G., de Joux, and Arcus, M. (2004). Accommodation Options for Older People in Aotearoa/New Zealand. Report prepared for the Centre for Housing Research Aotearoa/New Zealand (CHRANZ). *NZiRA and BERL, Wellington.*

Department of Communities and Local Government. (2004). Fire Statistics. Accessed at: www.communities.gov.uk/index.asp?id=1141801

Department of Health U.K. (2001). National Service Framework for Older People. www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/OlderPeoplesServices/OlderPeopleArticle/fs/en?CONTENT_ID=4073597&chk=4wRxm%2B

DiGuisseppi, C., Edwards, P., Godward, C., Roberts, I. & Wade, A. (2000). Urban Residential Fire and Flame Injuries: a Population Based Study. *Injury Prevention.* **6(4):250-254.**

Downing, A., & Wilson, R. (2005). Older People's Use of Accident and Emergency Services. *Age and Ageing.* **34:24-30.**

Dulay, M.F. & Murphy, C. (2002). Olfactory Acuity and Cognitive Function Convergence in Older Adulthood. *Psychology and Aging.* **17(3):392-404.**

Duncanson, M., Ormsby, C., Reid, P., Langley, J., & Woodward, A. (2001). Fire Incidents Resulting in Deaths of New Zealanders Aged 65 and Older 1991-1997. *NZFSC Report Number 32. Wellington: New Zealand Fire Service Commission.*

Duncanson, M., Reid, P., Langley, J., & Woodward, A. (2001). Overview of Fire-Related Mortality Data for Aotearoa New Zealand 1991-1997. *University of Otago: Fire Injury Research Team Report. University of Otago.*

Duncanson, M., Woodward, A., & Reid, P. (2000). Where in New Zealand Have Domestic Fires Occurred?: Descriptive Analysis of Data 1986-1998. *NZFSC Research Report Number 6. Wellington: New Zealand Fire Service Commission.*

Dunston, K. and Thomson, N. (2006). Demographic Trends. Chapter 2. **Statistics New Zealand. (2004).** Older New Zealanders: 65 and Beyond. *Statistics New Zealand, Wellington.* In Boston, J. and Davey, J. (Eds.), *Implications of Population Ageing: Opportunities and Risks.* Institute of Policy Studies, Wellington.

Elder, A.T., Squires, T., & Busuttil, A. (1996). Fatal Fires in Elderly People. *Age and Ageing.* **25(3):214-216.**

Ellenhorn, M.J., & Barceloux, D.G (1988). Medical Toxicology: Diagnosis and Treatment of Human Poisoning. *Elsevier: NY.*

Fergusson D., Hong B., Horwood J., Jensen J., and Travers P. (2001). *Living Standards of Older New Zealanders.* Ministry of Social Policy: Wellington. Also see: www.msd.govt.nz/work-areas/social-research/living-standards/older-nz.html#livingstandards

Gamache, S. (2001). Reaching Those at Highest Risk to Fires and Burns: Young Children, Older Adults, and People in Low-Income Communities. *Injury Control & Safety Promotion.* **8(3):199-201.**

Geneva Association. (2005). World Fire Statistics: Information Newsletter. *International Association for the Study of Insurance Economics, Geneva*

- Gitlin, L.N. (2003).** Conducting Research on Home Environments: Lessons Learned and New Directions. *The Gerontologist*. 43:628-637.
- Graham, R.A. (1998).** A Closer Look at Domestic Fire Deaths. (*In Human Behaviour in Fire: Proceedings of the 1st International Symposium, Belfast. Belfast: Textflow*).
- Hall, J.R. & Harwood, B. (1995).** Smoke or Burns – Which is Deadlier? NFPA Journal. Jan/Feb. *National Fire Protection Agency. Quincy, MA*.
- Hall, J.R. (2005).** Characteristics of Home Fire Victims. *National Fire Protection Agency. Quincy, MA*.
- Halpern, D.F., & Hakel, M.D. (2003).** Applying the Science of Learning to the University and Beyond: Teaching for Long-Term Retention and Transfer. *Change*. 35(4): 36 -41.
- Hamdy, R.C., Forrest, L.J., Moore, S.W. (1997).** Use of Emergency Departments by Elderly Patients in Rural Areas. *South Medical Journal*. 90:616-620.
- Hodsoll, K. & Nayak, U.S.L. (1999).** The Perception of Fire Risk by Older People and its Impact on Relevant Fire Safety Education. *International Journal for Consumer and Product Safety*. 6(3):159-168.
- Huseyin, I., & Satyen, L. (2006).** Fire Safety Training: It's Importance in Enhancing Fire Safety Knowledge and Responses to Fire. *Australian Journal of Emergency Management*. 21(4):48-53.
- Istre, G.R., McCoy, M.A., Osborn, L., Barnard, J.J., & Bolton, A. (2001).** Deaths and Injuries in House Fires. *New England Journal of Medicine*. 322 (25):1911-1916.
- Istre, G.R., McCoy, M.A., Carlin, D.K., & McClain, J. (2002).** Residential Fire Related Deaths and Injuries among Children: Fireplay, Smoke Alarms, and Prevention. *Injury Prevention*. 8(2):128-132.
- Iwarsson, S., Werner-Wahl, H., Nygren, C., Oswald, F., Sixsmith, A., Sixsmith, J., Szeman, Z., & Tomson, S. (2007).** Importance of the Home Environment for Healthy Ageing: Conceptual and Methodological Background of the European ENABLE-AGE Project. *The Gerontologist*. 47:78 84.
- Kose, S. (1999).** Emergence of Aged Populace: Who is at Higher Risk in Fires? (*In Human Behaviour in Fire: Proceedings of the 1st International Symposium, Belfast. Belfast: Textflow*).
- Lawton, M.P. (1999).** Environmental Taxonomy: Generalizations from Research with Older Adults. In **Freidman, S.L. & Wachs, T.D.** (Eds). *Measuring Environment Across the Life Span. Washington, D.C.: American Psychological Association*.
- Leth, P., Gregersen, M., & Sabroe, S. (1998).** Fatal Residential Fire Accidents in the Municipality of Copenhagen 1991-1996. *Preventive Medicine*. 27(3):444-451.
- Lilley, J.M., Arie, T., & Chilvers, C.E.D. (1995).** Accidents involving Older People: A Review of the Literature. *Age and Ageing*. 24:346-365.
- Lim, K.H., & Yap, K.B. (1999).** The Presentation of Elderly People at an Emergency Department in Singapore. *Singapore Medical Journal*. 40:742-744.

- Loveridge, R.W. (1998).** Fatalities from Fire in One and Two Family Residential Dwellings. (*In Human Behaviour in Fire: Proceedings of the 1st International Symposium, Belfast.* 393-399. *Belfast: Textflow*).
- Lowe C.J., Raynor D.K., Purvis J., Farrin A., Hudson J. (2000).** Effects of a Medicine Review and Education Programme for Older People in General Practice. *Brit. J. Clinical Pharmacology*, 50(2), 172-175.
- Lyons, R.A., Jones, S.J., Deacon, T., & Heaven, M. (2003).** Socioeconomic Variation in Injury in Children and Older People: A Population Based Study. *Injury Prevention*. 9:33-37.
- Mayhorn, C.B., Nichols, T.A., Rogers, W.A., & Fisk, A.D. (2004).** Hazards in the Home: Using Older Adults' Perceptions to Inform Warning Design. *Injury Control and Safety Promotion*. 11(4):211-218.
- McConnell, C. F., Leeming, F. C., & Dwyer, W. O. (1996).** Evaluation of a fire-safety training program for preschool children. *Journal of Community Psychology*, 24:213-227.
- Metropolitan Fire Brigade. (1999).** Research on Home Fire Safety. *CFA & MFB. Carleton: Victoria, Australia*.
- Metropolitan Fire Brigade. (2001).** Human Behaviour in Fires Research Project. www.mfb.org.au/asset/PDF/researchsummary
- Miller, I. (2005).** Human Behaviour Contributing to Unintentional Residential Fire Deaths 1997-2003. *NZFSR Research Report 47. NZ Fire Service Commission: Wellington*.
- Miller, I & Beever, P. (2005)** Victim Behaviours, Intentionality, and Differential Risks in Residential Fire Deaths. [In Brebbia, C.A., Bucciarelli, T., Garzia, F., & Guarascio, M (Eds) *Proceedings of First International Conference on Safety and Security Engineering, Rome*. WIT Press, Southampton].
- Miller, I. (2006).** Risk awareness & Dangerous Habitual Behaviours: Developing Effective Strategies to Reduce Residential Fire Risks. *Invited presentation to the Republic of Ireland Institute of Fire Engineers Annual Conference, 12 October 2006*.
- Murphy, C., Schubert, C.R., Cruickshank, K.J., Klein, B.E.K., & Nondahl, D.M. (2002).** Prevalence of Olfactory Impairment in Older Adults. *J. Amer. Med. Assoc.* 288:2307-2312.
- Narayanan, P., & Whiting, P. (1996).** New Zealand Fire Risk Data (1986-1993). *BRANZ Study Report No 64. BRANZ: Wellington*.
- National Fire Safety Council (2002).** International Accident Facts (3rd Ed). *Itasca: Il*
- Newton, J. (2003).** Structural Fire Fatalities in Queensland. *Queensland Government Department of Emergency Services: Brisbane*.
- Notake, H., Sekizawa, A., Kobayashi, M., Mammoto, A., & Ebihara, M. (2004).** How to Save the Lives of Vulnerable People from Residential Fires? (*In Human Behaviour in Fire: Proceedings of the 3rd International Symposium, Belfast.* London: Interscience Communications).

- NZ Fire Service. (1969).** Report on Fatal Fire, Saturday 26th July 1969: Sprott House. *NZ Fire Service, Wellington.*
- NZ Fire Service. (1996).** Report and Findings of Fire Incident Wimbledon Rest Home. *NZ Fire Service, Western North Island Area.*
- Office of the Deputy Prime Minister. (2002).** Establishing Fire Safety Issues Among Older People. *OPDM: London.*
- Oswald, F., Schilling, O., Werner-Wahl, H., Fange, A, Sixsmith, J., & Iwarsson, S. (2006).** Homeward Bound: Introducing a Four-Domain Model of Perceived Housing in Very Old Age. *Journal of Environmental Psychology. 26:187-201.*
- Petraglia, J.S. (1991).** Older Adults Stand Out as One of the Largest Groups in the United States at Risk of Dying in a Fire. *National Fire Protection Agency Journal. Quincy: MA.*
- Proulx, G. (2003).** Playing With Fire: Understanding Human Behaviour in Burning Buildings. *ASHRAE Journal. 45(7):33-35.*
- Report of Committee of Inquiry. (1970).** Fire Protection and Means of Escape in Buildings for Accommodation of the Public or Incapacitated Persons. *NZ Government: Wellington.*
- Rhodes, A. & Reinholdt, S. (1998).** Residential Fire Fatalities: A Study of Factors Contributing to Residential Fire Fatalities and their Prevention. *Mount Waverley, Victoria; Country Fire Authority.*
- Salmond, C., & Crampton, P. (2002).** NZDep2001 Index of Deprivation: Users Manual. *Department of Public Health, Wellington School of Medicine & Health Sciences: Wellington.*
- Satyen, L., Sosa, A., & Barnett, M. (2003).** Applications of Cognitive Theories to Children's Fire Safety Education. *Proceedings of 39th Annual Conference, Aust. Psych. Soc: Melbourne. 250-254.*
- Scottish Executive (2000).** Statistical Bulletin: Fire Statistics Scotland. Accessed at: www.scotland.gov.uk/stats.
- Sekizawa, A. (2004).** Care of Vulnerable Populations: Who are Vulnerable to Fire and What Care is Needed for Their Safety? (*In Human Behaviour in Fire: Proceedings of the 3rd International Symposium, Belfast. London: Interscience.*)
- Shenassa, E.D., Stubbendick, A., & Brown, M.J. (2004).** Social Disparities in Housing and Related Pediatric Injury: A Multilevel Study. *American J. Public Health. 94(4):633-639.*
- Social Care Institute for Excellence (2005)** Research Briefing 15: Helping older people to take prescribed medication in their own home. Accessed at: www.scie.org.uk/publications/briefings/briefing15/index.asp
- Statistics New Zealand. (2004).** Older New Zealanders: 65 and Beyond. *Statistics New Zealand, Wellington.*
- Sternberg, R.J. (2001).** Psychology in Search of the Human Mind (3rd Ed). *Harcourt College Publisher: Orlando.*

- United States Fire Administration (1999).** Fire Risks for Adults. *USFA: MA.*
- United States Fire Administration. (2002).** 1947 Fire Prevention Conference. <http://www.usfa.fema.gov/about/47report.shtm>
- United States Fire Administration. (2004).** The Fire Risk to Older Adults. Topical Fire Research Series 4(9). *USFA: MA.*
- United States Fire Administration. (2006).** Fire and the Older Adult. FA-300. *USFA: MA.*
- United States National Fire Protection Agency. (2006).** Fact Sheet: Deadliest Fires in Facilities for Older Adults. <Http://www.nfpa.org/Research> & Reports.
- United States Food & Drug Administration. (2007).** Medication Use and Older Adults. http://www.fda.gov/fdac/features/2006/406_olderadults.html
- United States National Library of Medicine & National Institutes of Health, (2005).** Aging Changes in Skin. . <http://www.nlm.nih.gov/medlineplus/ency/article/004014.htm>
- Urban Research Associates (1978)** Self-medication: A study undertaken in Wellington, New Zealand. *Research undertaken on behalf of the Chemists Guild of NZ (inc.), the Pharmaceutical Society of NZ & the NZ Pharmacy Education and Research Foundation. Wellington.*
- VisionConnection (2005).** The Four Most Common Causes of Age-Related Vision Loss. <http://www.visionconnection.org/Content/YourVision/TheAgingEye.htm>
- Walker, B.L., Beck, K., Walker, A.L., & Shemanski, S. (1992).** The short-term effects of a fire safety education program for the elderly. *Fire Technology. 28(2):134-162.*
- Warda, L., Tenenbein, M., & Moffat, M.E. (1999).** House Fire Injury Prevention Update. Part I. A Review of Risk Factors for Fatal and Non-Fatal House Fire Injury. *Injury Prevention. 5.145-150.*
- Wells, N. M., & Evans, G.W. (1996).** Home Injuries of People over Age 65: Risk Perceptions of the Elderly and Those Who Design For Them. *J. Environmental Psychology. 16:247-257.*
- Williams, D. (1998).** New Study Shows Who Survives in Fatal Residential Fires. www.unc.edu/news/newsserv/archives/may98/ruyan.htm
- Wells, N.M., & Evans, G.W. (1996).** Home Injuries of People Over Age 65: Risk Perceptions of the Elderly and Those Who Design For Them. *J. Environmental Psychology. 18:247-257.*
- Yablonski, M.S. (2003).** Loss of Vision in Later Life: A Different Perspective. *Aging and Vision. 15 (1).*
- Zhang, G., Lee, A.H., Lee, H.C., & Clinton, M. (2006).** Fire Safety among the Elderly in Western Australia. *Fire Safety Journal. 41:57-61.*

Appendix A: Subject Interview Schedule

**Perceptions and Experiences of Fire Risks among Older People
Interview Schedule**

ID Number

Date of Interview
....

Introduction and explanation

Part 1 – Context of recent fire incident

1. Place – address at which fire occurred

(Note if different from location of interview)

2. Date of fire 3. Time of day

4. Type of housing

House

Town house or ownership unit

Apartment

Retirement Village

Other (specify)

5. Who was living at the house/apartment at the time of the fire?

.....

6. Who owned that house/apartment? (owned by interviewee, other resident(s)
[specify who], if rental – state landlord, other)

.....

7. Ascertain household situation of interviewee (e.g. home owner, tenant, living with family)

.....

8. How long have you (interviewee) been resident at that/this address?

.....

Part 2 – Experience of fire

9. Who was present at the time of the fire?

.....

10. Where did the fire start?

.....

11. Where were you when the fire started?

.....

12. How did you first become aware of the fire?
(what were the cues? – sounds, smells, visual cues, alarms, warnings from other people)

.....

.....

13. Did you have smoke alarms(s) in the house at the time?

13a. If yes, did the smoke alarm(s) go off?

.....

14. What did you think was the cause of the fire, at the initial stage?

.....

15. How and where did the fire spread?

.....

16. How fast did it spread?

.....

17. What was your first reaction and what did you do first?

.....

.....

18. What did you do next?

.....

19. What did you do in order to escape?

.....

20. Were you exposed to smoke? If so, how did this happen?
Where did the smoke come from? How fast did the smoke spread?

.....

.....

21. Were you exposed to flames and heat? If so, how did this happen?
Where did the flames and heat come from? How fast did the flames spread?

.....
.....

22. Were you injured as a result of the fire? If yes, how did this happen?

.....

22a. What injuries did you sustain?

.....

22b. How did you get help for your injuries at the time?

.....

22c. What type of treatment did you receive at the time, and where?

.....

.....

23. Were the fire services called to the fire? If yes, who called them?

.....

23a. At what stage? How long after the fire began?

.....

23b. How long was it before the fire services arrived?

.....

23c. How did they go about tackling the fire?

.....

.....

Part 3 – Consequences of fire

This section is about how your life was affected by the fire.

24. Did you require alternative housing?
If yes, how was this arranged, where did you go and for how long?

.....

25. Did you require ongoing medical care?
If yes, what type of care did you need?
If yes, how was this arranged, where did you go for care and for how long?

.....
.....

26. Did you lose property in the fire? If yes, what property was lost?

.....
.....

26a. Did you have insurance cover for the losses?
If so, what did you do to make a claim and how did this go through?

.....
.....

26b. Has the property been replaced?

.....

26e. Did you lose pets in the fire?

.....

26f. Did you lose anything else which was special to you?

.....

27. Have your regular activities (such as going to clubs, meetings, to sports) been affected as a result of the fire?

.....
.....

28. Has your family life been affected as a result of the fire? If so, in what way?

.....
.....

29. What would you say has been the most significant consequence of the fire for you personally?

.....
.....

Part 4 – Looking back at the experience of the fire

30. Looking back, how do you feel about the way in which you (and other people in the house, if any) responded to the fire?

.....
.....

31. How do you feel that the fire services responded to the fire?

.....
.....

32. Have you any suggestions about how the fire services might change the ways in which they respond to fires in homes?

.....
.....

33. Has the experience of the fire made you think differently about the risks of fire? If yes, in what ways?

.....
.....

34. Are you doing things now which you did not do before, as a result of the fire experience?

.....
.....

35. Are you not doing things now which you did before, as a result of the fire experience?

.....
.....

36. What advice would you give to other people about the risks of fire?

.....
.....

37. What advice would you give to older people, in particular, about the risks of fire?

.....
.....

38. From your experience, what advice would you give to the fire services which might help to prevent fires?

.....
.....

Part 5 – Some details about yourself

40. Age of interviewee 41. Sex of interviewee
42. Age and sex of other usual residents in household (at time of interview)

.....

43. Are you - working full-time (30 hours or more per week)....
- Working part time (less than 30 hours a week).....
- Working on a casual basis.....
- Working unpaid in a family business.....
- Working unpaid to provide care for other(s).....
- Unemployed and looking for work.....
- Not in the workforce/retired

43a. If you are working for pay, what type of work are you doing?

.....

43b. If you are retired or not in the workforce, what type of paid work did you do most recently?

.....

44. What sources of income do you have? (tick all those which are appropriate)

- New Zealand Superannuation
- Veterans' pension
- Other welfare benefits or supplements
- Occupational pension/superannuation (from employment)
- Income from savings
- Financial assistance from family or relatives
- Rent from property
- Earnings from employment
- Other

45. What ethnic group or groups do you identify with?

- European/Pakeha
- Maori
- Pacific Peoples
- Other (specify)

46. Generally, would you say your health is –

- Very good
- Good
- Fair
- Poor

47. Do you have any disability or handicap that is long-term (lasting 6 months or more)?
If so, please specify.

.....

48. Do you have any difficulty in hearing?
If yes, do you use any kind of hearing aid? Do you use this regularly?

.....

49. Do you have any difficulty in seeing?
If yes, do you use any kind of glasses or contact lenses? Do you use them regularly?

.....

50. Do you have any difficulty in breathing?
If yes, what do you do when you have these problems?

.....

51. Are you taking any regular medication?
If yes, what is it and what is it for?

.....

.....

52. Do you smoke one or more tobacco cigarettes a day?

52a. If yes, about how many cigarettes do you smoke in an average day?

.....

52b. Do you smoke tailor-mades or roll your own cigarettes?

.....

53. For each of the following activities, please tell me if your health limits you a lot, a little, or not at all? (record as L. S. N)

- Vigorous activities (such as running, lifting heavy objects, participating in strenuous sports)
- Moderate activities (such as pushing a vacuum cleaner, moving a table, playing bowls or golf)
- Lifting or carrying groceries
- Climbing several flights of stairs
- Climbing one flight of stairs
- Bending, kneeling or stooping
- Walking more than one kilometre
- Walking half a kilometre
- Walking 100 metres
- Bathing or dressing yourself

54. Is there anything else you would like to add about your experience of a fire in your home?

.....

55. Is there anything you would like to ask me?

.....

End of interview. Thank respondent