Risk Factors and Incidence of Residential Fire Experiences Reported Retrospectively

By

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ABSTRACT

The frequency of all residential fires that are attended by the Melbourne Metropolitan Fire Brigade is routinely recorded and hence well known. However, the frequency of residential fires which are not attended, including instances where the occupant of a dwelling has extinguished the fire or the fire has self-extinguished, has not previously been investigated in an Australian sample. This project includes two studies: in the first study the aim was to develop the Fire Safety Awareness and Experience Interview Schedule and to determine whether the risk factors for attended fires (in which there are fatalities or injuries) are different to the risk factors of residential fires not attended to by the fire brigade. Additionally, the first study aimed to determine the incidence of unattended residential fires by retrospective report from adults since the age of 18. The second study aim was to determine whether correct and regular maintenance behaviours were being carried out by occupants who own a smoke alarm.

Five hundred participants, recruited from four shopping centers located in Melbourne, Victoria, completed the Fire Safety Awareness and Experience Interview Schedule. The questionnaire collected information on all residential fire experiences, including attended and unattended fires, since the age 18.

Results showed that participants had approximately a 50% chance of experiencing either an attended or unattended residential fire within their adult lifetime; and the mean annual probability of having an unattended fire experience (0.8 fires per 100 adult years) was higher than the probability of having an attended fire experience (0.37 fires per 100 adult years). In addition, of all residential fires in which fire service attendance status was known, the vast majority of fires (78%) were unattended.

Results also revealed the vast majority of unattended fires were caused when cooking was left unsupervised by the cook; and oil or food was usually the first material ignited. Of concern is the number of instances in which the unattended fire was extinguished via dangerous actions (i.e. moving the burning object the sink or floor of the home). It is therefore important to educate people on how to safely fight a cooking fire should one occur and occupants should be encouraged to have a fire blanket in an accessible location in their kitchens.

Findings from Study Two revealed that the vast majority of the sample (96%) reported owning a smoke alarm. However, over one third of owners are not testing their alarms and 17% are not carrying out battery changes. Overall, the results from this project can be used to help prevent cooking fires in Australia and the developed interview schedule can be used to collect comparison data from other States and Territories. Furthermore, the development instrument can be used to collect unattended home fire data internationally.

DECLARATION

I, Michelle Barnett, declare that the PhD titled "Risk factors and incidence of residential fire experiences reported retrospectively" is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Signature: Date:

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CHAPTER 1. PREVALENCE DATA ON FIRES

Fires occur worldwide and can have devastating consequences; being an important contributor to not only property damage, but death and injury also. If the fire fatality rates for the U.S., U.K., Singapore, Japan, and Australia can be generalized to the rest of the world, fires are causing approximately 67,000 deaths annually. This assumes there is approximately one death per 100,000 people (U.S. Department of Health and Human Services, 2007; Office of Deputy Prime Minister, 2004; Australasian Fire Authorities Council, 2005; & Geneva Association, 2008). In addition, the majority of these fatalities are occurring in residential homes (Roberts & Giguiseppi 1999). Hence, fires occurring in the home present a significant hazard, despite being a location that most consider secure and safe from danger (Barillo & Goode, 1996). Due to the losses associated with residential fires, research has been conducted in Australia and overseas to determine the incidence and risk factors in order to tackle the fire problem and reduce fatality rates.

1.1 Fatalities/ Injuries

Research in Australia and overseas continuously shows that house fires result in the largest proportion of fire related injuries, and are more often fatal compared with fires occurring in other locations (Anderson, Watson, & Harland, 1981; Mierley & Baker, 1983; Miller, 2005; Rahikainen & Keski-Rahkonen, 2001; & Runyan, Bangdiwala, Linzer, Sacks & Butts, 1992). For instance, McGwin, Chapman, Curtis, and Rousculp, (1999) found that in the U.S. the vast majority of fire related deaths for young, middle aged, and older persons were the result of residential fires (87.8%, 87.5%, and 94.1% respectively); with the remaining deaths occurring in other locations, or as a result of crashes. In the U.K. from 1996 to 2000 86% of all fires deaths occurred in residential dwellings (Holburn, 2001). Similarly, in Australia fires occurring within private dwellings make up the largest proportion of all

accidental fire related deaths (Department of Emergency Services, 1998). In 1998 57% of all accidental fire deaths (70 of 123) resulted from fires within private dwellings (ABS, 2000). Hence, in industrialized countries, house fires are more often fatal compared with fires occurring in other types of structures (based on the death rates and number of deaths).

In Australia the rate of fatal residential fires appears to be decreasing. From the years 1975 to 1995 there was a general downward decline by 39% in accidental death rates from fire, flames, and scalds in Australia (National Injury Surveillance Unit, 1996). Data from the Australia Bureau of Statistics (ABS) also showed a decrease in the likelihood of death from home fires, with a fall from 7 people per million in 1968 to 4 people per million in 1998 (ABS, 2000). A more recent analysis of Australian fire fatality data by the Australasian Fire Authorities Council (2005) also showed a decline in the number of residential fire deaths; from July 2000 to June 2003 the national rate of residential fire fatalities had further dropped to 0.3 deaths per 100,000 people. However at the time of the July 2000 to June 2003 analysis data from the Northern Territory was not available and the data for the remaining states and territories may not have been complete; which might mean the fatality rate was inaccurate.

In the U.S. and the U.K. the fire fatality rate is also on the decrease. The national rate of residential fire fatalities in the U.S. dropped from 1.4 deaths per 100,000 people in 1995 (Centre of Disease Control and Prevention, 2000) to 1.0 deaths per 100,000 in 2004 (U.S. Department of Health and Human Services, 2007). In the U.K. the death rate from fire fell from 1.2 deaths per 100,000 in 1995 to 0.9 deaths per 100,000 in 2002 (Office of Deputy Prime Minister, 2004).

1.2 All attended fires

All attended fires include those fires in which fire services attended the scene of that fire and in which there may or may not have been injuries or fatalities. According to the Australian Bureau of Statistics (2002), in the year 2000, there were more than 10,000 residential fires which caused over 1,500 injuries and 70 deaths, in a population of 19,153,000. The number of attended fires for the year 2000 appears to be the latest overall estimate available for residential fires in Australia.

Although there is limited data on the overall prevalence rates of attended fires for Australia as a whole, there is evidence that within the state of Victoria the number of attended fires per annum is on the rise. According to figures from the Metropolitan Fire Brigade the incidence of attended fires in Melbourne's residential dwellings increased by 25.8% from 1991 to 2000, despite fire safety campaigns within the community (Taylor & Pepperdine, 2003). In fact, the number of attended fires increased more than the overall population growth (5.6%) and more than the number of occupied dwellings (10.7%) in Melbourne. The rise is evident in statistics that show in 1991 for every 1,364 persons there was one residential fire, and by 2000 this figure had increased by 16%, with one residential fire for every 1145 persons (Taylor & Pepperdine, 2003). In terms of occupied dwellings in 1991 for every 476 occupied dwellings there was one residential fire, which rose by 12% by the year 2000 to one residential fire every 419 occupied dwellings.

In contrast to Australian statistics which are limited, more recent data for the incidence of overall residential fires overseas is available. In the U.S. during 2006 the fire department responded to an estimated 412,500 residential structural fires causing 2,620 civilian deaths and 12,925 injuries (Karter, 2007) in a population of 299,398,484 (U.S. Census Bureau, 2008). In the U.K during 2006, fire services attended 55,800 residential dwelling fires

which caused 363 deaths and 11,200 injuries (Fire & Rescue Services, 2008) in a population of 60, 587, 000 (National Statistics, 2007).

1.3 Un-attended fires

In an effort to gain a clearer understanding of the residential fire problem research has been carried out in the U.S. and U.K. investigating the incidence and features of unreported (unattended) fire events. In the U.S. the first study was conducted in 1974 by the Consumer Product Safety Commission (U.S. Consumer Product Safety Commission, 1985). Surveys were used to collect information on structural fires (fires within a dwelling) and non-structural fires (those in the surrounding yard space). Results from this survey showed a higher than expected number of serious, unreported fires, in which injuries were sustained. The work highlighted at this time that the national fire problem could not be thoroughly accessed by dealing with reported fire data only, prompting yet another investigation.

In 1981 the U.S Consumer Product Safety Commission (1985) conducted another study on un-reported residential fires in order to update the 1974 database. The major reason for the update was to determine if there had been an increase in un-reported fires since 1974 due to the widespread implementation of smoke detectors in residential homes. The Commission hypothesized that the increase in the use of smoke alarms would allow for earlier detection of fires. This would enable more occupants to extinguish the fire without requiring fire fighter assistance; hence resulting in an increase in un-reported events and presumably a simultaneous decrease in reported fire events. Telephone interviews were used to collect data from 32,000 households, from December 1983 to November 1984. Detailed information was gathered on all attended (reported) and unattended (non-reported) residential fires occurring within a three-month retrospective reporting

period. Fires that occurred within and immediately around a residential structure were included as well as fires in personal motor vehicles.

From the 30,000 households interviewed by the U.S Consumer Product Safety Commission, 1819 (6%) residential fires were reported, with 85 (5%) being attended fires and 1734 (95%) un-attended fires. The overall estimation of fires occurring in the U.S. during the survey period was derived from the total number of residential fires reported in each monthly cohort being projected to the U.S. population of households. The estimate revealed that there were approximately 25,197,000 residential fires in the continental US during the 12 month period, an equivalent to 3 out of every 10 households. Approximately 4% (925,000) of these fires were attended and the majority, 96% (24,250,000) was unattended. In comparing these estimates to those made in the 1974 survey (in which there was an estimated 13 million residential fires) the number of fires in the U.S. had since doubled. The Commission attributed this increase to a number of factors including; an increased number of households in the U.S. and to the increased rigor of the 1983/84 survey methodology compared to that of the 1974 survey.

Similarly, in the U.K., the survey methodology was used to gather information about unattended fires in order to provide an overall measure of the number of domestic fires in England and Wales in 2001/2. The British Crime Survey (BCS) was primarily designed to measure the extent and nature of crime against adults living in private households. However, the survey was further developed to gather information regarding other issues of Home Office concern, including that of domestic fires. Previously the survey had been conducted for 1999 (2000 BCS sweep), 1995 (1996 sweep), and 1993 (1994 sweep). The BCS was designed to acquire fire incident statistics, and to collect an extensive range of social demographic information in order to identify those groups within society more likely to experience an unattended fire.

In comparison to the U.S. data collection in which participants were asked to report on fires that occurred three months previous to the survey, in the U.K. 2001/2 sweep, over 30,000 respondents were asked if they had experienced a domestic fire (including attended and non-attended fires) in the previous 12 months of the survey. If the person had experienced more than one fire they were asked to report on the most recent. A post code address file was used to randomly select households, and one adult in each household was chosen to complete a self interview questionnaire. The un-attended fires measured by the BCS were typically those that resulted in little or no damage and hence were not officially recorded by fire services.

In contrast to the finding that the overall fire incidence appears to be on the increase in the U.S., results from the British survey found a decrease in domestic fire rates over an 8 year period. The current British results revealed that 1.5% of survey respondents had a domestic fire in 2001/2. This figure represented a large fall in prevalence rates compared with previous years, in which the rate was 3.1% in 1999, 3.4% in 1995, and 3.9% in 1993. However, it was noted that prevalence rates in previous survey sweeps had been based on an average recall period of approximately 14 months, therefore some of this reduction may have been due to the shorter recall period in the 2001/2 survey. Results from the BCS also indicated that in 2001/2 only 12% of respondents who reported a fire, reported experiencing more than one fire, similar to the 11% in 1999.

In order to make an estimate of the total number of domestic fires (including attended and unattended fires) in the U.K. within the 12 month period the incident rate was multiplied by the estimated 21,968,600 domestic properties in England and Wales in 2001. This calculation resulted in 383,300 domestic fires; hence approximately 1.7% of households had experienced a fire in one year. Because this estimate was derived from a sample of the population the BCS calculated the range within which the true value is likely

to fall. Using a 95% confidence interval, the BCS found the true value to lie between 346,000 (1.6%) and 421,000 (1.9%) domestic fires.

In addition, findings from the BCS showed that in 2001/2, of those households that reported having had a fire, 22% stated that the fire was attended (while 78% were unattended fires). This indicated a rise in attended fires compared to the previous sweep (1999 findings) in which 14% of households had an attended fire. The conclusion drawn from the 2001/2 BCS was that although there appeared to be an increase in attended fires, overall the long-term downward trend in domestic fires appeared to be continuing, possibly even accelerating.

Carrying on from the fire research conducted with use of the BCS, a more recent study conducted by the Office of Deputy Prime Minister (2006) also investigated unattended fires in the U.K. The survey of English Housing (SEH) was used for the first time in 2004/05 to collect information on fire related issues in the home. The SEH was conducted with 18,000 households over a 12 month period starting mid-April 2004. The researchers visited households and face to face interviews were conducted with the use of a Computer Assisted Personal Interviewing tool to display questions and collect answers on a laptop. The interviewee was asked if they had had a fire experience in the last 12 month period.

Similar to the results of the BSC, 1.5% of survey respondents had a domestic fire in 2004/05. In addition, an estimate of the total number of domestic fires (including attended and unattended fires) showed that approximately 308,000 households in England experienced at least one domestic fire in the previous 12 months; with an incident rate of approximately 1.6 fires per every 100 households.

Results from the SEH also showed that of the households that had experienced a fire 22% were attended, 78% unattended by fire services. In addition, also similar to the BCS findings, of those who reported experiencing a fire the vast majority of households (94%) had experienced one fire only.

In comparing the estimated percentage of the population who had experienced a fire (either attended and unattended) within a 12 month period, there was a significant difference in prevalence rates found for the U.S. and U.K.. Results for the U.S. showed that approximately 3 of 10 (30%) of households had experienced a fire within a 12 month period, while in the U.K. the BCS and SEH results showed only 1.7% and 1.6% of the population were estimated to have had a fire. In addition, of those residential fires reported by households, a greater percentage of fires in the U.S. were unattended (96%), compared to the number of unattended fires reported by the U.K. sample (78% in both BSC and SEH survey results). The difference in prevalence rates between the U.S. and U.K. (including unattended vs. attended fire rates) might be partly attributable to the methodology used to collect the data; as the initial contact with participants differed between studies. The U.S. Consumer Product Safety Commission, (1985) attempted to increase the reliability of their data collection by providing clear and concise definitions of the type of fires they were interested in collecting; in order to avoid confusing interviewees.

According to the Commission, a limitation of the previous data collection methods used in their 1974 survey was the definition of a fire. In the 1974 survey a fire was defined as "any unplanned event that flamed, smoldered, or emitted sparks in a household, or related property such as a vacation home, boat, car, or truck" (p3). The Commission maintained that this definition did not clearly distinguish between what researchers believed to be a fire and what respondents believed to be a fire. Therefore it was possible

that there would be great variability in what respondents were reporting as fires and it is possible that under-reporting might have occurred.

In order to communicate more clearly with survey respondents as to what type of fire event the interviewee was interested in, the Commission increased the detail of the opening introduction. An initial unaided question was first presented, and if the person stated they had no fire experience after this question, a second probing question was used.

The first question presented to interviewees was:
"We are interested in asking about any fires—large or small—that you have had in or around your home, vacation home, or on your property. By fire I mean any incident—large or small—that resulted in flames or smoke, and could have caused damage to life or property if left unchecked. Have you had a fire in or around your home, vacation home, or on your property during the past three months—that is (month1), (month 2), or (month 3)?" (p3).

If the respondent answer 'no' or 'don't know' the probing questions was asked:

" There are some fires which are often overlooked but which we want to include. Have any of the following incidents occurred in your home during the past three months—that is during (month 1), (month 2), or (month 3)? Grease or something flaming on the stove or in the oven? A smoking electrical appliance? Burning clothing? Smoldering or smoking mattress, rug, or upholstered furniture? Any other fire of this type?" (p.3).

The U.S Consumer Product Safety Commission found that respondents who initially answered no to question one, responded positively to the second probing question. Therefore in order to obtain more accurate responses from participants it is important to give a clear, detailed statement of what type of

fire events of interest and then to probe by presenting numerous examples to further clarify.

In comparison to the opening introductory lines given to interviewees by the U.S. Consumer Product Safety Commission, the BSC and SEH approach was a great deal broader. The BSC opening lines were: "I would now like to ask about fires in the home. This means all sorts of fires, including chip pan fires and very minor fires and includes fires in sheds, garages or greenhouses. In the last 12 months, that is since the first of (date), have you had a fire of any sort where you live?" (p5).

The SEH asked: ""I would like to ask about outbreaks of fire in the home. This means all sorts of fires, including chip pan fires and very minor fires and includes fires in sheds, garages or greenhouses on your property. In the last 12 months, that is since (date, 12 months ago), have you had an outbreak of fire of any sort where you live?" (SEH, p8-9).

Due to the fact that the BCS and SEH used only one probing question it is possible that a number of minor fires might have gone un-reported to interviewers, therefore resulting in a lower prevalence rate and lower percentage of unattended fires reported compared to that found in the U.S. study.

Such an under representation may be an effect of memory decay. In contrast to the U.S. study, in which participants were asked to report on any fires within the previous 3 months to the interview, the BCS and SEH asked participants to report on fire in the previous 12 month period. According to the U.S. Commission the problem of interviewee memory decay was identified as a weakness of their earlier survey conducted in 1974. Results from the 1974 database showed the monthly incidence of reported fires decreased dramatically from months one to 12. Subsequently, in order to

address this problem, the U.S. Commission limited the reporting of fires to three months previous to the interview date. In addition, although data was collected over a retrospective 3 month period, in order to obtain a valid estimate of all residential fires occurring in the U.S. in a 12 month period, only fire reported within the previous one month was used when calculating fire incidence.

Another possible reason for a lower percentage of unattended fires in the U.K. might be due to the fact that the BCS and SEH asked respondents to report on the most recent fire; it is therefore possible that householders gave details of the most serious fire instead, because it was more significant to them.

The U.S. might also have found a greater number of unattended fires reported because the fire experiences requested from interviewees were those events that 'could' have caused damage to property if left unchecked. Fires in which food ignited briefly in a pan (causing no damage) might therefore have been included in the data collection process, hence leading to a high percentage of unattended fires being reported.

Apart from the use of surveys as a method to collect unattended fire data, attempts have been made to gather such data from alternative existing information sources (e.g. hospital & fire records). Marriot (1993) aimed to evaluate the suitability of one of these databases, the Home Accident Surveillance System (HASS), as potential source of data that could possibly be used in a large scale study to examine unattended fires. HASS is a database in the U.K. that contains records of non-fatal accidents that take place in the home or at leisure, which cause a serious enough injury to necessitate a visit to hospital. Findings from the analysis revealed that unattended fires made up only 59% of all fires, which was substantially lower than the British Crime Survey would have predicted the prevalence of unattended fires to be at that

time (92% to 88%). The inflated number of attended fires in the database was due to the fact the HASS was a medical database, containing cases in which the person was injured seriously enough to have to seek medical attention; thus the fires in the database were likely to be the larger more serious fire events. Although it was concluded that using HASS data alone was not an effective means of analyzing the full extent of the unattended fire problem (because it is based on hospital admissions & data was therefore bias); the findings from the study highlighted the hazardous nature of unattended fires in terms of causing injuries. Of all fire injuries in more than half of all cases (59%) a person was injured in the event of a fire they were able to extinguish without the assistance of fire services. This emphasizes the need to investigate unattended fire events as well as attended events, as injuries may occur in the event of both fire types.

In considering the findings from overseas data (uncovering that unattended fires make up the vast majority of all fires events) it is evident that there is a large gap in what is known about the overall fire problem within Australia; as the incidence of unattended fires is currently unknown.

1.4 Summary

In Australia fires occurring within private dwellings make up the largest proportion of all accidental fire-related deaths. Statistics also indicate that the number of fatal fires is slowly decreasing in Australia. In contrast to this decrease, it appears that the number of overall attended fires is on the increase within Victoria, Melbourne. Such an increase clearly signals that the fire safety campaigns are not leading to the desired reduction in the number attended fires occurring within the community.

Also of concern are findings from U.S. and U.K. studies which indicate that attended fires make up only a small number of fires in terms of the overall fire problem in the community. In the overseas studies the majority of fires being experienced are in fact unattended fire events in which the fire has either self-extinguished, or has been extinguished by the occupant of that dwelling. For Australian statistics, this highlights a large gap of missing data in terms of what is known about the overall fire problem, as the prevalence of unattended fires is currently unknown. Without unattended fire incident data, it is currently unknown whether a problem exists in Australia that society is unaware of, and the magnitude of that problem if it does exist.

Of further concern is that smaller unattended house fires may preempt a more serious fire event later on in the future (Brennan & Thomas, 2001). It is therefore possible there is a link between unattended fires and the increasing number of attended fires within the community; as the occurrence of small unattended fires might be preceding larger attended fire events. Research on unattended fires within Australia could therefore help fire services in targeting and improving fire prevention programs for persons who may be carrying out hazardous actions that may eventually lead to a more serious fire.

The current study is therefore being carried out in order to determine the incident rates for unattended fires to gain a better understanding of the overall extent of the fire problem within Australia.

The risk factors for experiencing a residential fire (including occupant characteristics, environmental and dwelling characteristics and ignition sources) were collected in the different international and Australian studies and will be further discussed in the literature review and in the discussion, where they will be compared with current data.

Summary of fire statistics *(see text for references)*

Residential Fires	**Australia**	**U.S.**	**U.K.**
Fatalities	2000-2003 0.3 per 100,000 people in population	2004 1.0 per 100,000 people in population	2002 0.9 per 100,000 people in population
Overall attended fires	2000 10,000 residential fires in a population of 19,153,000	2006 412,500 residential in a population of 299,398,484	2006 55,800 residential fires in a population of 60, 587, 000
Attended & unattended fire in a 12 month period based on interviews	?	1985 Out of 30,000 house-holds interviewed, 1919 had a fire in 3 months (6.3%)	2004/2005 Out of 18,000 households interviewed, approx 2,800 had a fire in 12 months (15%)
Unattended fires only in a 12 month period based on interviews	?	1985 Out of 30,000 house-holds interviewed, 1734 unattended (1734/30,000= 5.7)	2004/2005 Out of 18,000 households interviewed, approx 2,180 unattended (2180/18,000= 12.1)
Attended fires only in a 12 month period based on interviews	?	1985 Out of 30,000 house-holds interviewed, 85 were attended (85/30,000=0.3)	2004/2005 Out of 18,000 households interviewed, 22% (approx 620 fires) were attended (620/18,000= 3.4)

? = unknown

CHAPTER 2. OCCUPANT CHARACTERISTICS

2.1 Fatalities/injuries

The occurrence of a residential fire fatality is not exclusively attributable to the severity of the fire itself (Sekizawa, 2004). Numerous papers have shown that fatalities are distributed unevenly across the population, and particular groups within society are more at risk of dying in the event of a residential fire than others (Karter & Miller, 1990; Runyan, Bangdiwala, Linzer, Sacks & Butts, 1992; DiGuiseppi, Edwards, Goodward & Wade, 2000). Worldwide, research repeatedly defines the very young and very old as being the groups within society who are at the highest risk of becoming a fatality in the event of a residential fire (Levine & Radford, 1977; Brodzka, Thornhill, Howard, 1985; Copeland, 1985; Conley & Fahy, 1994; Elder, Squires & Busuttil, 1996; Baux, Mimoun, Saade, Lioret, Esteve, Nolland, Bertiere, 1989; Waller, Marshall, & Langley, 1998; Istre, McCoy, Carlin, McClain, 2002; Karter & Miller, 1990; Mashall, Runyan, Bangdiwala, Linzer, Sacks, Butts, 1998; Runyan, Bangdiwala, Linzer, Sacks, Butts, 1992; Barillo & Goode, 1996; Notake, Sekizawa, Kobayashi, Mammoto & Ebihara, 2004; & Miller, 2005). Other variables found to influence the fire death rate include the sex of the victim, socio-economic factors and the influence of alcohol.

2.1.1 Age

Although the incidence of burn injuries in the elderly population is usually lower than among other age groups, research continually shows that the aged are more likely to die as a result of their injuries (Hammond & Ward, 1991). According to the London Fire Brigade (2007) during 2001 to 2005 over half of all unintentional fire fatalities (55%) were 60 years of age and above. In the U.S. statistics for 2001 showed adults 64 years and over suffered more

than 30% of all fire deaths, despite representing only 12% of the total population (U.S. Fire Administration, 2004). Australian statistics are no exception to this trend, with fire data for July 1996 to June 2004 showing that individuals aged 65 and over were one of the dominant age categories of residential fire fatalities; making up 22% of all fire deaths (Australasian Fire Authorities Council, 2005). In addition, fire statistics specific to the state of Victoria showed that from January 1998 to February 2005, individuals who were 65 or older made up 41% of all fire fatalities, despite representing only 12.6% of the total Victorian population (Watts-Hampton, 2006).

Overseas research also indicates that for the elderly the risk of dying in a residential fire becomes even greater as their age increases. According to the U.S. Fire Administration (2001) persons aged 65 years and over have a fire death rate 20 percent higher than the national average and this risk increases to double the national average at age 75 years, and is four times the average at age 85 years. Similarly, U.K. fire statistics for 1996 to 2000 showed that in comparison to the 20 to 39 year age group, the death rate was five times higher for those aged 60 to 79 and ten times higher for persons aged 80 plus (Holborn, 2001).

The elderly represent a high risk group for fire fatality because as age increases the likelihood of developing a disability increases. As people grow older physical and cognitive changes take place that could increase a person's risk of starting an unintentional fire, and increase the risk of being injured in the event of that fire (United States Fire Administration, 2004). The decline in functional capabilities of the elderly affect three main areas, their sensory skills (including visual, audio and tactile systems), their action skills (mobility) , and their decision making skills (understanding the meaning of what is perceived and deciding what actions to take) (Kose, 1998).

For the elderly the most frequently reported sensory disabilities are a loss of hearing and vision (The United States Fire Administration, 1999). The hearing impaired may be unaware that a fire even exists because most fire detection systems use audible warning signals (such as a high frequency smoke alarm), and such systems are of little use to those who cannot hear them (Blye & Yess, 1987). The problem is compounded by the fact that older adults are more prone to high frequency hearing loss (Bruck & Thomas, 2007). Vision loss is also a problem in regards to fire safety as it reduces a person's ability to interact with the environment (United States Fire Administration, 1999). For example, in cooking fires the risk of sustaining a burn injury increases when burners and flames cannot be clearly seen. Also, an impaired sense of smell may prevent a person from recognizing fire cues such as smoke from a fire (Petraglia, 1991). In addition reduced physical mobility means the elderly are more vulnerable in a fire event, as they are less able to escape easily and quickly from danger (Karter, 1986; Lilley, Arie, Chilvers, 1995) and physical performance may be especially affected by the elderly upon awakening from sleep suddenly (Bruck, Thomas, & Kritikos, 2006).

Another factor leading to increased fire fatality risk for the elderly population is living alone. In a review of fatal fires (that occurred in 1997-1998) in which smoke alarms reportedly operated, Fahy and Molis (2004) found that of the 72 victims aged over 70 years, 34 were home alone when the fire started; in addition 31 of the 72 had some sort of physical or mental disability. Despite functional impairments many elderly people are living on their own in order to maintain their independence (Turner, Leman, Jordon, 1989); this adds to the fire risk because they have no help in the face of an emergency situation (Brodzka, Thornhill, Howard, 1985; United States Fire Administration, 1999).

Like the elderly, children also have higher fire fatality rates compared to the remaining population; particularly for those under the age of five

(Fahy, 1986; Danaf, 1995; Shai, Lupinacci, 2003; and Karter, Miller, 1990). In the U.S. the rate of deaths from residential fires for pre-school children is more than double the rate for all age groups combined (Committee on Injury & Poison Prevention, 2000). Australian statistics for July 1996 to June 2004 showed that individuals age 0-4 were, along with the elderly, another dominant age category of residential fire fatalities; making up 8% of all fire deaths (Australasian Fire Authorities Council, 2005). Young children are generally at higher risk of dying in home fires because they usually fail to understand the danger of fire and are generally unable to escape without help (Byard, Lipsett, Gilbert, 2000).

2.1.2 Sex

For decades, it has been found that the victims of fatal residential fires are more often male than female (Duncanson, 2000; Early & Hanzlick, 1987; Miller, 2005; Mierley & Baker, 1983; Reynolds, 2004; & U.S. Fire Administration, 2002). In the U.K., Taylor, Manifold, and Lodge (2001) found that during 1996- 2000 in Nottinghamshire, 60% of all home fire victims were male; and the incidence of male deaths was double that of females for the 20 to 60 year age group. U.S. data for 1983-1987 has also shown a higher death rate for males, in varying degrees, across all age groups; particularly for adults 20- 64 years of age and 85 plus years, where deaths rates were 83-165% higher for males than for females (Karter & Miller, 1990). Swedish data showed that most victims were male (61%) in the analysis of fatal residential fires between the period of 1999 and 2000 (Sardqvist, 2004). Australian data also shows gender trends; according to the Australian Bureau of Statistics (2000) in 1993 63% of residential fire deaths in Australia were male. The Australasian Fire Authorities Council (2005) also found similar results for a three year period (1991 to 1996) in which there were 514 fatalities in Australia

with 318 male victims (62%); a finding that was consistent across all Australian states.

Higher fire fatality rates for males have been attributed to known gender differences in behaviour; as males are generally more likely to engage in risky behaviour compared to females. For example, Karter and Miller (1990) found that male victims were more often impaired by drugs or alcohol (12.4%) than female victims (4.4%) and were more often involved in smoking fires (7.4 fire deaths per million population), which was more than twice that for females (3.6 deaths per million population). In addition, male children have been found to be at greater risk of fatality than female children, because males tend to be more likely to play with fire (Scholer, Hickson, Mitchel, & Ray, 1998; Shai & Lupinacci, 2003).

In contrast to studies which have found males more at risk of fire fatality within the general population, studies examining fatal and non-fatal burns in elderly populations have found that older women are more likely than men to sustain burn injuries (Hammond & Ward, 1991; Sarhadi, Kincaid, McGregor & Watson 1995). For instance, Hammond and Ward, (1991) found the reverse of the gender pattern seen in younger patients in their collection of demographic data of fire injury victims (from Sep 1982 to August 1990) for 29 patients over the age of 80. The authors determined that most injury victims were women (72%). Similarly, Sarhadi, Kincaid, McGregor and Watson (1995) found more females admitted with burns (61%) in their examination of 176 patients aged 65 years and above, treated in Bangour Burns Unit during a 10-year period between 1982 and 1991. However, the percentage of females aged 65 plus in the population was not specified in the two studies and elderly women may be more prone to burn injury than elderly men because they generally make up a larger proportion of the 65 plus population; as women usually live longer than men. In addition, the data analysed in both studies included fatal and non-fatal burn injuries, and a common problem with non-

fatal burn injury data is that studies are usually inclusive of not only burns from house fires, but other burn types (such as scalds from a hot water bath). Hence the effect of sex as a risk factor for non-fatal burns resulting from residential fires only remains unclear.

Research has also shown that the type of burn injury sustained differs due to known gender roles. Cutillas, Sesay, Perro, Bourdarias, Castede and Sanchez (1998) conducted a retrospective study on 716 patients aged 60 and above (324 men, 392 women) in order to determine quality control in burn management in South West France. The authors found that burn injuries occur mainly indoors (86%) with most occurring from domestic accidents; and women experienced more domestic related accidents (82%) than males (63%); while outdoor accidents (mainly recreational in nature) were five times more frequent in males. In addition the equipment involved differed by sex also, with burns from kitchen utensils higher for females (39%), than males (18%) and brushwood fire and barbeque burns were more frequent in males (18% vs. 2%).

2.1.3 Alcohol

It has been shown time and time again that there is an association between alcohol intoxication and fire injuries and deaths (Early & Hanzlick, 1987; Barillo, Rush, Goode, Lin, Freda & Anderson, 1986; & Miller, 2005). Brennan (1999) found that of 150 residential fire fatalities that occurred in Victoria, Australia from mid 1990 to 1995 of those 18 to 75 years of age nearly half of the sample had alcohol readings over 0.5. In the U.S. Marshall, Runyan, Bangdiwala, Linzer, Sacks and Butts, (1998) found of a sample of fatal fire victims 53% had a BAC reading that exceeded 22mmol/L; and in 37 cases the victim had a history of alcoholism. In Finland Rahikainen and Keski-Rahkonen (2001) found that 71% of victims were under the influence of

alcohol at the time of their death in a study of 689 fatal fires during 1988-97. However a common problem when assessing the role of alcohol in fatal fires is that the number of victims intoxicated is often underestimated, as there are cases in which alcohol readings are not able to be taken for a number of reasons (Brennan, 1998).

2.1.4 Sleeping

In Brennan's (1999) examination of coronial reports for 150 deaths in Victoria, Australia during mid 1990 to 1995 it was found that for fires from 8pm to 8am, 86% of victims were sleeping; while during the day (8am to 8pm) 31% of victims were asleep. The author also found that of those who were asleep at the time of the fire three quarters remained in the room that they were first residing in. According to Brennan, this finding indicates that people were either killed by the fire while sleeping or woke up too late to evacuate. Although sleeping has been identified as a risk factor for fatal fires the problem remains that those most at risk of experiencing a residential fire are not only less likely to own a smoke alarm (Runyan, Bangdiwala, Linzer, Sacks, Butts, 1993; U.S. Fire Administration, 2002); but for high risk groups, including those under the influence of alcohol and the elderly, current smoke alarms (even if present) may not be effective in waking at risk groups (Bruck & Thomas, 2007; Bruck , Thomas & Ball, 2007).

2.1.5 Occupation

Of the fatal fires that occurred in Australia during 1991 to 1996 a high percentage of victims were not in the workforce (58%) with their occupation listed as pensioners, retirees, home duties or unemployed (Department of Emergency Services, 2003). This finding was consistent across all Australian

states. Although numerous studies have investigated the risk of dying in a fire and level of income, in which injury is more frequent in economically disadvantaged groups (DiGuiseppi, Edwards, Godward, Roberts, & Wade, 2000; Shai & Lupinacci, 2003; Wolf & Rivera, 1992), only one other known study examined 'not in the workforce' as a risk factor (Watts-Hampton, 2006). Watts-Hampton found that of all fire deaths that occurred in Australia, Victoria in 1998 to 2005 those not in paid employment were overrepresented in the fatality statistics. Financially disadvantaged persons are at increased risk because they are less able to invest in fire safety provisions, such as smoke detectors, safe heating equipment and new furniture/ mattresses that are more resistant to ignition (Fahy & Norton, 1989).

2.1.6 Education level

Studies have found a link between the risk of child fire fatality and maternal education level. For example, Hussy (2003) found an association between head of households with a low level of education and increased unintentional fire injuries in children and young adults (Shai & Lupinacci, 2003). Similarly, Scholer, Hickson, Mitchel and Ray, (1998) also found that maternal education had a particularly pronounced association with child fire fatality rates when examining the 270 child deaths in Tennessee between 1980 and 1995. According to Shai and Lupinacci (2003) it is probable that parents with low education levels are more likely to be living in conditions that are hazardous in nature, and parents might be less knowledgeable in how to prevent injuries from occurring. However, it is unknown whether level of education plays a role in increasing the risk of residential fire fatality for adults.

2.1.7 Birthplace and ethnicity

Findings from overseas tend to show an overrepresentation of ethnic minorities in regards to residential fire mortality and fatality (Ballard, Koepsell & Rivara, 1992; Istre, McCoy, Osborn, Barnard & Bolton, 2001; Patetta & Cole 1990). Mierley and Baker (1983) found the death rate for black Americans was twice the death rate for white Americans in a study of house-fire deaths in Baltimore from 1976-1978. Similarly, McGwin, Chapman, Curtis, and Rousculp (1999) found that in the U.S. for all age groups black males tended to have the highest fatality rates followed by black females, white males, and white females respectively. In New Zealand, Duncanson (2000) found threefold increase in residential fire mortality for Maori compared to non-Maori occupants. In contrast, the Australasian Fire Authorities Council (2005) found that during the period of July 1996 to June 2004, in terms of ethnicity no one particular ethnic group made up more fatalities than another in Australia. In addition, the Department of Emergency Services, (2003) showed that from 1991 to 1996 the majority of fire death victims (76%) were born in Australia. However the birthplace of the victim was only known for 68% of fire victims; and such findings are complementary only, as the studies from overseas did not specify whether ethnic minorities were native-born or immigrants.

2.2 All attended fires

For overall attended fires the data is limited regarding surviving occupant characteristics, as the vast majority of research is directed towards the profile of fire fatality victims. A number of studies in the U.S. have conducted investigations into the demographics of those responsible for

starting attended fires, however such studies have focused exclusively on cooking fires (National Association of State Fire Marshals, 1996; Smith, Monticone, & Gillum, 1999); which are the leading cause of all fires in the U.S. and Australia (Hall, 2006; SGIO, 2004).

2.2.1 Age

The National Association of State Fire Marshals (1996) conducted an investigation of attended cooking fires reported to fire departments in 10 communities over a six month period during 1995. Results showed that persons aged 19 to 69 were involved in disproportionately more fires than their incidence in the overall population. In addition, the age group with the highest risk of experiencing an attended cooking fire was those aged between 30 to 49 years. In another study of cooking fires involving the range (stoves), the CPSC (1999) conducted an analysis on 289 attended range fires that occurred between October 1994 and July 1995 (Smith, Monticone, & Gillum, 1999). Of the 165 cases in which the age of the cook was known, results showed that adults aged 24 to 64 were associated with almost two-thirds of the fires (61%). Hence, data tends to indicate that for overall attended residential fires the majority of persons experiencing such fires are young to middle aged adults. However, results from both studies are based on residential fires caused by cooking only.

2.2.2 Sex

In their analysis on attended range fires the CPSC (1999) found that roughly two-thirds of the cooks were females (Smith, Monticone, & Gillum, 1999). While for overall cooking fires the National Association of State Fire Marshals (1996) data showed that women were involved in 40% more cooking

fires then men. However, in general women are more likely to carry out the activity of cooking compared to men; therefore men may in fact be involved in a disproportionate number of cooking fires if taking into consideration the time they spend engaging in the activity of cooking.

2.2.3 Occupation, education, & birthplace and ethnicity

Generally for overall attended residential fires there has been very little analysis of the occupation, education, and cultural background of the occupants who are experiencing such fires. The CPSC (1999) did collect information on the annual household income of households who had experienced an attended cooking fire; and results indicated that persons earning less than 35,000 per anum were experiencing more fires compared to their incidence in the population (Smith, Monticone, & Gillum, 1999). The authors also examined the education level of the head of the households experiencing attended cooking fires. Results indicated that households with a high school level education (40%) and households that had completed college or some other course work (43%) were also experiencing a disproportionate number of attended cooking fires.

In terms of ethnicity, the National Association of State Fire Marshals (1996) examined the effect of cultural background on cooking fire incidence and found that minority households (particularly African-American households) were disproportionately involved in an increased number of cooking fires. Despite making up only 30% of the population in Cincinnati, 70% of those experiencing a cooking fire were African-American.

Although results from the U.S. cooking fire studies appear to indicate that those experiencing attended cooking fires tend to be households with lower incomes, those with high school or college level education, and

minority households, research is currently limited in this area. In addition, for Australia there is no known published data regarding the occupant characteristics of those involved in the start of overall attended fires.

2.3 Un-attended fires

In their analysis of unattended fires the U.S Consumer Product Safety Commission (1985) compared fire households (that reported a fire experience in the previous 3 months of the survey) to non-fire households (no reported fire in the previous 3 months). The authors found that both samples were predominantly white (82.1% and 80.3%) and reported income did not differ significantly for fire households and non-fire households. In addition the authors found that respondents in fire households had a higher level of education, as 54.6% had attended college compared to 38.5% in non-fire households. Data presented however included attended and unattended fires which were combined into a single category for the analysis because there were no significant differences between the attended and unattended fire households.

For unattended fires no data has been collected regarding the characteristics of the occupant involved in the fire start and or extinguishment of the fire. Factors including the age and sex of the occupants involved currently remains unknown. No data exists on the involvement of alcohol and whether the occupant was sleeping at the time of the fire.

2.4 Summary

Research in Australia and overseas repeatedly shows that the very young and the elderly have higher fire fatality rates compared to the remaining population. This is attributed to the fact that young children and elderly persons have physical and mental limitations that may affect their ability to respond quickly to a fire emergency.

Research also indicates that males tend to be more at risk of becoming a fatality in residential fires compared to females. This is most likely due to their tendency to engage in more risky behaviours.

Research overseas and in Australia indicates that there is an association between alcohol intoxication and fire injuries and deaths; and fatalities are more likely to occur during the sleeping period.

Overseas research on fatal fires has shown fire fatalities are more frequent in homes which have low income levels. For Australia, data has been analysed in terms of the number of fire fatality victims in the workforce or not in the workforce, with findings indicating that during 1991 to 1996 a high percentage of victims were not in the workforce at the time of the fire.

Although research overseas tends to show an overrepresentation of ethnic minorities in regards to residential fire mortality and fatality, in Australian data from 1991 to 1996 the majority of fire death victims (76%) were born in Australia. However such findings are indicative only, as overseas studies do not tend to specify whether ethnic minorities are native-born or are immigrants.

For overall attended fires occupant characteristic data is limited, as the vast majority of research is directed towards the profile of fire fatality victims.

However, data from two U.S. studies indicate that the persons responsible for starting attended fires tend to be young and middle aged adults, which is a contrast to fatality data showing the very young and elderly are most often the victims of home fires. However, such studies are based on cooking fires only.

In addition, in contrast to fatality data in which males are more often the victim, attended cooking fire data has shown a greater number of women to be the cook at the time of the fire. However, as men spend less time engaging in the activity of cooking it is possible males may be involved in a disproportionate number of cooking fires compared to their female counterparts.

Although results from research in the U.S. appear to indicate that, similar to fatality data, those experiencing attended cooking fires tend to be households with lower incomes, those with high school or college level education, and minority households, research is limited in this area. Currently for Australia there is no known published data regarding the occupant characteristics of those involved in the start of overall attended fires.

CHAPTER 3. ENVIRONMENTAL & DWELLING CHARACTERISTICS

3.1 Fatalities/injuries

The type of residency in which fatal fires occur differs for different countries (Leth, Gregersen & Sabroe, 1998; Center of Disease Control, 1985, Sardqvist, 2004). In the U.K. from 1996 to 2000 nearly half of fatal fires occurred in purpose build flats (49%, 134 deaths), 22% occurred in terrace houses (62 deaths); with relatively few occurring in detached houses (Holburn, 2001). In contrast, in the U.S. during 2005, 81.3% of all fatal residential fires occurred in one and two family homes, with only 14% of fires occurring in apartments (U.S. Fire Administration, 2006). Similarly in New Zealand the majority of home fire fatalities (87.7%) occurred in single dwelling houses during 1991 to 1998; with only 11.3% of fatal fires occurring in flats or apartments. The percentage of fires occurring within certain building types may differ between countries depending on the proportion of the population living in certain residency types.

In line with data from the U.S. and New Zealand, in Australia from July 1996 to June 2004 the majority of residential fire fatalities occurred in houses (80%), with only 6% occurring in units and apartments (AFAC, 2005). In addition most fatalities occurred in properties that were classified as owner-occupied (76%), with only 13% of fatalities occurring in rental properties and 11% occurring in public housing. For the state of Victoria the majority of fatal fires also occurred in houses (80%), with only 10% in units or apartments, and 4% in sheds or garages, and a further 4% were in other residential areas (AFAC, 2005). However no data was available regarding the property status of Victorian homes during this period.

Research also shows that fatal residential fires occur most often inside the dwelling. In the U.S. during 1996 to 1998 the majority of fatal fires were

residential structural fires (73%); with only 17% of fatal fires occurring in motor vehicles and the remaining 6% were evenly divided between fatal fires occurring outside and other types of fire (U.S. Fire Administration, 2002). U.K. statistics indicate that during 2000 to 2005 82% of fatalities occurred in the home, 7% occurred in motor vehicles and 11% occurred in other areas (London Fire Brigade, 2007).

3.2 All attended fires

The U.S. Consumer Product Safety Commission (1985) found that of the 25,197,000 fires that were estimated to have occurred during the 12 months interview period, the majority were residential structural fires (94.6%). In addition, most residential structural fires were unattended fire events (96.6%). Non-structural fires, on the other hand, had a greater tendency to be reported to fire services. Of the non-structural fires, there were approximately 630,000 motor vehicle fires (in which 29% of such fires were attended) and 580,000 yard fires (in which 17% of fires were attended).

More recent statistics show that in the U.S. during 2006 there were 412,500 attended residential structural fires (accounting for 78.7% of all structural fires). Of these fires 304,500 (74%) occurred in one and two family dwellings, and 91,500 (22%) occurred in apartments (Karter, 2007). There is no known data available regarding the number of overall attended fires occurring in various property types for the U.K. and Australia.

3.3 Un-attended fires

The 2001/02 BCS showed alike patterns in their results. The BCS estimated that 85% of all domestic fires occurred inside the house. In addition, fire services were called to more fires occurring outside residential structures (73% of all attended fires), than inside the home (20% of all attended fires). This is due to the fact that there were a high number of indoor cooking fires which are least likely to be attended by the brigade. The SEH results for fires in England during 2004/05 also found that the majority of fires (89%) occurred indoors; only 11% of fires occurred outdoors (e.g. in the garden) (Office of the Deputy Prime Minister, 2006).

The U.S Consumer Product Safety Commission (1985) investigation into unattended fires revealed that most fires including attended and unattended (67.8%) occurred in single family dwellings, 21.1% in multiple dwellings, and 6.1% in mobile homes. Of those in the sample who had experienced a fire 64.6% were owners and 34.7% were renters.

In Australia the environmental and dwelling characteristics of unattended fires remains unknown.

3.4 Summary

Within Australia, fatal fires are most often occurring in houses, compared with apartments, units and flats. There is no available data for Australia specifying the dwelling types in which overall attended residential fires are occurring. No Australian data exists describing the environmental and dwelling characteristics of unattended fires. However research from the U.S. indicates that in the vast majority of unattended fires occur in single family dwellings, indoors.

CHAPTER 4. ROOM OF FIRE ORIGIN /IGNITION SOURCES

4.1 Fatalities/ injuries

4.1.1 Leading causes of ignition

In the U.S. and the U.K. the leading causes of fatal residential fires are similar; smoking is the number one cause in both countries. In the U.S. during the period 2000 to 2004 smoking was the leading cause of residential fire fatalities, causing 24% of all civilian deaths (Ahrens, 2007). Similarly, in the U.K. during 2005 the majority of all accidental fire fatalities in homes were started by cigarettes, cigars or tobacco (35.4%) (Department for Communities & Local Government London, 2007). Studies show that the majority of all tobacco fires start when the smoker or other responsible person has fallen asleep, either dropping a lit cigarette or not putting it out correctly (Brodzka, Thornhill, Howard, 1985; Rahikainen & Keski-Rahkonen, 2001; U.S. Fire Administration, 2005).

Distantly following smoking fires, for both countries, heating and cooking fires are also leading causes of fire fatality; with the difference between the two countries being in the rank. In the U.S. fires caused by heating equipment and intentionally set fires ranked equal second, causing 11% of all fire deaths each; while cooking equipment fires and candle fires ranked third causing 7% of all fires deaths each from 2000 to 2004 (Ahrens, 2007). In comparison, in the U.K. cooking related fires rank well ahead of heating related fires; in which fires starting with cooking appliances made up 16% of all deaths; followed by the third leading cause of fatalities which was space heating fires (8.4%) in 2005 (Department for Communities & Local Government London, 2007).

In Australia, the Department of Emergency Services, (1998) determined the leading causes of accidental fatal fires via analysis from data from the AIRS system and Fire Investigation Unit Records. Similar to overseas findings, from July 1991 to June 1996 the majority of fatalities (89 victims, making up 22% of all deaths) died in fires caused by accidents involving discarded smoking materials, lighters or matches. The second leading cause, in which 36 victims were killed, was due to heating related fires, followed by fires attributed to electrical faults (causing 24 fatalities). In contrast, more recent statistics for the period of July 1996 to June 2004, analyzed by the AFAC (2005) showed smoking fires as the second leading cause of all Australian fire fatalities. The three leading causes of fire death were found to be due to heater/open fire/lamp (27%), smoking materials/equipment (25%), followed by fires starting due to electrical faults (23%) (AFAC, 2005). However, smoking materials/ equipment fires were classified separately to fires starting due to smoking in bed (the number of smoking related fires might have been higher if the two categories were combined). In addition, of the 412 fatality cases recorded during that period, in 224 fatality cases (54%) the cause of the fire was undetermined or not recorded. Also data from the Northern Territory was not available during the 1996 to 2004 analysis.

AFAC (2005) also specified the leading causes of fatal fires for the state of Victoria during the time period of November 1997 to September 2003. Findings showed the major causes of fatal fires (which was known for 49 cases out of 99) were; heater/ open fire/lamp (11 victims, 22%), smoking materials/ equipment (9 victims, 18%), smoking in bed (6 victims, 12%), electrical fault (6 victims, 12%) and accident or explosion (5 victims, 10%). Considering that in this analysis fires relating to smoking materials and smoking in bed were considered in different categories, if the two were combined smoking-related fires would in fact be the leading cause, with heating fires coming second. Results may be different to overseas data as classification system used for fire data may differ between countries.

Overall for Australia, in determining the leading causes of fatal fires a number of factors should be considered. One is that the database is incomplete and in nearly half of all fires the cause is unreported or unknown; and additionally data for Northern Territory was not available for the 1996 to 2004 analysis. In addition, the classification system used to group and analyse data may differ between overseas and Australia (e.g. smoking materials and smoking in bed are presented as separate categories in the Australian database).

4.1.2 Room of fire origin

Research shows the most common location of fatal residential fire is the bedroom and living room of the home (Karter & Miller, 1990; U.S. Topical Research Series, 2005; Shai & Lupinacci, 2003). In the U.K. the London Fire Brigade (2007) found that during the period of 2001 to 2005 the lounge and bedroom had the highest number of fatality incidents at 34% each, followed by kitchen fires at 20%. Similarly, in the U.S. during 2000 to 2004 fatal fires started most frequently in the lounge (24%) and the bedroom (23%) and fires in the kitchen accounted for 15% of deaths (Ahrens, 2007). However, no known statistics for Australia specify the percentage of fatal fires occurring in differing locations in the home.

4.1.3 Materials First Ignited

Considering that most fires are caused by smoking and begin in the bedroom or living area, it is no surprise that studies have found that the materials usually first ignited are that of upholstered furniture and bedding (Mierley & Baker, 1983; Karter & Miller, 1990; & Barillo & Goode, 1996). In

the U.S. the annual average for 2000 to 2004 showed the leading items first ignited in home structural fires were upholstered furniture (21%) and mattresses or bedding (13%) (Ahrens, 2007). When the material most likely to be ignited first is that of bedding, furniture or clothing, the victims ability to escape is drastically limited because of their close proximity to the fire.

4.1.4 Time of day

Research repeatedly shows that fatal fires usually start during the night time hours when most occupants are expected to be sleeping (Duncanson, 2000; Sardqvist, 2004). In the U.S., from 2000 to 2004, fires between 11.00pm and 7.00 am caused more than half (54%) of all residential fire fatalities (Ahrens, 2007). AFAC (2005) found that in Australia during July 1996 and end of June 2004, fires were mostly (72%) occurring during the hours of 8.00pm to 8.00am (during sleeping hours); and within this time period there was a peak of fatalities between midnight and 4.00am. For Victoria (for the period of November 1997 to September 2003), findings were similar to that of the national data, in which the majority of fatalities (70%) occurred between 8.00pm to 8.00am.

4.1.5 Season

Research indicates that the incidence of fatal residential fires shows a seasonal pattern, with a greater number of fatalities occurring during the colder months (Early & Hanzlick 1987; Center of Disease Control, 1994; Barillo & Goode, 1996). In the U.S., for example, for the period of 1996 to 1998 there were fewer residential fire deaths in the summer months, with an increasing number of deaths in the winter months (U.S. Fire Administration, 2002). The same pattern has been observed for the U.K., in which Taylor, Manifold and Lodge (2001) found that in Nottinghamshire during 1996-2000, although fire

fatalities occurred throughout the year, there was a higher prevalence of fatalities in the colder months of the year (70% in the 6 months of October to March). For Australia findings from AFAC (2005) investigations revealed that, similar to worldwide fatal fire data, the majority (56%) of Australian residential fire deaths occurred in the winter period. According to the AFAC this is most likely attributable to the use of heating equipment during these months.

4.2 All attended fires

4.2.1 Leading causes of ignition

In comparison to fatal fires in which smoking is generally the leading cause of ignition, for overall attended fire starts the leading cause of residential fire is cooking in the United States (Hall, 2006), United Kingdom (Department for Communities & Local Government, 2005) and in Australia (SGIO, 2004). In the U.S. from 2000 to 2004 cooking fires made up 32% of all reported fires, followed distantly by heating fire which made up 16% of all fires (Ahrens, 2007). In the U.K. cooking related fires also made up a large proportion (57%) of all accidental dwelling attended fires in 2005 (Department for Communities & Local Government, 2005). In Australia during 2006/07 the NSW Fire Brigade attended 2,437 kitchen fires, which accounted for 56% of all attended residential fires (NSW Fire Brigade, 2007).

Research shows that careless cooking activities are usually responsible for cooking fires; with the leading contributing factor to the cause of residential cooking fires being due to cooking left unattended (U.S. Fire Administration, 2005). In the U.S. during 2003 unattended cooking fires in which occupants have left food on a stove or in an oven and forgot about it accounted for 30% of all cooking fires (U.S. Fire Administration, 2005). Other

contributing factors were found to be the misuse of materials or products (9%), and having the heat source to close to combustibles (9%). Similarly, Hall (2006) found the leading factor contributing to ignition for home cooking fires to be unattended equipment which was involved in one third of home cooking fires in the U.S. from 1999-2003. The next leading factors were found to be heat source too close to combustibles and unintentionally turning on or not turning off equipment (the two combined made up one fifth of cooking fires). In N.S.W., Australia, of the 45% of house fires start in the kitchen, almost half of kitchen fires are caused by cooking being left unattended (N.S.W. Fire Brigade, 2007).

Key Research and Marketing Ltd (1998) also found unattended equipment also to be the leading contributor to attended cooking fires in New Zealand and further examined where the occupants of unattended fires were located at the time of the fire; 16% were still in the kitchen, 43% were in another room of the house, 14% were outside of the house (but still on the property), and 25% stated they were off the property. The authors also found most persons responsible for ignition were still in the home, but outside of the fire affected room (most likely the kitchen). In addition the authors found that the common reasons for leaving cooking unattended included; being distracted by children, other adults in the home, TV, and unexpected phone calls or visitors.

4.2.2 Room of fire origin

Because the majority of attended fires are cooking related the leading room of fire origin for overall fires is the kitchen. In the U.S. 38% of home structural fires originated from the kitchen during the period 2000 to 2004 (Ahrens, 2007). Similarly, in Australia, according to SGIO (2004), approximately 30% of all attended fires in the home start in the kitchen.

4.2.3 Equipment involved in cooking fires

Research findings generally show that the main equipment involved in cooking related fires is the range (U.S. Fire Administration, 2005). Hall (2006) found in the U.S. from 1999 to 2003, the leading equipments involved in confined cooking fires were the range or stovetop (53%). The second leading equipment involved was that of oven or rotisserie (23%). In New Zealand the range was also most often the equipment involved in the ignition of a cooking fire (83%), followed by the oven (15%).

4.2.4 Type of cooking fires

In terms of the type of cooking fires being experienced, frying fires dominate in home cooking fires for both U.K and in New Zealand (Hall, 2006). Statistics for the U.K (2003) showed that chip or fat pan fires made up 30% of all cooking fires, in addition they made up 40% of home cooking fire fatalities and 51% of injuries (Hall, 2006). Key Research and Marketing Ltd (1998) found that out of 51 cooking related attended fires in New Zealand, most (64%) were due to frying, 35% boiling, 8% baking, 6% roasting, 4% grilling and 2% toasting.

4.2.5 Materials first ignited in cooking fires

In the U.S. during 2002, oil, fat, and grease were found to be the leading types of materials ignited in 41% of cooking fires, followed by other foods or starches (21%) and plastics including appliance casings and cooking utensils (10%) (US Fire Administration, 2005). Similarly, in New Zealand, in

most cooking fires (43%), fat or oil was responsible for the fire (Key Research & Marketing Ltd, 1998). According to the U.S. Fire Administration (2005) oil and grease are particularly hazardous because they are highly flammable and can splatter or spill during cooking.

4.2.6 Time of day

Rahikainen and Keski-Rahkonen, (2001) studied fires in Finland from 1988 to 1997 and found that non-fatal fires correlated with the activity cycle of people. Research on cooking fires confirms this phenomenon. In a study of residential cooking fires in Oregon in 2004, (in which data was gathered from an All Incident Reporting System), findings showed that cooking fires do follow a daily time pattern; with a noticeable peak occurring around 6 p.m. (dinner time) and a secondary peak occurring around lunch time (Oregon Office of State Fire Marshal, 2005). The same pattern was found nationally for the U.S. in 2002 (U.S. Fire Administration, 2005). Similarly, in New Zealand when participants were asked what type of meal was being cooked at the time of the fire the majority (49%) was preparing dinner (the evening meal), while 24% were preparing a snack and 8% were making lunch (Key Research & Marketing Ltd, 1998).

The severity of the fire has also been found to vary with the time of day the fire occurs. Ducic and Ghezzo (1980) found that minor attended fires (where there was not considerable property damage) were generally more common between 1.00pm and 7.00pm, whereas the more serious fires (which caused considerable damage) occurred more frequently between 7.01pm and 1.00 am. These findings are not surprising considering that the more serious fires usually occur during the night time hours, when people are often asleep.

4.2.7 Seasonal trends

In the U.S., for overall fire starts there is a peak in winter; likely due to the fact that the weather is colder and wetter and there is the increasing the need for heating systems to be utilized (U.S. Fire Administration, 2004). However, specifically for overall cooking fires, generally research has found there to be no seasonal trends. In a study of residential cooking fires in Oregon in 2004, in which data was gathered from the All Incident Reporting System, findings showed that cooking fires did not follow any seasonal or monthly trends. Cooking fires occurred steadily throughout the year, with a slight decrease in the summer months which is probably due to an increase in outdoor cooking (such as barbequing) and due to an increase in vacationing at that time of year (Oregon Office of State Fire Marshal, 2005). Similarly, for New Zealand cases fires were spread fairly evenly spread across the seasons, with over one quarter reporting a fire in autumn (26%), one fifth (20%) in summer, and in winter (19%) and just over one seventh (16%) in spring (Key Research & Marketing Ltd, 1998). Such findings can be explained by the fact that cooking is a necessary activity for daily living and is an activity that is a carried out repeatedly and in a similar manner everyday day, and is therefore not affected to a great degree by the weather.

4.2.8 Initial action taken in attended cooking fires

Hall (2006) found that firefighting related injuries were much higher for home cooking fires than for other fire types. The study found that in 1999-2003, 55% of injuries were attributed to firefighting in cooking fires, compared to only 11% of non-fatal injuries in house fires other than cooking. Key Research and Marketing Ltd, (1998) also found that of attended cooking fires in New Zealand, the majority of those who first noticed the fire attempted to

fight the fire (54%), while 18% waited for fire services to put out the fire and in 1% of cases the fire self-extinguished. In addition it was found that although 53% carried out actions considered 'correct', the remaining 44% were engaging in 'potentially dangerous' activities. The activities considered to be correct included: suffocating fire with wet towels or blanket (5 cases) or lid (3 cases) or dirt (1 case). Switch off appliances (10 cases), or owner turned off at mains (4 cases). Also safe were exiting building (7 cases), shutting doors (2 cases) and waiting for the fire brigade (15 cases). The activities considered 'potentially dangerous' included: attempting to move burning article (19 cases) (which made the fire worse); using water (7 cases) salt (1 case), flour (1 case), and baking powder (1 case) on an oil fire; entering or reentering burning building (5 cases) and removing a lid or opening the door on the item burning (3 cases).

Occupants should never move a burning object and should not touch or move a burning pan or pot because hot oil ignites quickly (N.S.W. Fire Brigade, 2007). Occupants are advised to turn the stove off and cover with a lid or a wet cloth or fire blanket and leave to cool down and occupants should never use water on an oil/ fat fire (N.S.W. Fire Brigade, 2007).

4.3 Un-attended fires

4.3.1 Leading causes of ignition

In regards to the fire start, the U.S Consumer Product Safety Commission (1985) found that most unreported residential fires were cooking related (78%). In addition, the vast majority of kitchen fires were deemed to have started due to human carelessness (83.5%). However, the specific cause of human carelessness was not specified further in the study results. The appliances most implemented in cooking fires were ranges and stoves

(48.6%), followed by ovens (27.1%). Toaster and toaster oven fires (3.1%) were not nearly as prevalent, and were most likely to be attributed to product failure, rather than human carelessness. Cooking materials tended to be the material first ignited (in 76% of instances) and in fires which food or grease ignited first, only in 4% of instances did something else catch fire.

Following kitchen and cooking related fires, the U.S Consumer Product Safety Commission found that unreported fires involving electrical wiring (6%) were found to be a distant second. Four out of ten unreported electrical wiring fire incidents involved an appliance cord. Most electrical fires (7 in 10) were considered to be the result of product failure rather than human carelessness. Fires starting in the electrical system resulted in electrical wiring igniting (26.6% of the time) and furniture (10.4%).

Heating appliances or equipment was implicated in 3.9% of un-attended fires. Portable space heaters were involved 39.2% of the time, a central or fixed heating system 34.1% of the time, fireplaces 4.8% of the time, and water heaters 2.5% of the time. Almost half the heating fires were accredited to product failure (44.7%), 51.2% to human carelessness.

The BCS 2001/02 results also showed that cooking was the leading cause of fire starts, however in comparison to the U.S. results, cooking fires only made up 53% of all fire incidents. Similar to the BCS results, the SEH revealed that in England during 2004/05 53% of all fires were caused by cooking accidents. The lower percentage of cooking fires in the U.K. compared to the U.S. might be because, although the majority of fires were unattended in the U.K., their analysis of fires also included attended fire events; whereas the U.S data describes the cause of unattended fires only.

Of cooking fires reported to researchers in the SEH survey, the common causes were grill pans catching fire (31%), followed by a pan of fat or

oil catching fire (28%), or occupants placing something to close to the cooker (22%). The extent to which fires began due to unsupervised cooking however, is unclear.

The second leading cause of fires in the BCS 2001/02 involved heating appliances (including chimneys), and electrical equipment or wiring (making up 9% of fires each). Similarly, the SEH showed the second leading cause of all fires to be caused by electrical equipment or wiring (11%).

4.3.2 Room of fire origin

The U.S Consumer Product Safety Commission (1985) found the vast majority of unattended fires (76.4%) occurred in the kitchen. The second most common location was in the living room, den, recreational room, and family room (10.1%), followed by bedroom (5.4%), and bathroom (3.2%). The BSC 2001/02 uncovered very similar results, in which the majority of fires started in the kitchen (62%); with just over a tenth of all domestic fires starting in the lounge room (12% in 2001/02), followed by 6% in the bedroom. In addition, more recent results show that in England during 2004/05 over half of all fires (60%) started in the kitchen, followed by fires in the lounge (13%) (Office of Deputy Prime Minister 2006). However, U.K. findings from both the BCS and SEH included both attended and unattended fires in the analysis.

4.3.3 Time of day

The U.S Consumer Product Safety Commission (1985) found that of the fire experiences reported to them 43% occurred between 1.00pm to 6.00pm; 29.3% occurred between 7.00pm to 11.00pm; 17.6% between 7.00am and noon. Only 3.8% occurred between midnight and 6.00am. Although the analysis was based on attended and unattended fires, the majority (96.6%) were unattended. Similarly, in England during 2004/05 most occurred during 4pm and midnight (43%) and during midday and 6pm (36%) (Office of Deputy Prime Minister: London, 2006).

4.3.5 Method of fires extinguishment & injuries

The U.S Consumer Product Safety Commission (1985) found that the majority of occupants attempted to fight the fire in 87.2% of all (attended and unattended) residential fire incidents. These occupants were most often successful in extinguishing the fire (hence fire services were only called in 4.5% of cases). In cases where the occupant did not try to put out the fire, fire services were called 11.6% of the time. The main methods used to extinguish the fires included; cutting off the main power of equipment involved (35%), removing burning material from heat source (24.6%), smother flames with a lid/ blanket (20%), using tap water (18.5%), using baking soda, salt or some other product (13.7%), home fire extinguisher (4.7%). In 86.5% of fires a household member was responsible for the fires extinguishment, in 2.2% of case another person or neighbor extinguished the fire, and in 2.9% of cases fire-fighters extinguished the fire.

According to the U.S Consumer Product Safety Commission (1985) injuries or illness occurred twice as much in reported fires compared to unreported fires. In reported residential fires injury/ illness occurred 12.8% of

the time; in un-reported fires 5.6% of the time. Only 3% of the time the injured or ill were admitted to hospital. The age group 20-24 years had the greatest proportion of injuries/ illnesses (24.1%). While 13.8% of the time injuries were experienced by children 14 years old and younger, and 1.3% of the time injuries were experienced by those 65 and older.

The U.K. BCS results also showed that, in total, over half of all fires were extinguished by the respondent (54%), or someone else in the household (22%). According to the authors this suggests the majority of domestic fires are not serious and are tackled adequately without the need for fire service involvement (BCS, 2001/02).

Similar to the U.S. findings, the U.K. BCS showed the vast majority of unattended fires resulted in no personal injury to the survey respondent or to anyone else in the household (91%). Out of those injured the most common was smoke inhalation making up 82% of all injuries. Additionally, of those injured only 4% sought medical attention and 3% resulted in someone in the household requiring hospital treatment. Such results were also found in the more recent SHE study, in England during 2004/05 of all domestic fires only 9% resulted in an injury (Office of Deputy Prime Minister, 2006). However in more recent results fewer people were injured due to smoke inhalation (52%), with 36% of injury victims suffering from burns and scalds. However attended and unattended fires combined in this analysis and the extent of injuries as a result from unattended fires alone is unclear.

4.3.6 Extent of damage & losses

In regards to property damage, the U.S Consumer Product Safety Commission (1985) found that in the majority of residential fires no property damage occurred (55.8%). In 36.4% of cases the damage caused less than $100; in 5% of cases the damage was between $100- $1000; and 1.9% of cases the damage caused exceeded $1000. Findings indicated that where there were losses, they were covered by insurance 85.5% of the time, and in cases where losses were not covered it was because the total damage did not exceed insurance excess. In addition, reported residential fires tended to be associated with greater property loss than those unattended.

The BCS asked respondents to estimate the total cost of damage from their last reported fire. Results indicated that 42% of respondents reported no loss, 19% stated minimal loss (less than 25 pounds), and 11% reported between 25 and 99 pounds. According to the authors this suggests that losses such as ruined food in a cooking fire are discounted.

4.4 Summary

In contrast to fatal fires, which are most often a result of smoking fires, the leading cause of overall attended fires and unattended fires is cooking. Such cooking fires usually begin because the cook has left the cooking unsupervised.

Fatal fires most often originate in the bedroom or living room of homes and consequently the materials first ignited are usually bedding or furniture; whereas overall attended residential fires and unattended fires most often originate in the kitchen and food products (mainly fats and oils) are usually first ignited.

Fatal fires are most common during the colder months and usually occur during the night (sleeping hours). Although overall attended fires also tend to show a peak in winter, when it comes to attended cooking fires there is no seasonal pattern evident. For both attended and unattended fires there is a peak in the number of fires occurring at dinner and lunch time (coinciding with cooking being the leading cause of the majority of fires in both cases).

In terms of attempts to extinguish the fire by occupants, for both attended cooking fires and unattended fires, studies have shown one of the main methods of extinguishment is to move the burning article, despite Fire Brigade advice that occupants should never move a burning object.

CHAPTER 5. STUDY ONE: DEVELOPMENT OF THE QUESTIONNAIRE

5.1 Study rationale

Due to the large proportion of unattended fires being reported in previous research studies (e.g., 78% in the U.K. & 96% in the U.S.) it is clear that in order to gain a clearer understanding of the fire problem within Australia it is necessary to investigate not only attended fires, but those unattended also. In Australia, the incidence of unattended fires is currently unknown. The current study is therefore being carried out to develop the methodology for investigating this issue and to take a first step in determining incidence rates for unattended fires.

Although fire statistics have been successful in identifying 'high risk' groups of house fire death and injury, there is also a need to investigate the fire circumstances of other groups who are experiencing non-fatal fires within society. This need is highlighted by the fact that despite the implementation of fire prevention programs the incidence of fire within residential dwellings in Melbourne appears to be increasing (Taylor & Pepperdine, 2003).

It is also important to investigate the patterns and trends of non-attended fires because a large number of house fires and fire related injuries go un-reported to fire departments (Karter & Miller, 1990). Therefore data is missing in relation to the risk factors of having an unattended fire which extinguishes itself or which is extinguished by an occupant. However, early identification of risk factors are vital, because smaller house fires may be a warning sign that a more serious fire event may occur in the future and because previous experience of a fire or near fire does not necessarily indicate that there will be a behaviour change, in which a person will carry out safer actions (Brennan & Thomas, 2001).

Additionally, further investigation of non-attended fires is essential because many house fires that result in fatalities could be prevented if occupants were aware of the danger of their actions at the particular time of carrying out that action (Loveridge, 1998). Therefore the identification of risk-factors will aid in the detection of early warning signs allowing fire services to increase their ability to offer the community more effective solutions tailored to a variety of fire situations. Furthermore, it is also of particular importance to determine residential risk factors for those who fall outside the two high risk groups (the elderly and the very young) because it is the middle band of people who may be caretakers for those at high risk.

Data is also missing in relation to the individual and social risk factors that make a person more susceptible of having an attended fire in which there are no injuries or fatalities. Additional research on attended home fires in which there are no casualties would also prove useful, as this data will allow for comparisons to be made between non-attended fire circumstances and attended fire circumstances; hence yielding a greater understanding of how interventions may be modified to suit differing fire situations. Fire engineers will also benefit from the collection of missing data for both attended and non-attended fires, as this information can be incorporated into their performance-based models.

Furthermore, the development of an instrument to collect the currently unknown non-attended home fire data will also be beneficial. From previous research it is known that although injury record data is another alternative information source to fire service records, it may not be sufficient to assess the full extent of the problem; as most fires in which serious injuries occur are being attended by the fire services. The use of surveys can be an effective method of collecting missing fire data. When collecting data it is important to have a clear introductory statement for participants, with probing questions in order to aid in their recall of past fire events. In the following project, a

questionnaire will be constructed and published so that it may be implemented internationally and used for cross-cultural comparisons. In addition, the current study could provide the beginning of a larger Australian or international database which includes information on attended and non attended fires in which injuries may or may not have been sustained.

In summary, it is important to learn about the differences between those who have a high risk of having an attended fire and those who have non-attended fires. The following study will allow for clearer understanding of the fire problem within Melbourne, Victoria and therefore allow for improvements in preventative strategies aimed at reducing the rising incidences of home fires. Furthermore, the development of an instrument to collect the currently unknown unattended home fire data may be used internationally and could therefore have a significant influence on program development and implementation, not only in Australia, but on programs around the world.

5.2 Study one aims

Aim 1: The first aim of the current project is to collect data on and examine the patterns and trends of unattended fires. At the same time data will also be collected on attended fires, however it is recognized that the number of attended fire data will be small and therefore of less validity and reliability.

Aim 2: The second aim is to determine whether the risk factors for overall attended residential fires, and attended fires in which there are fatalities or injuries, are different to the risk factors of residential fires not attended to by the fire brigade in Australia. Attended fire risk factors will be determined from the available literature (international).

Aim 3: The third aim is to determine whether the fires which are not attended to by the fire brigade will have similar characteristics and occupant demographics to overall attended fires

Aim 4: The fourth aim is to determine the incidence of un-attended residential fires by retrospective report from adults since the age of 18.

5.3 Study one hypotheses

1. It is hypothesized that fires which are not attended to by the fire brigade will have different characteristics and occupant demographics than fires that are attended to in which there are **fatalities and injuries**.

2. It is hypothesized that fires which are not attended to by the fire brigade will have similar characteristics and occupant demographics to **overall** attended fires (including fires in which there may or may not have been an injury or fatality).

5.4. Aims & approach

In order to achieve these aims of study one the following questions were considered; what is the problem, what information needs to be collected, and how can the information be obtained. By answering these questions an appropriate methodological approach was selected.

5.5 Key terms defined

The general definition of a 'fire' is the event of something burning (Wordnet, 2005). This definition is too broad for the purpose of this study; in which certain types of fire experiences are under investigation. Hence a number of terms must first be defined to clarify the type of information required for collection. For the current investigation a 'fire' has been defined as a situation in which there is a naked flame or the presence of smoke, singeing, or smoldering.

Fire events can be controlled (i.e., back burning) or uncontrolled events (i.e. kitchen fire). The following study is investigating fires which are not controlled. In order to determine if a fire is 'out of control' a fire event was defined as one in which there was some degree (even if minor) of property damage. For example, a blackened pan, blackening of utensils, the singeing of clothes or hair, and/or any smoke damage would indicate the fire was out of control. A fire might also be deliberately started or not deliberately started. Fires that are deliberately lit are not included in the current database. In addition, a fire event is defined as one in which a person may or may not have sustained a burn injury.

Information will be collected on both attended and un-attended fires. An 'attended fire' has been defined as a situation in which fire services were alerted to a fire event, and consequently became present at the scene (either during the fire or following the fires extinguishment). Fire services include the Metropolitan Fire Brigade (MFB) and the Country Fire Authorities (CFA). In contrast, an 'un-attended fire' is an event in which fire services are not contacted and subsequently do not attend the scene (fires unknown to the MFB or CFA). Un-attended fires are either extinguished by a person/ or persons at the scene, or self-extinguish.

In addition to the definition of a 'fire event' the meaning of a 'fire experience' must also be determined. A 'fire experience' was defined as a situation in which the participant was personally involved in the ignition and/ or extinction of the fire, or was an immediate observer of the event. A person is classified as being responsible for a fire start (ignition) if that fire began as a consequence of their behaviour. Examples are leaving cooking unattended, or plugging an appliance into a socket which consequently lead to electrical overload. A person is responsible for the extinguishment of a fire if their actions lead to the cessation of the burning fire. The person is not responsible for extinguishment if fire services put out the fire. An observer of the event can include any person present at the scene at the time of the fire (including household members, visitors, or even a passer-by) who witnessed the fire at any stage of the event (ignition or extinction).

Fire experiences meeting the above definitions may occur in a large variety of locations. For the purposes of this study, fire locations were classified into three major types; Residential, Recreational, or the Workplace. A residential fire is one that occurs in structures which are used as a residence by people. A residence is defined as a private dwelling (either owner occupied or rented) and its connecting structures, including the garage, porch and deck (Marshall, Runyan, Bangdiwala, Linzer, Sacks & Butts, 1998). A private dwelling includes single structure homes, unit/ flats, apartments, caravans and bungalows. Therefore, fire incidences that occur inside or outside of a dwellings structure, within the parameters of the surrounding front or backyard, are included as residential fires in the data collection (i.e. barbeques, sheds, fences).

Recreational fires are those that occur in an area (indoors or outdoors) which is used for leisurely activities. Examples include areas such as parkland, camping grounds, shopping complexes, etc. Workplace fires are

those that occur in any location in which an employee or employer is performing labor related tasks at the time of the event. A Workplace fire can also occur indoors or outdoors, and includes areas such as factories and office settings.

5.6 The problem: Taking into account existing literature

As reviewed in the introduction, the literature contains a wealth of information regarding risk factors for injury and death in attended fires for industrialized countries, particularly for the U.S. and U.K.. To a lesser extent some researchers have examined the risk factors for overall cooking fires (in which there may or may not have been an injury). Through previous research it is evident that certain demographics pre-dispose particular groups within the population to greater risk of experiencing a fire in which death or injury occurs. The risk factors for experiencing an unattended residential fire has previously been explored in the U.S. and U.K., however such information remains unknown in Australia.

Australian fire records exist for attended fire events (completed for each fire with records taken by fire fighters), however they are not readily available due to confidentiality arrangements. The incidence of attended residential fires is known but there is limited information regarding risk factors of experiencing such a fire.

Based on the information available and not available it was decided that, to investigate the research problem, an instrument would have to be developed in order to collect data about fire incidents about which no records currently exist or about which information is limited.

5.7 Information to be collected: Data collection plan

In order to collect information about attended and un-attended fires participants must be asked to report on their experience and the factors surrounding that experience. Hence a survey methodology is required. The collection of information is relying on retrospective reporting, which means the older the person, the further back they would have to recall details about an event (particularly if they were children at the time). Recalling childhood incidents is particularly problematic due to disturbed perceptions in memories. Therefore it was decided that the study would focus on adult years and participants would be asked to report any fire experiences since the age of 18. Setting the age of 18 as the cut off criteria aids in the reliability of information obtained, as it is likely more detail will be obtained on each fire experience; aiding in the validity of data obtained by the researcher. In order to determine fire incidence it is also important to collect information from persons who have not experienced a fire, so the developed instrument needs to be designed to be administered to people with and without a fire experience.

5.8 Type of survey to be developed (questionnaire or interview)

Survey face-to-face interviews were selected for data collection, rather than mail questionnaires, as this method would allow for the researcher to work directly with the participant giving the opportunity to probe and follow up questions to be asked. Probing questions were important to help elicit memories (especially because collection of data is relying on retrospective memory- prompts may aid in participant's recall (Sternberg, 1998)). In addition, mail questionnaire responses rates might be low, as participants would have to be relied upon to return surveys; and results may be biased as

those with a fire experience may be more likely to return the questionnaire. In comparison, a face-to-face interview would allow for data to be collected immediately without having to wait or follow up on participants.

5.9 Memory of a fire event: Issues to consider

The current project methodology involves asking participants to report on any fire experiences since the age of 18. Thus, the collection of data is relying on participant's memory of any fire events they have observed or been involved in the start and/ or extinguishment of the fire. Therefore, there are two factors related to memory that must be considered. The first is that of decay; a process by which information is forgotten as a result of the passage of time (Sternberg, 1998).

The second issue to consider is that when humans recall information from their memory, they are more likely to recall the information that has meaning to them; however humans sometimes create the meaning that is later recalled. Hence memory is not simply reconstructive in which people recall information about events exactly as the event took place. Recall is constructive also, as an individual might build on a memory based on experience and expectations. This means that the way new information is stored into the memory might be affected by existing schemas (Sternberg, 1998).

For example, Fredrick Bartlett (1932) got participants in Great Britain to learn a North American Indian legend, which was difficult for them to understand. Bartlett found that when participants were asked to recall the legend people distorted their recall to make the story more understandable. Hence their prior knowledge and expectations had a significant effect on their recall (Sternberg, 1998).

The fact that prior knowledge has a substantial effect on a person's memory can also been seen in eyewitness accounts which are not always accurate. As eyewitness accounts are usually contrived from constructive memory, based in part on what actually occurred and part on what a person ties together from differing fragments of recollections (Sternberg, 1998).

In terms of the current project, to elicit the memory of any fire events from participants it is important to probe the person and provide examples of fires to aid in memory of any events. In addition, it is important when interpreting the data to be aware that the account given by the participant on the event recalled might differ depending on their role in the event and the clarity in their memory of that event. Some insight on this can be obtained by including a likert scale in the questionnaire to determine participant's subjective report of their clarity of memory of the event.

5.10 Summary

Since no documentation of unattended fire experiences exists in Australia, in order to collect data on fires fitting the definitions prescribed, and which participants had experienced since the age of 18, a survey was developed. In addition, to help the reliability and validity of data collected an interview approach with a sample was determined to be the best strategy, with participants will be asked to recall any fire experiences since the age of 18.

CHAPTER 6. METHODOLOGY

This chapter is comprised of three parts. The first part presents the development of the materials required to conduct the research. The second part is the consent, recruitment, and data collection stage. The third part describes the methods of analysis of the data.

6.1 Development of the questionnaire

The Fire Safety Awareness and Experience Interview Schedule was developed to collect information on all residential, recreational, and workplace fire experiences (including attended and non-attended fires) since the age 18. The schedule collected information including demographic factors, occupant characteristics, situational variables, and the number of fires experienced by each participant. In the development of the interview schedule three steps were taken:

(1) survey questions were identified

(2) focus groups were used to further develop the survey

(3) pilot tests were conducted within a focus group

6.2 Selection of interview schedule items

Questions to be included in the Interview Schedule were selected using previous literature as a guide. An inventory of variables to be included was constructed and from this list a draft questionnaire was initially developed by the researcher. Items were chosen based on existing literature on fires, in which there were injuries and/ or fatalities, in order allow for a comparison of the current study database. Specifically the aim was to select variables so that data from non-attended fires may be directly compared with existing data

regarding attended fires in which there was death/and or injury. It was important to select items that were the most relevant, as the survey had to be able to gain as much valuable information as possible, without becoming too time consuming to complete.

Variables were selected that would give as much in-depth information about the fire event as possible. In order to get detailed information a mixture of closed questions and open questions were required.

In some cases the categories used in the questionnaire were based on the Data Incident Coding Guide (1987), and are specified as such. Some other categories are similar to the guide and influenced by the guide, but have been changed based on the nature of the data collected in the project.

6.3 Use of focus groups in survey development

Focus groups were selected as a method of identifying and pre-testing interview schedule items. The advantage of using focus groups as a method of survey development is that a group of people can aid in the generation of a large variety of ideas in regards to the types of questions that should be included. In addition, after the survey is constructed pilot testing with focus group participants can encourage feedback in relation to the format of the questionnaire and its clarity, ensuring that the wording of the questions are comprehended and correspond with the respondents on approach to the topic.

Focus group participants were invited to take part (via flyers, and email contact) and involvement was voluntary. A lunch was provided to encourage involvement. A plain language statement was distributed to all

focus group participants and consent was obtained (see Appendix A). The appropriate ethics committee approval was obtained.

Three focus groups comprising of 6-9 individuals per group was used to aid in the construction of the survey. The three groups consisted of fire-fighters (focus group 1), fire researchers (group 2), and a group of students (focus group 3). Because of their expertise in the area, focus groups 1 and 2 aided in the surveys' development. Focus group 3 participated in the pilot testing of the questionnaire. Groups 1 and 2 were asked to discuss what is known about fire starts in the home, the extinguishment of fires in the home, and any personal experiences with uncontrolled fires.

6.3.1 Focus group 1: Firefighters

Focus group 1 consisted of seven participants and was carried out with a group of professional fire-fighters. The fire-fighters were included in the early stages of the questionnaire's development due to their direct involvement in the extinguishment of home fires on a regular basis. Additionally fire-fighters have the experience and knowledge in regards to the area under investigation, thus aiding the questionnaire's validity.

As well as giving feedback on the preliminary survey items, members of the Metropolitan Fire Brigade provided seven questions to be included in the questionnaire. The questions asked participants whether they had a fire alarm in their home, how many they have, how often they change the battery, whether they clean the alarm and how often, whether they test the alarm and the method used, and whether their alarms were standalone (battery operated) or hardwired (electrically connected to a power supply). These questions form the basis of Study Two.

6.3.2 Focus group 2: Fire researchers

Focus group 2 consisted of nine participants from a fire safety engineering centre. Due to the nature of their work the participants had a great deal of knowledge in regards to fire-related information.

Following the completion of focus group 1 and 2 the questionnaire was improved significantly, with many new questions added and the structure amended to accommodate the additional items.

6.3.3 Focus group 3: Pilot testing

Focus group 3 consisted of six students who participated in a pilot test of the questionnaire. Participants were required to give feedback regarding the questionnaires' structure, wording, clarity and ease. It was also important to determine whether the schedule was easy for the researcher (interviewer) to use and to ensure items were clear and flowed in a logical order. It was essential the questionnaire was concise to save time and increase the willingness of the participant to complete the survey interview.

6.4 The finalized survey structure

The Fire Safety Awareness and Experience Questionnaire consisted of four separate interview schedules. The first schedule, the demographic schedule, was the standard survey which all participants completed whether they had experienced a fire or not (see Appendix B). This survey consisted of an introductory paragraph that was to be read to all participants before the interview informing the participant of the type of information the researcher

was interested in. The survey collected information on whether the person had experienced a fire, their current demographics, and smoke alarm maintenance information (results from the latter is covered in Study Two). The remaining three interview schedules were tailored to collect information on residential fires, recreational fires, and workplace fires. These three schedules were similar in structure (items were alike), but differed slightly to adapt to the different fire types that participants had experienced in such locations. Although data was collected for fire experiences which were either residential, recreational, or workplace, the results for residential fires will be the main focus of this report. Recreational and workplace fires were collected for completeness but were not part of the main research questions being addressed.

The overall structure of each survey is summarized below:

The Demographic Interview Schedule (See Appendix B) consisted of 19 questions, gathering information for each fire reported in the following areas:

1. Fire experience & fire type
2. Demographic information
3. Smoke alarms & maintenance

The Residential, Recreational, and Workplace Interview Schedule (See Appendix C, D, E) consists of 37 questions, gathering information in the following areas:

1. Person Variables (demographics at the time of the fire experience)
2. Situational Variables
3. Fire Specific Variables (human and inanimate)

The variables within each survey are described below.

6.4.1 The demographic interview schedule (variables)

The Demographic Interview Schedule was a four page survey, which all participants completed (whether they have had a fire experience or not). This survey was developed to collect information about who was in the study sample (important in determining whether the sample was representative of the population). In addition the survey provided an introductory statement to the respondent, in which the fire experience (and type) questions allowed for probing and aided the researcher to prompt recall by giving examples of what type of fires we were looking for.

1. Fire experience and fire type: consisted of three variables (item 1 to 3) gathering information regarding whether a respondent had experienced a fire since the age of 18, the type of fire experience, and the total number of fires experienced. Items were closed-ended categorical and numerical questions.

2. Demographic information: included nine questions (item 11 to 19) that collected general background information about the person and their living situation. This information was current. Items were closed-ended categorical, numerical, and multiple-choice questions.

3. Smoke alarms & maintenance: (Study Two) consisted of seven questions (item 4 to 10) provided by the Metropolitan Fire Brigade. These questions collected valuable information about the presence of smoke alarms in residential dwellings (which are compulsory) and respondent's knowledge on correct maintenance procedures and their behaviour in carrying out these procedures in the home. Items were closed-ended categorical, numerical, and multiple-choice questions.

6.4.2 The residential fire interview schedule (variables)

The Residential Fire Interview Schedule (see Appendix C) contained 37 questions, which participants completed only if they have experienced a fire in the home setting. It collected information on one fire experience only, so if a participant reported multiple experiences they would be required to complete one survey per each fire. This survey was designed to gather information about a fire experience in relation to the following categories Person Variables (demographics at the time of the fire experience), Situational Variables, and Fire Specific Variables (human and inanimate). The questionnaire was structured to talk a person through a fire event in a logical flowing order, so questions are ordered in terms of the start of the fire event to the end (not necessarily ordered in terms of the categories variables fall into below). The Interview schedule consisted of a mixture of close-ended categorical, numerical, Likert scale, multiple-choice questions, and open-ended questions depending on the information required.

6.4.2.1 Person variables (at time of fire)

Person Variables consist of four items that investigated the respondent's demographics at the time of the fire experience. These questions gave valuable information about the person, their living status, education, and occupation type at the time of the fire.

Item 22: Determined the status of the participant at the time of the fire. The fire might have occurred in the respondents home, in which case they would have been a home owner, renter or living in their parents home. The respondent may have been involved in a fire event in a dwelling not of their own, thereby being a visitor, neighbor or passerby.

Item 23: Determined the postcode in which the dwelling (that the fire occurred in) was geographically located.

Item 54 to 55: Collected information about the respondent's occupation and education level at the time of the fire.

Additional person variables were previously collected in the Demographic Interview Schedule (detailed above). These are unchanging variables including: sex and culture. Age at the time of the fire is also a person variable. The researcher calculated the 'age at the time of the' variable. This variable is determined by taking the Year Born variable (attained from the Demographic Interview Schedule) and subtracting the Year of the Fire variable (Item 51 which will be discussed later under Situational variables).

6.4.2.2 Situational variables

Situational variables include those that remained consistent whether a fire occurred or not. Such variables were not changed by the event of a fire, but might have contributed to the fire starting in the first place.

Item 20: Specified whether the fire started in the participant's home or whether it started in another person's dwelling.

Item 21: Indicated the type of building structure in which the fire occurred in.

Item 24: Specified the number of occupants living in that dwelling at the time of the fire and what their relationship with each other was.

Item 28 to 29: These items show the location of the point where fire ignition took place within the dwelling and surrounding the dwelling.

Item 44: Consisted of four subset questions which detail the presence or absence of fire safety devices in the home at the time of the fire experience. These questions also showed whether these devices played a role in response to the fire.

Item 51, 52, and 53: Specified the year in which the fire experience occurred, the season, and the time of day.

6.4.2.3 Fire specific variables (human)

Fire specific human variables are those which have a direct interaction/ effect on the fire event and which are attributed to the people present, and their involvement with the fire. Such variables may uncover how human interaction with a fire might affect the fire during the course of the event and subsequently the event outcomes. Also included are items which show the participants subjective perception of the danger of the fire event.

Item 25: Specified the role of the survey respondent in a fire event as either the person responsible for starting the fire, extinguishing the fire, both starting and extinguishing, or was an observer of the event.

Item 26-27: Specified who was in the dwelling when the fire started and who was in the same room at the time of the fire start.

Item 30: Specified demographic information about the person who started the fire; age and sex. This question is asked because the participant

being interviewed may not have necessarily been the person who started the fire (e.g. might have been an observer or extinguisher).

Item 31: Specified the reason for the fire start. This question is open-ended as responses varied widely.

Item 32 and 33: Specified the activity the persons in the household (at the time of the fire) were engaged in.

Item 36, 37, 38: These items specify who was alerted to the fire start first and by what cue.

Item 39 to 40: Asked the participant of their initial actions, and the actions of those in the household when first alerted to the fire.

Item 41 to 42: Collected demographic information (age and sex) about the person who extinguished the fire and the method of extinguishment. There are relevant options if the fire self-extinguished.

Item 43: Specified whether the participant being interviewed had any fire safety training before the fire event.

Item 45: Consisted of two sub-questions specifying whether the participant had been under the influence of alcohol or whether others at the scene were under the influence of alcohol at the time of the fire start.

Item 46: Consisted of six sub-questions specifying whether the fire-brigade attended the scene, when they attended the scene, who called them, and whether the participant perceived their presence as necessary. The first five sub-questions are closed multi-choice, one sub question (why was their attendance necessary or not) was an open-ended question.

Item 47: Consisted of seven sub-questions specifying whether anyone at the scene was injured due to the fires occurrence. Injuries recorded were not limited to the fire itself (direct burns), with smoke inhalation or injuries sustained while fighting fire or escaping (e.g. falling over) being also included. Sub-question (e) specified the severity of the person's injuries and was based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).

Item 48 (f): Question 48 presented a five option Likert scale investigating the participant's attitude towards the likelihood of there being major property damage if intervention (occupant or fire fighters) had not taken place.

Item 50: Consisted of 2 sub-questions in Likert scale format. The question requires participants to rate their level of perceived physical danger to themselves and others both at the time of the fire, and reflecting back on the fire.

Item 56: Required the participant to rate on a Likert scale how reliable they feel their memory of the fire event is. This question gives an indication of how accurate the information collected on that particular fire experience is.

6.4.2.4 Fire specific variables (inanimate)

Fire specific inanimate variables are non-human factors involved in the fire event, or are a consequence of the fire event.

Item 34 to 35: Specified the equipment involved in the fire start and the type of material first ignited.

Item 48 (a, b, c, d, e): Consisted of five sub-questions that specifies the extent of damage caused as a result of the fire; based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).

Item 49: Consisted of two sub-questions specifying whether an insurance claim was made and the amount claimed in dollars.

6.4.3 The recreational & workplace fire interview schedule

The recreational and workplace fire interview schedules differed only slightly to the residential survey (see Appendix D & E). The number of items (37) remained consistent between the three surveys. The difference between the residential survey and the recreational and workplace survey is questions 20, 21, 22, 24, and 26. The remaining questions are identical in all three surveys. Below lists the items tailored to the recreational and workplace survey and their differences compared with the residential survey:

Item 20 and 21: For recreational survey, specified the type of recreational land the fire started in/ or on (options include retail, camping site, hotels etc.). For the workplace survey specified the type of workplace the fire started in (options include retail, education, factory etc.). Item 20 on the residential survey determined whose home the fire started in (participant's home, parent's home etc.). On both the recreational and workplace surveys item 21 is the same and specifies the type of building the fires started in (options include multi-level, single level etc.).

Item 22: Specified the participant's status at the time of the fire. For recreational survey options include visitor, passerby, and patient; where the

workplace survey includes options such as employee, employer, and contractor.

Item 24 and 26: These items were the same for the recreational and workplace survey. Item 24 specified the approximate number of people usually present in the building or area, and item 26 specifies the number of people present at the time of the fire.

6.5 Survey amendments during the data collection phase

During the data collection phase a number of amendments were made to the interview schedule, as early use of the survey uncovered areas of improvement to be made. Changes were made to make the survey easier to gather information by decreasing the completion time. This was done by giving some questions (previously open-ended) tick box responses so as to save researchers time in writing the full response.

Another change made was to the demographic survey. Initially demographic information was the first questions presented to participants, followed by smoke alarm maintenance items. However, midway through data collection the survey was re-structured as to collect smoke alarm data first, then demographics. This change was made to help build a rapport with interviewee and so they understood what the survey asking of them before answering the more personal demographic questions.

Another interview schedule amendment involved the omission of a previously included question. A question item asked participants whether there was any drug use at the time of the fire. It was determined this question would not collect any valuable information as participants reaction to this question indicated discomfort to being asked. This possibly is related to the

venue type used to collect data, shopping complexes, in which there was not much privacy (data collection methods discussed further in below).

Changes to the format of the demographic survey might have made participants more comfortable in disclosing demographic information; however the amendments made to the remaining of the questionnaire did not affect survey responses. The changes implemented were generally to make the questionnaire easier to fill out by the researcher.

6.6 Administration of the questionnaire & data collection

The second phase of the project was the consent, recruitment, and data collection phase. Prior to recruitment and data collection, a number of factors had to be considered:

1. the sample size required, and;
2. the method of recruitment to reach the sample size goal and to be a representative sample (as far as possible).

6.6.1 Sample Size

For this study a calculation of statistical power was inappropriate because the research does not aim to detect an effect, so no estimation of effect size can be made. Instead the sample size was based on the consideration that the number of unattended fires reported in the sample would be sufficient to allow some key trends to emerge. A total sample of some 60 -80 attended and unattended fires was felt to be sufficient to identify some key trends. A sample size of about 500 participants was confirmed as the minimum for probably providing the desired number of unattended fires. See the box below:

The population of Australia (20 million) experiences 10,000 attended residential fires per year (ABS, 2000):

20,000,000 people = 10,000 attended fires per year

500 people = 0.25 attended fires per year

Retrospectively across 30 adult years for 500 people:

500 X 30 = 0.25 X 30 attended fires across 30 years

= 7.5 attended fires across 30 years for 500 people

UK Home Office (1998) estimates for every 1 attended home fire, 9 unattended home fires occur:

= 7.5 X 9

= 67.5 unattended fires across 30 years for 500 people

In the above box 30 adult years was based on the midpoint number of adult years experienced by a sample aged between 18 and 78 years of age (i.e., range of 60 years). It is recognised that this sample size is a compromise between what is possible given the limited resources of time and money and the desirability of having a very large sample to add validity to the conclusions. A subsequent study with more resources would permit findings and trends to be further tested on a larger sample using the developed questionnaire.

6.6.2 Recruitment method

As previously mentioned, it was decided that a structured interview would be an effective method of data collection. In order to carry out such a method of data collection direct access to the population was required to conduct face-to-face interviews. It was determined that the most effective way to gain access to a large variety of people was to collect data in shopping

complexes. The advantages of using shopping centers is that there is generally a high traffic flow of people and flexible hours allows for access to a wide variety of participants in differing age groups. However the disadvantages are that some groups within the population may be more likely to shop than others, for example, more females tend to shop than males. In addition there might be more people who are not working full-time (as they generally have more time to shop) and there might be less elderly people that have restricted mobility.

6.6.3 The consent phase

In order to conduct data collection on the premises of shopping complexes the approval of their management was required. Consent to set up a research stall was requested from the Marketing Managers of 12 shopping complexes in Melbourne. In the process of seeking consent Marketing Managers were provided with a summary of the project, a detailed description of the project outlining the procedure, the survey, ethics approval, along with a list of reasons detailing the benefits of the project to the community. A Certificate of Currency was also provided for insurance purposes.

Out of the 12 shopping complexes approached, 4 gave permission to carry out the research project on their premises. The remaining shopping complexes were either; booked out (and therefore did not have a space available for researchers to set up a stall within the project's required timeline), or requested payment to set up a stall (which was not budgeted for in this project). In one case a Marketing Manager became un-contactable during the course of the consent seeking process.

Of the shopping complexes in which permission was successfully gained, three were located in the North-West region of Melbourne and one in North-East Melbourne. After consent was granted the researcher organised with management convenient dates to collect data within each shopping complex. Data collection was usually scheduled from 9.00am to 5.30pm (Monday to Sunday); with later time periods booked on Thursday and Friday nights (in which complexes are open until 9.00pm).

6.6.4 The stall setup

A small stall was set up by the researchers in each shopping complex during the data collection periods. In all four complexes the location of the stall was selected by Complex Managers (depending on available stall space). The stall table was decorated with a red table cloth, and Victoria University and Metropolitan Fire Brigade posters were displayed. Four chairs were supplied by the researchers, placed two on either side of the table (two for the researchers and two for participants) in order to provide comfort to participants while completing the survey. The stand was decorated with a display including a fire safety pack, balloons, pens, and bike clips bearing the MFB logo (these were donated materials from the MFB used to thank people for their participation and will be discussed in more detail later). The stall was occupied by two researchers the majority of time. Having two research assistants at the stall was also important in the survey collection process and served a number of purposes. More than one participant could be interviewed at the same time, increasing the speed of data collection. Also, two researchers allowed for more floor coverage of the complex area in which the stall was located. In addition, having two researchers present allowed for one to complete the survey, while the other kept children or others who were waiting on the participant being interviewed entertained, lessening the rush of the interviewee. This was especially effective when children were present.

6.6.5 Recruitment phase

Shoppers were included in the study based on two criteria; participants were required to be 18 years of age or over (data collected was a retrospective report from the age of 18), and only one person per household could complete the survey.

Individuals, or groups of shoppers who were walking past the research stand or who were located within the vicinity of the research area were approached by the researcher on an *ad hoc* basis. It was discovered that the wording used in the first few seconds of contact with a shopper was going to be an important aspect of recruiting a non-biased sample.

The approach used by the researchers in their initial contact with potential participants changed after the first day of data collection. Initially, researchers were approaching customers and saying "Hi we are from Victoria University. We are gathering information for a research project, and asking about any fire experiences that you might have had since the age of 18, have you got a few minutes?" Usually the customer would ask how long the survey would take and the researcher would reply "it depends on whether you have had an experience and how many you have had". The problem with this approach was that customers would automatically assume that we were looking for persons with fire experience only, and would possibly decline to participate simply because they felt they were not relevant candidates. Another problem with this introductory speech was that people were less likely to agree to complete the survey with no certainty over exactly how long it would take, and what was required from them. Following the first day of attempted recruiting, researchers changed their approach. Researchers

decided that their opening introductory line had to be short, to the point, and inviting to all (whether they had a fire experience or not).

The following approach was implemented "Hi, we're doing important research for Victoria University on fire safety, would you be interested in completing a quick survey? As a thank you we give you a free pen or free bike clip to show our appreciation". To decrease sampling bias participants were told the survey was based on fire safety (rather than fire experience) so they would not say no to completing the questionnaire, mistakenly thinking that they had not had an experience and therefore would automatically exclude themselves. If such bias did occur, it was only for the first day of data collection, in which data was collected for only 30-40 people so the effect would be small. If participants asked how long the survey would take, they were told it would take a few minutes to complete the survey (Demographic and Smoke Alarm Schedule). After completion of the demographic survey participants were given the option to talk about any fire experiences additionally. It was found that after the person sat down and starting talking to us about general fire safety in the home they were more relaxed and understood our purpose and therefore likely to spend more time in talking to us in detail about any experiences.

6.6.6 Survey response

The majority of participants were approached by the researchers, however, occasionally a passerby would approach the stand themselves showing interest. When participants approached the stand it was usually for one of two reasons; when the stand was busy other shoppers became curious as to what was occurring or a few approached the stall due to a previous experience they felt was relevant to us (i.e. had a fire or was a fire-fighter). In

the last 100 surveys, a record began to be collected indicating whether the participant approached the stall or researcher approached the participant.

Customers who declined the invitation to participate were thanked and not pursued further.

If a participant agreed to complete the questionnaire they were invited to take a seat at the stall. Participants were first notified that the information was confidential and no names were required, and that results would present group data only. Participants were not required to complete a consent form, as agreeing to complete the questionnaire was consent in itself.

After the smoke alarm questions the Demographic Interview Schedule was almost always completed next, followed by a Fire Interview Schedule if necessary. In some cases the participant would automatically start describing a fire experience before the demographic interview was completed. This was fine, and if necessary, the order in which data was collected was tailored to the participant. In some cases the participant would describe events before the question was even asked. The interviewer therefore had to be very familiar with survey, and sometimes remember information to fill out certain items at the conclusion of the interview if necessary.

Following completion of the Demographic Interview Schedule the participant was told about the types of fire experiences that the researchers were interested in and the cover sheet was read out (See Appendix B). The participant was then asked if they had experienced a fire, how many experiences, and the type of fire. The researchers found that it was important to give the person some examples of the types of fires being investigated because people's initial response was usually that they had had no fire experience. However, once some examples were given, in many cases the participant would then state that they had in fact had an experience that they

had forgotten about. Examples used included "any kitchen fires, small fires in the home, outdoors, any fire experience that could occur in the home, outside of the home, or even in the workplace". In addition we clarified that the experience had to be one in which there was some form of flame or smoke damage, for example even blackening of a pan. If the participant had experienced a fire the relevant survey was produced and completed (either residential, recreational, or workplace). If the participant had experienced more than one fire, a separate questionnaire was completed for each fire experience.

On completion of the questionnaire participants received either a pen with a fire safety message on it or a fire safety flashing bike clip. All fire safety promotional items were donated by the MFB and were used to spread the fire safety message. The donated gifts from the MFB helped immensely as customers initially thought the researchers were selling items. The gift also made participants feel appreciated for their time.

Participants were also given the opportunity to leave their name and contact phone number to enter a raffle. The raffle was drawn after data collection was completed and three fire safety home packs (including two smoke alarms, a fire extinguisher and fire blanket) valued at $80.00 each were given away. The MFB Advisory board agreed to donate three of these home safety packs. Participants who choose to enter the raffle were informed that their contact details would not be used for anything other than the drawing of the raffle.

Participants were also offered the option to leave their details on a separate mailing list if they wished to receive a two page summary report on the group results of the questionnaire.

The survey was quite long to complete if the person had had a fire experience. In three cases the person was happy to answer the demographic questions, and to state they had had a fire experience but was not willing to spend more time discussing the experience. In many other cases the researchers had to complete the survey at a rushed pace in attempt to get all the information required, as customers sometimes wanted to rush off and would alert the researcher to the fact they had to leave. For this reason, sometimes details were not given and missed (presented as missing case in frequency data).

In some cases participants were not willing to give certain information, such as their date of birth or occupation.

It took 28 days of data collection with two researchers to survey 500 participants. Out of the 500 cases 130 fire incidents were reported. Of the fires in which fire service attendance was known (123 fires) 92 were unattended and 31 were attended.

6.7 Data management phase

The next phase of the study was the Data Analysis stage which involved quantitative measures. It was in this phase of the project that the following was carried out:

1. A database was designed in SPSS
2. Surveys were coded and data was input
3. Analysis of the data was conducted

6.7.1 Database design & survey coding

A database was set up using the Statistical Package for the Social Sciences (SPSS) for Windows version 9.0. Each survey question was coded and entered into the database. Over 100 variables were entered. Variables that were examined included age at time of ignition, education and occupation of the person when the fire incident occurred, type of residential circumstances and gender. In addition, information including who extinguished the fire and who started the fire and whether the fire brigade attended was examined.

6.7.2 Analysis of data

A descriptive analysis of the demographics of the sample was carried out (see Results section). To determine whether the sample was representative of the population on selected key variables, study data was compared to the actual population characteristics of Melbourne (using census data).

Descriptive analysis was then conducted investigating the reported fire experiences. Variables examined included Person Variables, Situational Variables, Fire Specific Variables (Human and Fire related).

Following analysis of demographic and fire data the mean annual probability of having an unattended or attended residential fire experience throughout an individual's lifetime was calculated.

Chi-square testing (**p**-value = 0.05 threshold) was also used to determine any significant associations between persons who started a cooking fire and those responsible for the start of a non-cooking fire.

CHAPTER 7. RESULTS

First, the sample demographics are described and are compared to actual population characteristics using census data. The remaining sections report descriptive statistics in order to identify any patterns and themes within the data set.

7.1 The study sample

The overall sample consisted of a total of 500 participants who were recruited by opportunistic sampling method.

Data analysis was carried out with a total of 498 participants, due to the criteria not being met for two participants. One participant did not meet the age cut off (the person was under 18) and one participant was excluded from the database because they were living with another person already interviewed (both from the same household). The demographic characteristics of the sample are presented in Table 1.

Table 1

Sample demographics (N=498)

Variable	n		%
Age			
18-28	85		18.0
29-38	100		21.1
39-48	105		22.2
49-58	94		19.9
59-68	45		9.5
69-78	35		7.4
79-88	9		1.9
Sex			
Female	309		62.4
Male	186		37.6
Culture (Birth Place)			
Australia	370		75.5
Overseas	120		24.5
Mother's Birth Place			
Australia	263		54.5
Overseas	220		45.5
Father's Birth Place			
Australia	259		54.0
Overseas	221		46.0
Education			
No Post Secondary Qualification	266		55.1
Year 11 or Below		181	
Year 12 Completed		85	
TAFE	73		15.1
University	127		26.3
Bachelor		124	
Post-graduate		3	
Apprentice	17		3.5
Employment Status			
Employed	287		59.8
Not Employed	44		9.2
Not in Labor Force	149		31.0
Retired		85	
Stay Home Parent		39	
Student		25	
Occupation Type			
Senior Management & Professionals (Type A)	7		2.43
Managers & Associate Professionals (Type B)	92		32.0

Trades persons, Clerks, Skilled Office & Sales (Type C)	72		25.0
Machine Operators, hospitality, assistants, laboures (Type D)	116		40.4
Dwelling Type			
House	414		83.8
Town House	12		2.4
Flat/Unit/Apartment	67		13.6
Other (Caravan)	1		0.2
Living Status			
Home Owner	310		62.8
Renting	129		26.1
Living with Parents	55		11.1
Postcode			
VIC	488		
Melbourne		(476)	96.6
West		47	
North West		249	
North		50	
North East		113	
East		6	
Inner City		2	
Bayside		4	
Geelong		4	
South East		1	
Northern Vic		(9)	1.8
Bendigo		4	
North Western		1	
Shepparton		3	
Macedon Ranges		1	
South Eastern Vic		(3)	0.6
Gippsland		3	
NSW	2		0.4
Inner West Sydney		1	
Sydney, Eastern Suburbs		1	
QLD	1		0.2
Brisbane		1	
NT	2		0.4
Adelaide		2	

Analysis of each variable did not always include a total of 498 cases, due to some information not being collected at the time of the interview (in some cases the participant was not willing to disclose certain types of information, or the participant did not have time to answer a particular question).

The age of participants ranges from 18 years to 87 years. The mean age of the sample was 44 years with a standard deviation of 15.81. Of the 498 participants there were 309 females and 186 males. The sex of participants is evidently skewed with 203 more female participants than male participants; with females making up 62.4% of the total sample (see Table 1). The majority of participants were born in Australia, with persons born overseas making up 24.5 per cent of the sample. The participant was also asked where their mother and father were born and generally there was an even number of mothers and fathers born in Australia and born overseas. The educational background for most of the participants was "no post secondary qualification". The second highest group was made up of participants with a University education level making up 26.3% of the sample.

Slightly more participants were employed at the time of the interview (59.8%) than those unemployed and not in the workforce (40.2%). The occupation type of participants in the sample is presented in Table 1. Occupation type for those employed was categorized using the Victorian Department of Education and Training Occupation Groupings. According to these groupings Occupation Group Type A includes those who work as Senior Management in large business organizations, government administration and defense, and qualified professionals. Occupation Group B includes other business managers, arts/ media/ sportspersons and associate professionals. Group C includes tradespersons, clerks and skilled office, sales and service staff. Group D includes Machine operators, hospitality staff, assistants, laborers, and related workers (State Government Victoria: Department of Education & Training, 2004). There were slightly more participants with Occupation type D (40.4%) and B groupings (32%).

The majority of participants were living in a house/ townhouse (86.2%), compared to other structural building types, and the majority of participants were home owners (62.8%), compared to renters.

Of the 498 participants in the sample, the majority (476 participants) were living in Melbourne at the time of the interview. The greatest number of participants interviewed were currently living in the North-West region of Melbourne. Within Melbourne, the range of participant's geographic location varied from the highest, 249 participants living in the North-West of Melbourne, to the lower of 1 person living in the South-East of Melbourne.

7.1.1 The sample compared to census data

To determine whether the sample was representative of the population, study data was compared to the actual population characteristics of Melbourne and is presented in column 2 and 3 of Table 2. The comparative analysis was conducted for Melbourne as described by Census data obtained from the Australian Bureau of Statistics (2001). The Wilcox Ranked Sum Sign Test and a series of Non-Parametric Chi Square tests were conducted to determine whether there was a significant difference between the study sample and the overall population. To carry out the analysis, census definitions were used to determine how variables were organized and grouped (for ABS definitions see the website at www.abs.com.au). Using the census definitions, demographic variables (in the study database) were grouped into the same categories (to enable data to be directly comparable to the census information).

A comparison of census data was also conducted for a sub-regions within Melbourne: the North Western region and Western Melbourne. These comparisons can be found in the appendix (see Appendix F).

Table 2

Difference between sample (observed) and actual population for Melbourne based on Census data (expected) (n=476)

Variable		Observed		Expected	P
Sex					
Female		301	(63.2%)	243.0	.000
Male		175	(36.8%)	233.0	
Culture (Birth Place)					
Australia		356	(75.3%)	329.5	.008
Overseas		117	(24.7%)	143.5	
Mother's Birth Place					
Australia		251	(53.7%)	---	
Overseas		216	(46.3%)	---	
Father's Birth Place					
Australia		247	(53.2%)	---	
Overseas		217	(46.8%)	---	
Education					
No Qualification		257	(55.3%)	284.9	
Year 11 or Below	174	---			
Year 12 Completed	83	---			
TAFE		71	(15.3%)	90.9	.000
University		120	(25.8%)	72.1	
Bachelor	118	---			
Post-graduate	2	---			
Apprentice		17	(3.7%)	---	
Occupation Type					
Senior Management & Professionals (Type A)		6	(2.2%)	81.7	
Managers & Associate Professionals (Type B)		88	(31.9%)	32.1	.000
Trades persons, Clerks, Skilled Office & Sales (Type C)		70	(25.4%)	114.1	
Machine Operators, hospitality, assistants, laboures (Type D)		112	(40.6%)	48	
Employment Status					
Employed		276	(59.7%)	278.9	
Not Employed		43	(9.3%)	19.4	.000
Not in Labor Force		143	(30.9%)	163.7	
Retired	81	---			
Stay Home Mum	37	---			
Student	25	---			

Dwelling Type				
House	397		354.6	.000
Town House	11		49.4	
Flat/Unit/Apartment	67		68.6	
Other (Caravan)	1		3.4	
Living Status				
Home Owner	295	(62.0%)	317.6	.011
Renting	126	(26.5%)	103.4	
Living with Parents	55	(11.6%)	---	

Footnote: It is assumed that in cases in which the information is unknown "unknown cases" span throughout all categories. The ABS has assumed this is the case and have excluded unknown cases when determining the % of persons in each category. Thus the following study has excluded the unknown cases and used the % based on the group that actually did respond to the question.

Non-Parametric Chi-Square analysis (within SPSS) was carried out across all variables as shown in Table 2. Findings show that all of the variables were comparisons were possible (Occupation Type, Living Status, Type of Dwelling, Culture, Education, and Employment Status) showed significant differences between the population of Melbourne and the study sample. Thus findings indicate that the sample demographics for these variables are not representative of the population demographics. Some categories were over-represented in the study sample, while others were found to be under-represented. This is possibly related to the location in which data was collected (shopping complexes) and will be further highlighted in the discussion section.

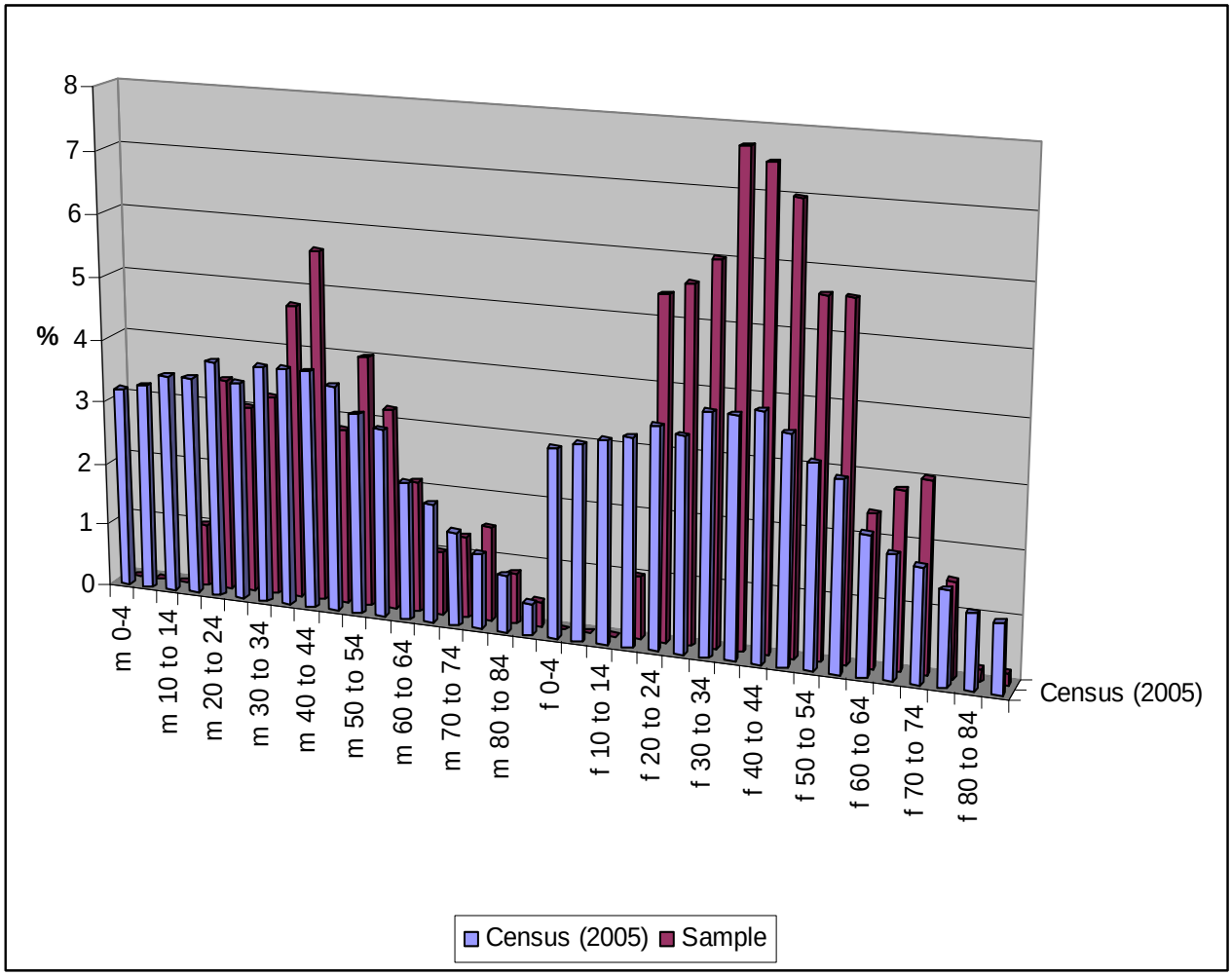

Figure 1. Percentage of females and males in each age group within the study sample compared to the percentage of persons in each age group in the population of Victoria (N= 471)

Figure 1 shows the comparison of the percentage of participants in each age group within the study sample to the actual population characteristics of Victoria (ABS, 2007). The sample was not representative of the population in terms of age. Persons aged 20 to 59 years of age are over-represented in the study sample, especially from ages 35 to 45 years. Visual inspection of figure 1 suggests this is especially the case for females.

7.2 Reported fires within the sample

From a sample of 498 participants a total of 135 fires were reported by 117 participants. However, five fires (3.7%) were excluded from analysis because the fire reported did not meet the criteria defined for a 'fire experience' (see Appendix G). After the exclusion of five invalid fire cases, of 498 participants a total of 130 fires were reported by 113 (22.7%) participants. Two of the invalid cases were arson (this study only includes unintentional fires). This includes fires which were either attended or unattended; and includes residential, recreational, or workplace fire types.

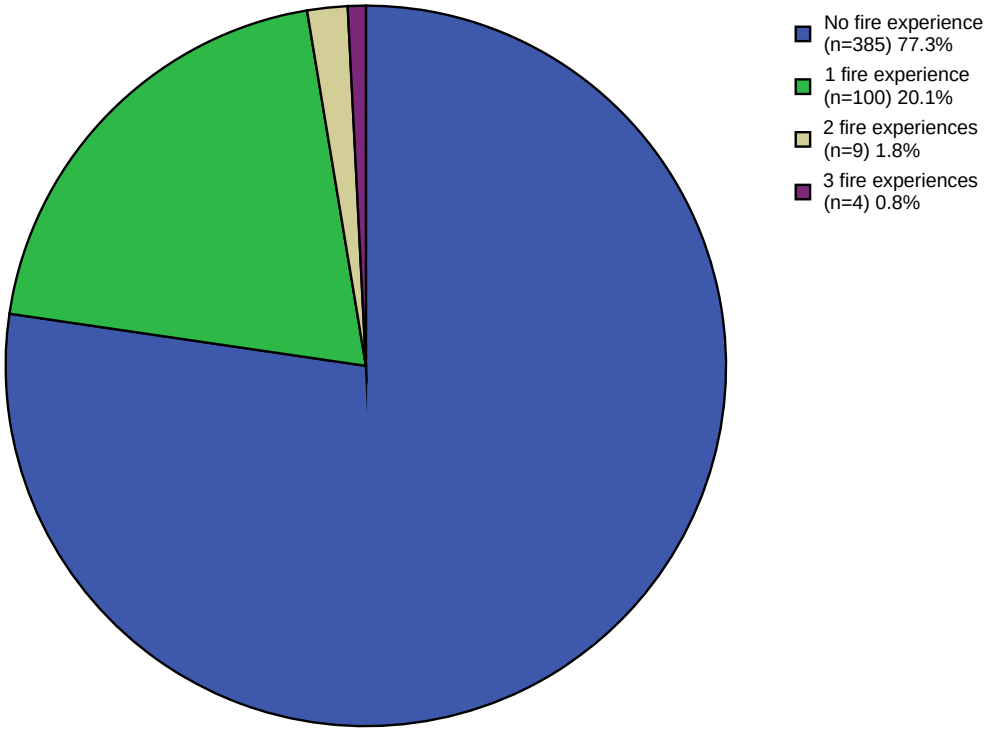

Figure 2. Percentage of participants reporting fire experiences within the sample (N= 498)

Figure 2 shows that of the 113 participants who reported a fire experience, the majority experienced only one fire since the age of 18. The maximum number of fire experiences reported by individual participants was three fires.

Table 3
Frequency of participants reporting different types of fires (n= 130)

Variable	Frequency (%)				
Fire Type	Attended	Un-attended	Attendance Unknown	Total	Number of Participants Reporting Fire
Residential	23	81	6	110 (84.6)	98
Recreational	4	7	1	12 (8.5)	12
Workplace	4	4	--	8 (6.9)	8

Table 3 shows that out of all three fire types, the majority of reported fire experiences were residential with 110 fires reported by 98 participants. Of the 110 residential fire cases, fire service attendance was known for 104 fires. The vast majority (81/104) of residential fires (77.9%) were unattended. As stated previously, residential fires will be the main focus of the results reported.

7.2.1 Missing/ incomplete residential fire data

Of the study sample, made up of 498 participants, 98 participants (19.7%) reported having had a residential fire experience. Of the 98 participants who reported having experienced a residential fire (with a total of 110 fires) fire data is missing for two cases. In one case all that is known is the fire was an accidental residential fire, however the participant had lost their house and was not willing to talk about the event. In another case all that is known is something melted in a residential fire.

Information is also limited for an additional six fire cases. In four of the six cases the fire's location is the only known information. In cases lacking data, participants were generally not willing to talk about the fire experience in detail as they did not have time to complete the full questionnaire. Without data for two fire experiences, of the 110 residential fires analyses were conducted for 108 residential fires.

7.2.2 Year of reported residential fire

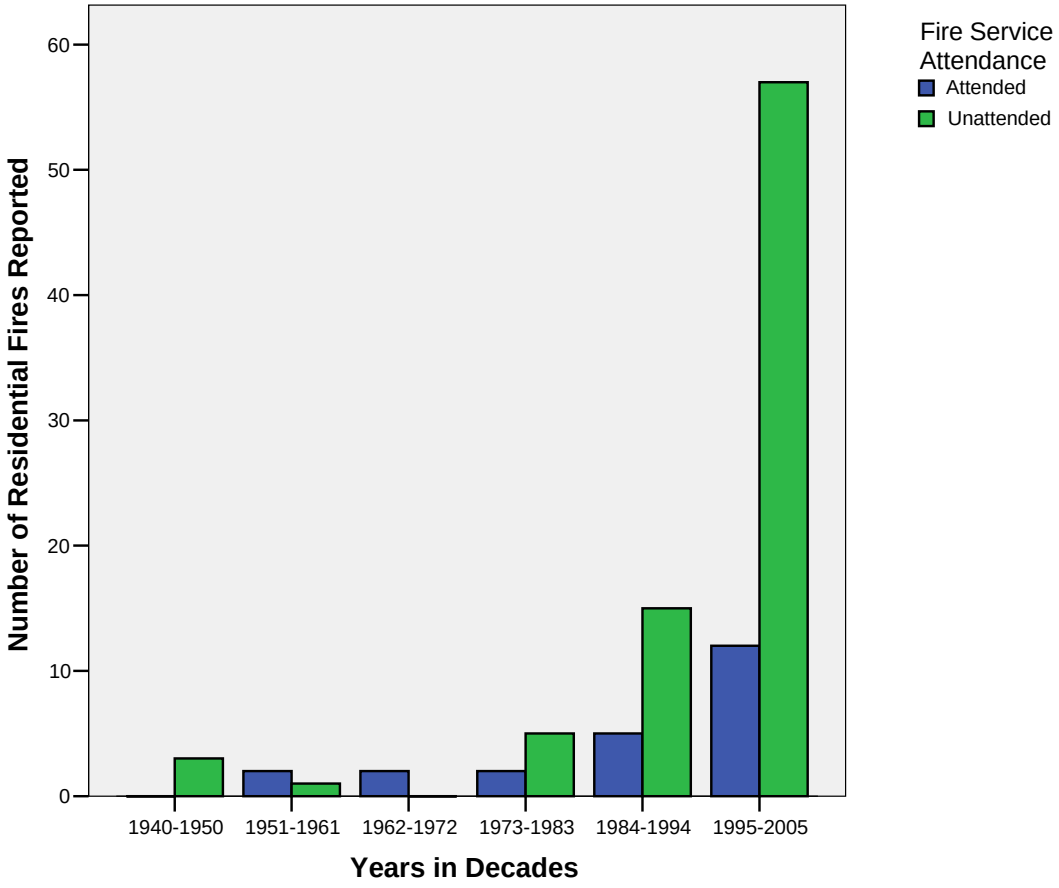

Figure 3. Frequency distribution of the number of residential fire experiences reported per decade

Figure 3 presents the number of residential fire experiences reported in each decade, spanning back to 1948 to 2005 (the year in which data was collected). The number of fire experiences reported is highest for the most current years; this is partly due to the distribution of ages of the sample (more younger and middle aged adults) and partly as a result of recency memory effects.

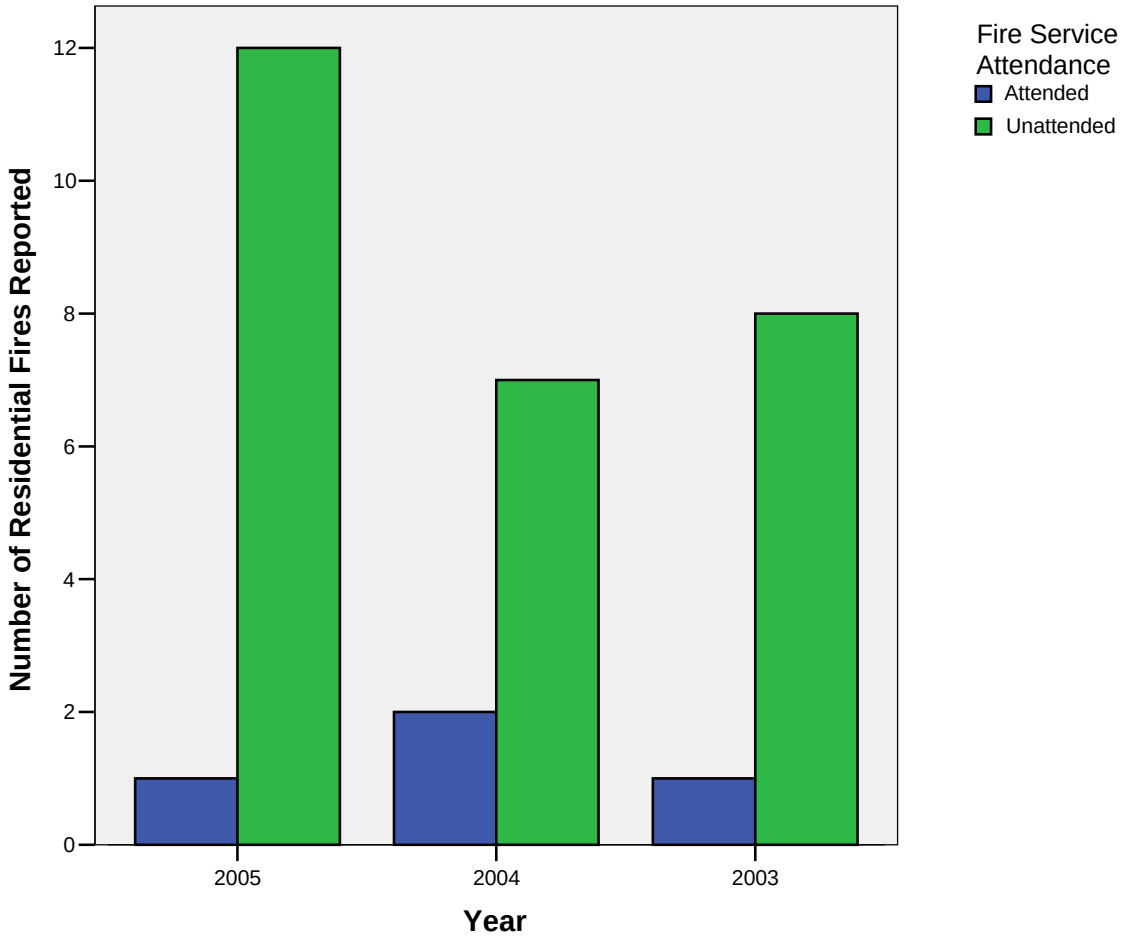

Figure 4. Frequency distribution of the number of residential fire experiences reported for 2003 to 2004

Figure 4 shows that there were 31 fires reported during 2003 to December 2005. Four fires were attended and 27 were unattended fires. Thus, for a sample of 498 participants there is an annual rate of approximately 10.33 fires per year over each of the previous three years (31 fires/ 3 years).

7.2.3 Comparison of fire households to non-fire households

Table 4 shows that there was a significant association between the sex of the person and whether they reported having had a fire experience. Females reported significantly more fire experiences than males within the sample (22% vs. 14%). In calculating the ratio of males to females, females reported 1.75 (22/14) times more fires than men did.

There was a significant association between whether the person was in the workforce or not and whether they reported having had a fire experience. Those not in the workforce at the time of the interview reported significantly more fire experiences than those in the workforce (25% vs. 15%). Those not in the workforce were 1.66 (25/15) times more likely to report having had a fire experience than those in the workforce.

There was no significant association between the age of the person (under 64 years or over 65 years) and whether they reported having had a fire experience.

There was no significant association between whether the person was born in Australia or overseas and whether they reported having had a fire experience.

There was no significant difference between the likelihood of persons reporting having had a fire experience who had only a high school level education and those with further qualifications.

Table 4
Current demographics of participants who have and haven't had a residential fire experience (n= 498)

Variable	Fire Experience Yes	No	P	Proportions
Age (Decades)				
18-28	10	75		.11 (11%)
29-38	15	85		.15 (15%)
39-48	28	77	.120	.26 (26%)
49-58	23	71		.24 (24%)
59-68	10	35		.22 (22%)
69-78	6	29		.17 (17%)
79-88	1	8		.11 (11%)
Age				
64 under	80	333	.394	.19 (19%)
65+	13	47		.21 (21%)
Sex				
Female	69	240	.021	.22 (22%)
Male	27	159		.14 (14%)
Culture (Birth Place)				
Australia	71	299	.470	.19 (19%)
Overseas	24	96		.20 (20%)
Mothers Birth Place				
Australia	54	209	.436	.20 (20%)
Overseas	39	181		.17 (17%)
Fathers Birth Place				
Australia	52	207	.673	.20 (20%)
Overseas	41	180		.18 (18%)
Education				
No Further Qualification	51	215		.19 (19%)
Year 11 or Below				
Year 12 Completed				
Further Qualifications				
TAFE	9	64		.16 (16%)
University	29	98	.342	.22 (22%)
Bachelor				
Post-graduate				
Apprentice	3	14		.17 (17%)
Education				
High-school level	51	215	.516	.19 (19%)
Further qualifications	41	176		.18 (18%)
Occupation Type				
Type A (Professionals)	2	5		.28 (28%)
Type B	12	80	.643	.13 (13%)

Type C	13	59		.18 (18%)
Type D	18	98		.15 (15%)
Employment Status				
Employed	45	242		.15 (15%)
Not Employed	11	33	.060	.25 (25%)
Not in Labor Force	36	113		.24 (24%)
Retired	---			
Stay Home Mum	---			
Student	---			
Working vs. Not Working				
Working	45	242	.013	.15 (15%)
Not Working	47	146		.24 (25%)
Dwelling Type				
House	85	341	.332	.19 (19%)
Town House				
Flat/Unit/Apartment	10	57		.14 (19%)
Other (Caravan) **Excluded*	---			
Living Status				
Home Owner	65	245		.20 (20%)
Renting	23	106	.323	.17 (17%)
Living with Parents	7	48		.12 (12%)

7.3 Calculating the mean annual probability of having a residential fire experience throughout a lifetime

Data was collected from participants on any fire experiences since the age of 18 (fires over the adult life span) enabling a new calculation to be applied in order to determine the mean annual probability of having a residential fire throughout an adult lifetime.

The age of the participant at the time the fire experience survey was utilized to calculate the mean annual probability of having a residential fire throughout a lifetime. Table 5 presents a summary of the participant's ages grouped into three categories and a breakdown of the number of residential fires reported.

Table 5
Variables used to calculate the mean annual probability of having a residential fire experience throughout a lifetime, N= 498

Variable	n	%
Number of Residential Fires Reported		
0 fires	400	---
1 fire	88	89.8
2 fires	8	8.2
3 fires	2	0.2
Age of Participant Reporting Fire at time of Questionnaire Completion		
1 fire		
18-40	31	---
41-60	37	---
61+	15	---
2 fires		
18-40	0	---
41-60	5	---
61+	1	---
3 fires		
18-40	0	---
41-60	1	---
61+	1	---

To determine the mean annual probability of having a fire experience a formula was applied using two variables; current age and total number of fires experienced. The Number of Years Lived (current age) minus 18 years (as fires since the age of 18 were investigated only), was used to calculate the Adult Years Lived (N) for each participant. Subsequently the Total Number of Fire Experiences (F) was divided by the Adult Years Lived (N) giving us the Annual Probability of a Fire (P) for each individual case. For participants who had not experienced a residential fire, the annual probability was zero.

Using this methodology it was then possible to determine the mean annual probability of experiencing a residential fire across all participants and

all fires, as well as for all un-attended fires and attended fires (See Table 6). Out of a sample of 498 the data available allowed the mean annual probability to be calculated for 473 participants. For 25 persons the annual probability could not be determined as they refused to give researchers their current age. Three of the non-disclosing participants had experienced one residential fire; two had experienced two fires.

Table 6
Mean annual fire experience probability: residential fires, N= 473

Variable	**Mean**	**Probability**
All fires	.0120	1.2 fires per 100 adult years 0 .6 fires per 50 adult years
Attended fires	.0037	0.37 fires per 100 adult years 0 .185 fires per 50 adult years
Unattended fires	.0079	0.8 fires per 100 adult years 0 .4 fires per 50 adult years

The mean annual probability of having a fire experience whilst an adult was .012. This means that within this sample adults had on average one fire experience every 83.3 adult years. The mean fire probability for all attended fire types was also calculated, indicating that adults have 0.185 chance of experiencing an attended fire per 50 adult years. The mean fire probability for all unattended fires was calculated indicating that adults have 0.4 chance of experiencing an unattended fire per 50 adult years. Other probability rates are shown in Table 6.

7.4 Involvement of participant interviewed & where the residential fire event occurred

Information about the participants who completed the questionnaire and their role in the fire event is presented in Table 7.

Table 7
Descriptive statistics of the involvement of participant interviewed & where the residential fire event occurred (n= 104)

Variable	Frequency		%
Role of Interviewee			
Involved Start/ Extinguishment	74		71.2
Started Fire		9	
Extinguished Fire		28	
Started & Extinguished		37	
Observer of Event	30		28.8
Residential Property Fire Occurred On			
Interviewee's Main residence	87		83.6
Someone Else's Property	17		16.3
Friend's Home		9	
Relative's Home		5	
Partner's Home		1	
Neighbor's Home		1	
Holiday House	1		0.9
Interviewee's Knowledge of Fire			
Aware During Fire	100		96.2
Aware After Fires Extinguishment	4		3.8

Most of the participants reporting a residential fire experience were personally involved in the start, extinguishment, or both the start and extinguishment of the fire (71.2%). While a smaller number of participants interviewed (28.8%) had observed the fire event.

In the majority of fire cases the fire was experienced in the home of the participant interviewed (83.6%). There was one case in which the fire occurred in a holiday house; which is considered a semi-permanent residency. The vast

majority of participants interviewed were aware of the fire during its occurrence, while it was flaming, smoldering, or singeing.

7.5 Participant's memory of the fire event

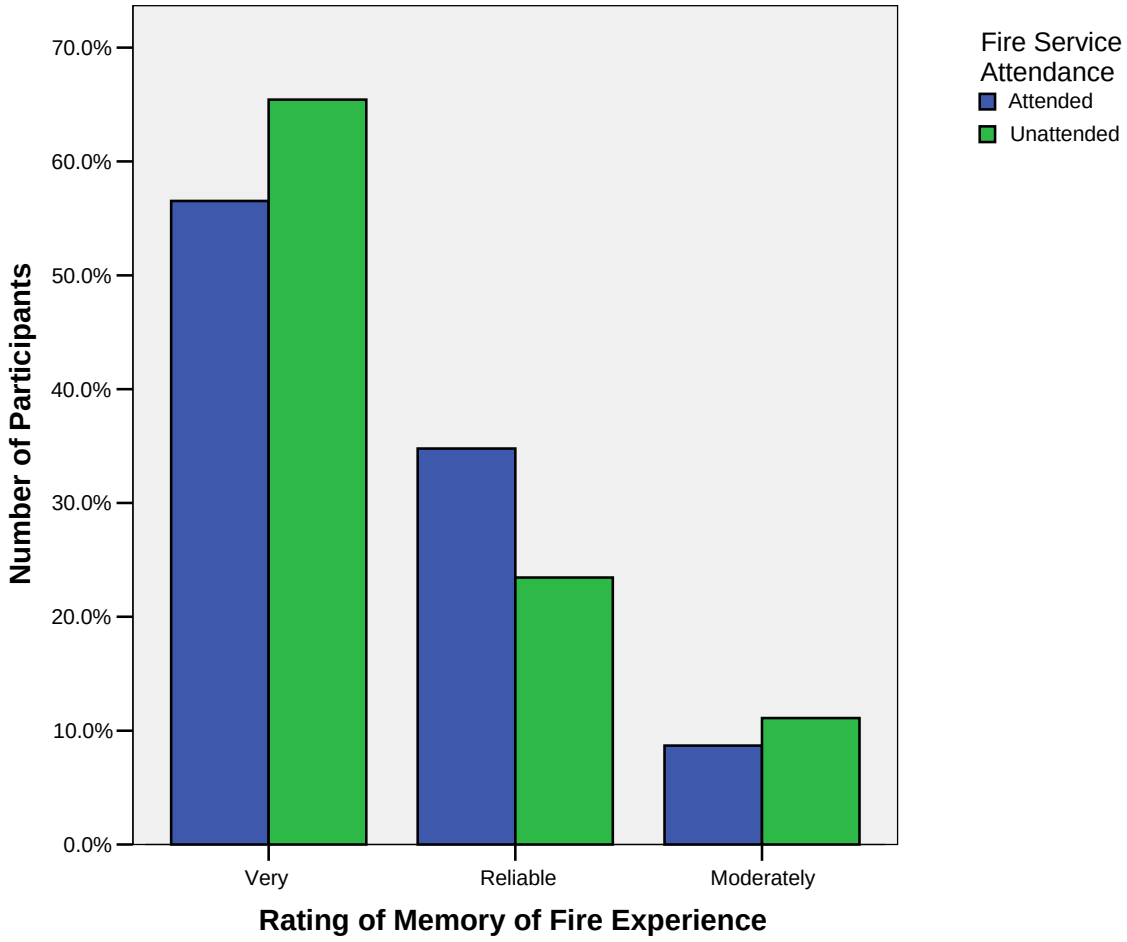

Figure 5. Frequency distribution of participants rating of their memory of the reported fire experience (n= 104)

Figure 5 shows that the majority of participants reporting a fire experience rated their memory of that particular event as very reliable (63.5%). Memory of the event was recorded on a 4 point Likert scale; options

were very reliable, reliable, moderately reliable and unreliable. No participants reported their memory of the fire event as being unreliable.

7.6 Unattended residential fires: Characteristics of the fires reported

The majority of fire experiences reported were unattended events, and the following section examines further the characteristics of unattended fire cases.

7.6.1 Where unattended residential fires are occurring

Table 8 shows that the majority of residential fires reported occurred in houses (88.9%), rather than in flats, units or apartments. In addition, most homes were owned (62.8%); with a smaller percentage of unattended fires occurring in rental properties. The vast majority of unattended residential fires occurred indoors (90.1%).

Table 8
Descriptive statistics of unattended residential fire location (n= 81)

Variable	Frequency	%
Location on Property		
Indoors	73	90.1
Outdoors	8	9.9
Dwelling Type		
House	72	88.9
Flat/Unit/Apartment	9	11.1
Property		
Home Owned	44	62.8
Rented	26	37.2

7.6.2 The causes of unattended residential fires

Table 9 shows that the leading cause of unattended fires was cooking (70.3%), followed distantly by heating fires (6.2%) and children playing (6.2%). Of all cooking fires the leading cause was leaving cooking unsupervised, causing 38 of the 57 cooking fires (67.8%).

Table 9
Descriptive statistics on the reason for the unattended residential fire start (n= 81)

Variable	Frequency	%
Cooking Fires	**57**	**70.3**
Unattended Cooking	38	
Fat build up (in properly operating cooking equip.)	5	
Oil spilled onto stove (gas)	4	
Substances placed in a cooking pan (ignited instantaneously)	2	
Homemade BBQ accidentally dragged into the house	1	
BBQ gas bottle malfunction	1	
Lighting a BBQ with petrol & catches fire	1	
Misused Equipment (Kitchen Appliances)		
Toaster used to heat incorrect food item	1	
Paper Pizza box placed hot oven	1	
Tea towel too close source heat		
Placed on top of hot stove	2	
When used pick up hot pan, contacts hot oven	1	
Heating Fires	**5**	**6.2**
Open Fire Places		
Chimney caught fire	1	
Clothing/ Object next to set alight Warming P.J.s	1	
Wood Spilled Out Fireplace	1	
Pot Belly Stoves		
Wood Spilled Out	1	
Wood Heater		
Wood & Heater caught fire	1	
Children Playing	**5**	**6.2**
Playing lighter	3	
Playing candle	1	

Playing oven	1	
Petrol Used for Cleaning Purposes/ Fueling a Fire	**3**	**3.7**
Cleaning a motor (sparked & ignited petrol)	1	
Soaking clothing (remove oil) & placed clothing in washing machine	1	
Open flame drum		
Petrol thrown onto & drum caught fire	1	
Candle Fire	**3**	**3.7**
Magazine thrown on same table as oil burner & set alight	1	
Candle spills onto carpet	1	
Oil burner flaming oil spills onto buffet	1	
Use of Overheating or Faulty Electrical Equipment/ Electrical Overload	**3**	**3.7**
Electrical bench grinder overheating	1	
Vacuum cleaner overheating	1	
Electrical fault in 40Watt light	1	
Smoking	**3**	**3.7**
Cigarette into kitchen bin	3	
Unattended Household Equipment	**1**	**1.2**
Incinerator unattended with lid off backyard	1	
Miscellaneous	**1**	**1.2**
Kiln sets nearby boxes alight	1	

The reason for cooks leaving their cooking unattended was also examined in the current study. Results showed that for known cases, a high proportion of cooks were distracted by the television while cooking (six unattended cases and one attended case). Followed by attending children (five cases). An even number of persons reported leaving their cooking while gardening (two cases), while talking on the telephone (two cases) and while socializing (two cases). For attended fires in two cases the person forgot about their cooking and went shopping (were located off the premises), in one case the person fell asleep. Very few fires were started due to smoking.

7.6.3 Room of fires ignition, equipment involved & materials first ignited

Table 10 shows that the largest proportion of unattended residential fires started in the kitchen (72.8%).

Table 10
Frequency data of the room/area that the unattended residential fire started in (n= 81)

Variable	Frequency		%
Room/Area Ignition			
Kitchen	59		72.8
Lounge/ Rumpus	7		8.6
Bedroom	2		2.5
Laundry	2		2.5
Hallway	1		1.2
Garage	2		2.5
Attached		1	
Separate		1	
Backyard	5		6.2
Shed	1		1.2
Car	1		1.2
Cubby House	1		1.2

Table 11 shows that the equipment involved in the start of the large majority of unattended residential fires was equipment used for cooking (72.5%). Of the cooking equipment fires, the largest proportion involved a stove (42/58= 72.4%).

Table 11
Frequency data showing the equipment involved in the unattended residential fire start (N= 80)

Variable	Total Frequency	%
Equipment Used in Cooking:	**58**	**72.5**
Stove (Pot)	9	
Stove (Fry Pan)	31	
Stove (Unknown)	2	
Oven or Grill	8	
Portable Stove	1	
Toaster	1	
BBQ's	6	
Heating structures/ equipment:	**5**	**6.2**
Open fire places	3	
Pot belly stove/wood heater	2	
Household Appliances:	**5**	**6.2**
Used in Repair/ Construction		
Bench Grinder	1	
Incinerator	1	
Kiln	1	
Cleaning		
Washing Machine	1	
Vacuum	1	
Decorative & Festive Items:	**5**	**6.2**
Candles	2	
Oil Burner	3	
Structures/ Fixtures of Home used to Supply Power:	**3**	**3.7**
Light bulb	1	
Power box	1	
Electrical plug	1	
Cigarettes	**3**	**3.7**
Lighter	**3**	**3.7**
Miscellaneous	**3**	**3.7**
Motor	1	
Brickets	1	
Drum (open flame)	1	

Table 12 shows that in the majority of cases the material first ignited in unattended residential fires were fats and food products (58%). The second leading materials first ignited was fabric (including upholstery and clothing) making up 7.4% of all materials first ignited, and paper/ wood products (also making up 7.4% of materials first ignited).

Table 12
Frequency of the materials/ objects/ and substances first ignited in the unattended residential fire (n= 81)

Variable	Frequency	%
Fats & Food Products	**47**	**58.0**
Fats & Oil	29	
Food Products		
Food	13	
Chip Pan	4	
Wine	1	
Dry Cooking Pot	**3**	**3.7**
Fabric (clothing & upholstery)	**6**	**7.4**
Table Cloth	1	
Tea Towel	3	
Clothing (not being worn)	2	
Paper/ wood products	**6**	**7.4**
Tissue	1	
Wood	2	
Pizza Box	1	
Cardboard boxes	1	
Magazine	1	
Structural Components Home	**5**	**6.2**
Lino Floor	2	
Carpet	2	
Chimney	1	
Household Fixtures	**1**	**1.2**
Light Bulb	1	
Furniture	**1**	**1.2**
Electrical Appliances & Heaters	**4**	**4.9**
Heater	1	
Electrical Appliances	2	
Incinerator	1	
Bins (Trash Can & Compost)	**3**	**3.7**
Trash Can	3	
Flammable Substances	**5**	**6.2**
Petrol	4	
Gas	1	

7.6.4 Characteristics of the occupants & unattended residential fires

Table 13 shows the age and sex of the person responsible for the unattended fire start. A greater number of females were responsible for the fire start (58/78= 74.3%) compared with males. However it should be noted that the study sample consisted of a greater number of female participants (64%). For unattended fires the highest proportion of those responsible for starting the fire were females aged 31 to 50 years of age (27/78 = 34.6%), followed by females 18-30 years of age (17/78= 21.8%).

Table 13
Frequency data of the age and sex of the person who started the unattended residential fire (n= 78)

Variable	Frequency	%
Age/ Sex starting		
Female	**58**	
0-5	0	
6-17	5	6.4
18-30	17	21.8
31-50	27	34.6
51-64	6	7.7
65+	3	3.8
Male	**20**	
0-5	2	2.6
6-17	4	5.1
18-30	5	6.4
31-50	4	5.1
51- 64	3	3.8
65+	2	2.6

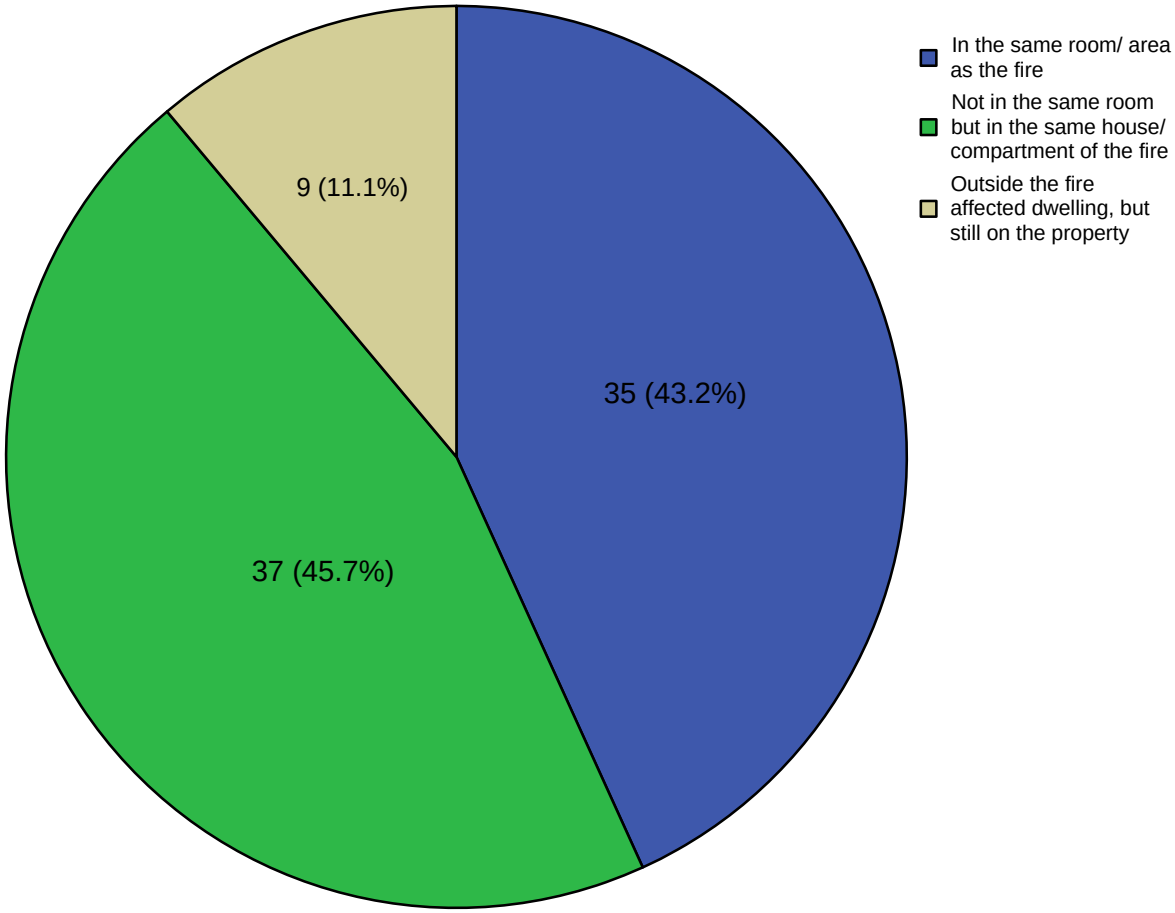

Figure 6. Location of the person responsible for the unattended residential fire start at the time of ignition (n=81)

Figure 6 shows that for unattended fires, nearly an equal number of persons responsible for ignition were either in the same room (35/81= 43.2%) or outside of the fire affected room, but in another location of the house (37/81= 45.7%). Only a minority were outside of the fire-affected dwelling at the time of ignition, and in no unattended fire cases was the person responsible for ignition off the property at the time.

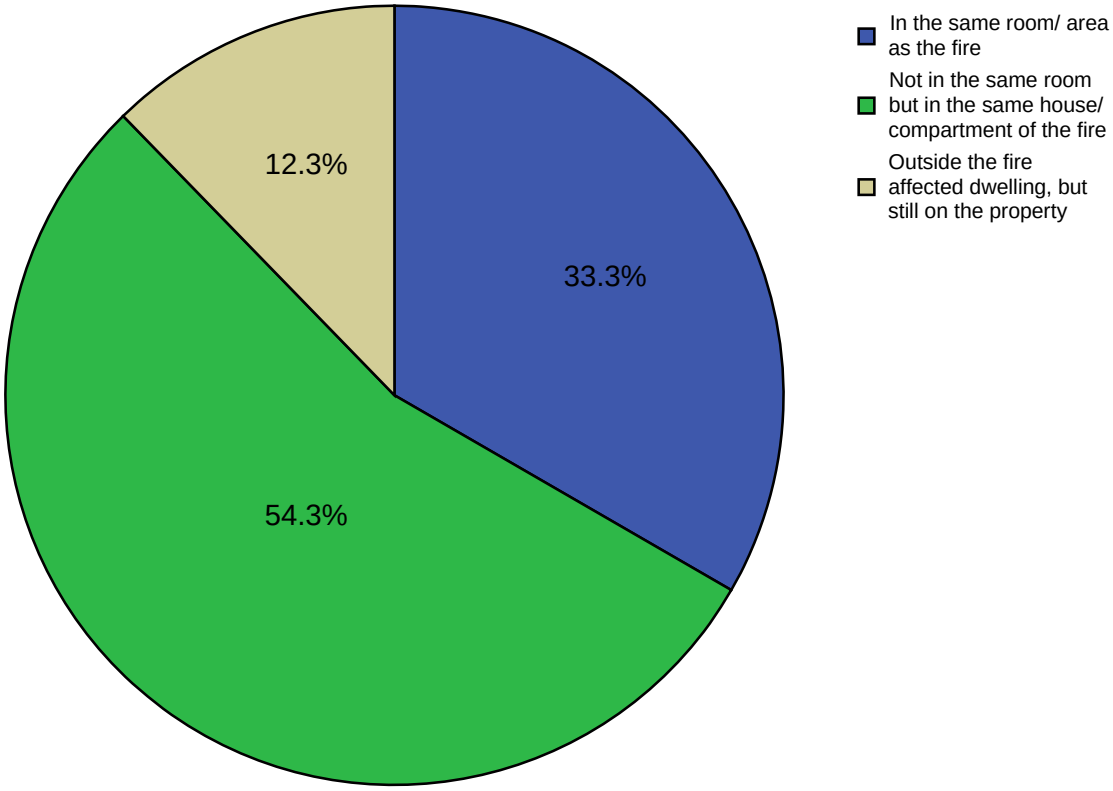

Figure 7. Location of the person responsible for the unattended cooking fire start at the time of ignition (n=57)

Figure 7 shows that for unattended cooking fires, the majority of persons responsible for ignition were outside of the fire affected room, but in another location/room of the house.

Table 14 shows for unattended fires the most common initial action of the person responsible for starting the fire was to fight the fire (nearly two thirds), followed by observing the fire.

Table 14
Descriptive statistics of the initial actions those responsible starting fire (n= 77)

Variable	Frequency	%
Fire Fight	49	63.6
Evacuate	2	2.6
Observe Fire	19	24.7
Alert Others	3	3.9
Watch Over Children	2	2.6
No Action- Unaware Fire	2	2.6

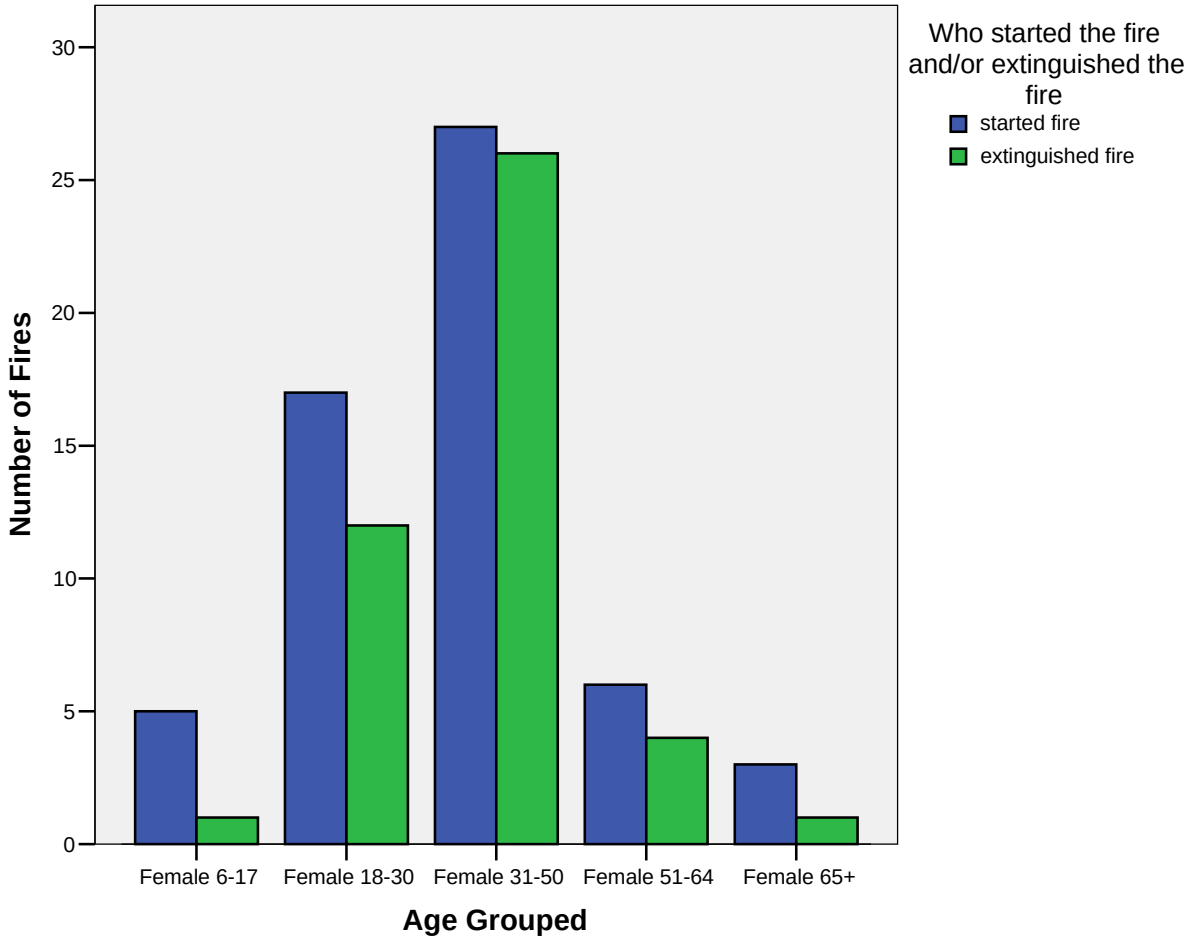

Figure 8. Frequency distribution of the number of females who started the fire compared to the number of females who extinguished the fire (n= 58)

Figure 8 shows the number of females responsible for the start of an unattended fire compared to the number of females who extinguished of the fire. In every age group slightly fewer females extinguished an unattended fire, compared to the number of females responsible for starting the fire. The graph includes some double counting where the same person started and extinguished the fire.

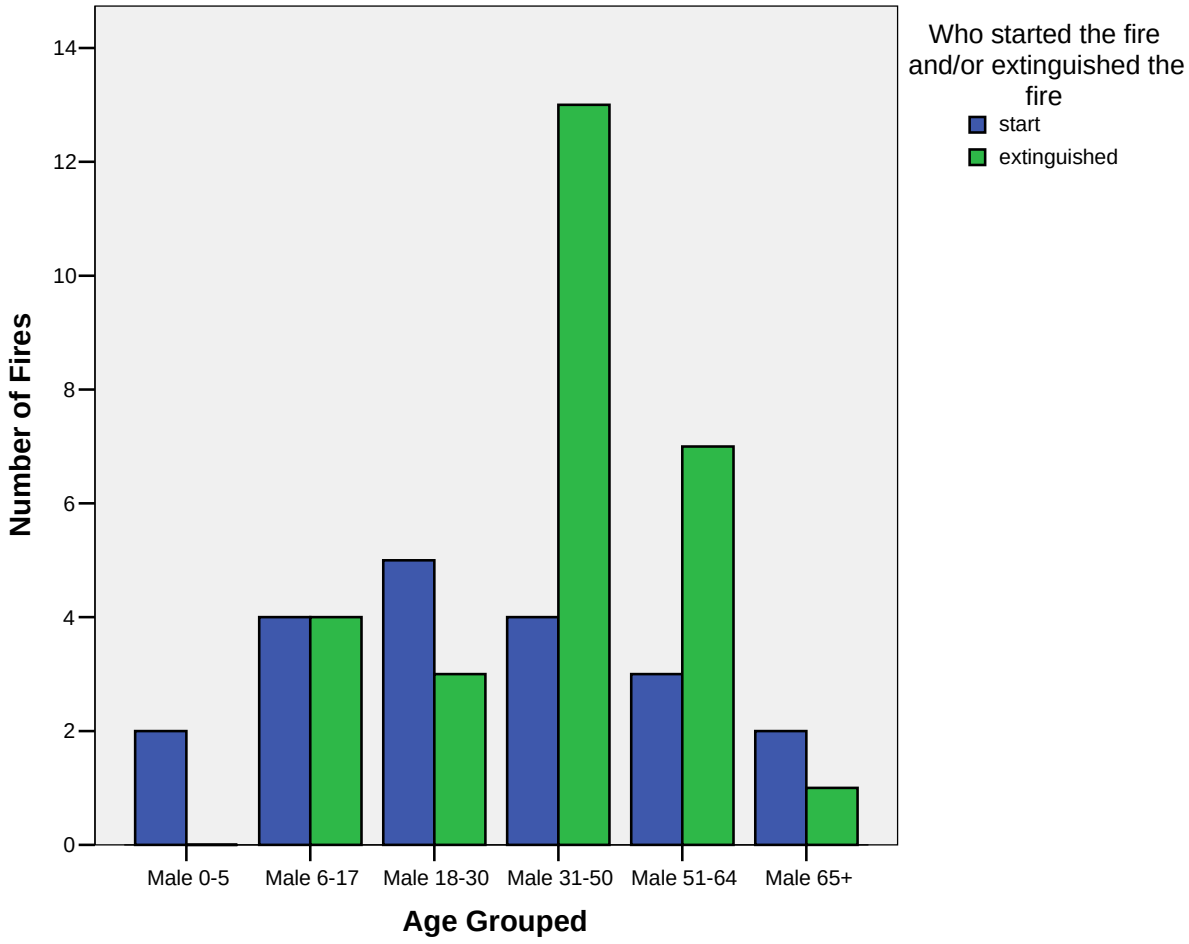

Figure 9. Frequency distribution of the number of males who started the fire compared to the number of male who extinguished the fire (n= 24)

Figure 9 shows the number of males responsible for the start of an unattended fire compared to the number of males who extinguished of the fire. For males aged 31 to 50 and 51 to 64 a greater proportion were

responsible for extinguishing an unattended fire than for starting an unattended fire. The graph includes some double counting where the same person started and extinguished the fire.

7.6.5 Common cues alerting those at fire scene

Table 15 shows that the first person alerted to the unattended residential fire was usually the person responsible for ignition (37% + 34.6% = 71.6%) and the cue most often alerting those who started the fire was seeing flames (48.1%), followed by smelling the fire (14.8%) and receiving a verbal warning from another person present at the scene (13.6%). For those that extinguished the fire the most common cue alerting them to the fire was also seeing the fire (36.7%), followed by smelling the fire (21.5%).

Table 15
Person First Alerted to the Residential Fire & The Cue Alerting Them (n= 81)

Variable	Frequency	%
Who Alerted First?		
Person Responsible Ignition	30	37.0
Person Responsible Extinguishing	12	14.8
Person who Started & Extinguished	28	34.6
Observer at Scene	9	11.1
Neighbor	1	1.2
Group of People	1	1.2
Type Cue Alerting Those Started Fire		
Hear Smoke Alarm	9	11.1
See Flames	39	48.1
See Smoke	4	4.9
Smell	12	14.8
Hearing Fire	2	2.5
Mixture: See/ Hear/ Smell	2	2.5
Verbal Warning from Another	11	13.6
Not Aware of Ignition	2	2.5
Type Cue Alerting Those Extinguished Fire		
Hear Smoke Alarm	11	13.9
See Flames	29	36.7
See Smoke	5	6.3
Smell	17	21.5
Hearing Fire	1	1.3
Mixture: See/ Hear/ Smell	1	1.3
Verbal Warning from Another	15	18.9
Unknown	**2**	

7.6.6 Household structure of the unattended fire-affected dwelling

Table 16 shows the highest proportion of households experiencing a fire was those in which a couple and two children were living (24.7%).

Table 16
Descriptive statistics of the family structure living in the fire effected dwelling at the time of the fire (n= 81)

Variable	Frequency	%
Living Alone	4	4.9
Couple	16	19.7
Couple & 1 Child	10	12.3
Couple & 2 Children	20	24.7
Couple & 3+ Children	14	17.3
Single parent & 1 child	2	2.5
Single parent & 2+ children	9	11.1
Flat mates (2- 4 persons)	5	6.2

7.6.7 Injuries as a result of attended and unattended residential fires

Table 17 shows that of all the fire experiences reported (104) there were 10 injuries. There were slightly more injuries reported for attended fires (13%) compared to unattended fires (8.6%). In most cases the person was injured when fighting the fire. Usually the person injured was involved in the start of the fire, and an equal number of males 31-50 years of age and females 31-50 years of age were injured. Medical attention was required in more than half the injury cases (6/10).

Table 17
Frequency of injuries sustained due to the residential fire event (n= 104)

Variable	Unattended	Attended	Total Frequency
Anyone Injured			
Yes	7 (8.6%)	3 (13%)	10 (9.6%)
No	74 (91.4%)	20 (87%)	94 (90.4)
Type of Fire in which Injury Occurred			
Cooking Fire	6	1	7
Use Overheating/ Faulty electrical equipment	0	1	1
Petrol used for cleaning	1	0	1
Children playing	0	1	1
How Injured			
Fighting Fire	5	1	6
Lighting Fire	1	0	1
Playing Fire	0	1	1
Escaping	1	0	1
Asleep	0	1	1
Age/ Sex Injured			
Female			
6-17	1	0	1
18-30	2	0	2
31-50	2	1	3
Male			
6-17	0	1	1
31-50	2	1	3
What Injuries Sustained			
Singed Hair	1	0	1
Scald	2	1	3
Small Burn	2	0	2
Sever Burn	2	1	3
Asphyxia	0	1	1
Medical Attention Sought			
Yes	4	2	6
No	2	1	3

7.6.8 Alcohol involvement in attended and unattended residential fires

Table 18 shows that for attended and unattended residential fires very few cases involved alcohol.

Table 18
Frequency of fires in which there was alcohol consumption at the time of the fire (N= 88)

	Alcohol consumption?	
	Yes	No
Variable		
Unattended	4	64
Attended	1	19

7.6.9 Interviewee's perception of danger

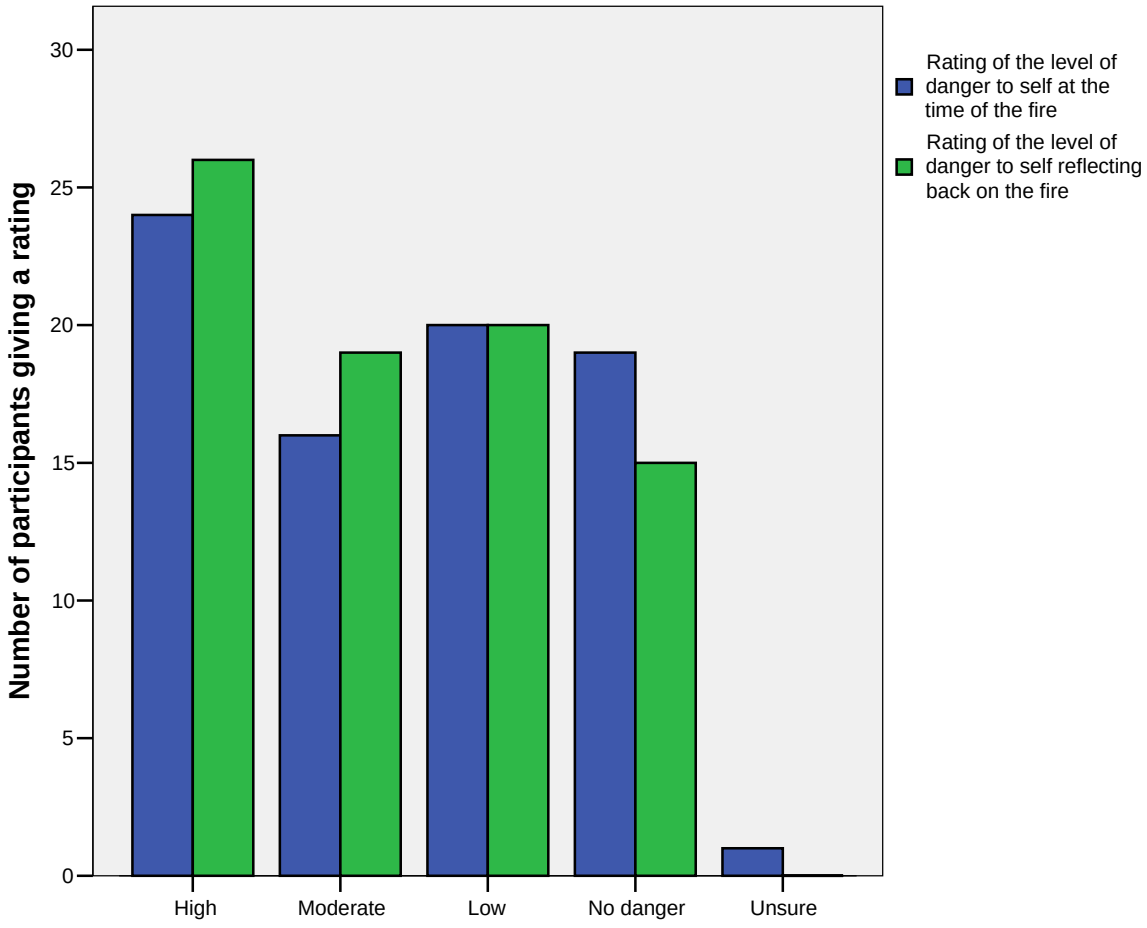

Figure 10. Frequency distribution of interviewee's perception of level of physical danger to themselves at the time of the fire and reflecting back on the unattended fire event (n= 80)

Figure 10 shows the participant's perception of the level of physical danger to themselves at the time of the unattended fire and in reflecting back on the fire event. For unattended fires most of the participants felt their own level of danger was either high or moderate (with the ratings increasing slightly when they were reflecting back on the event).

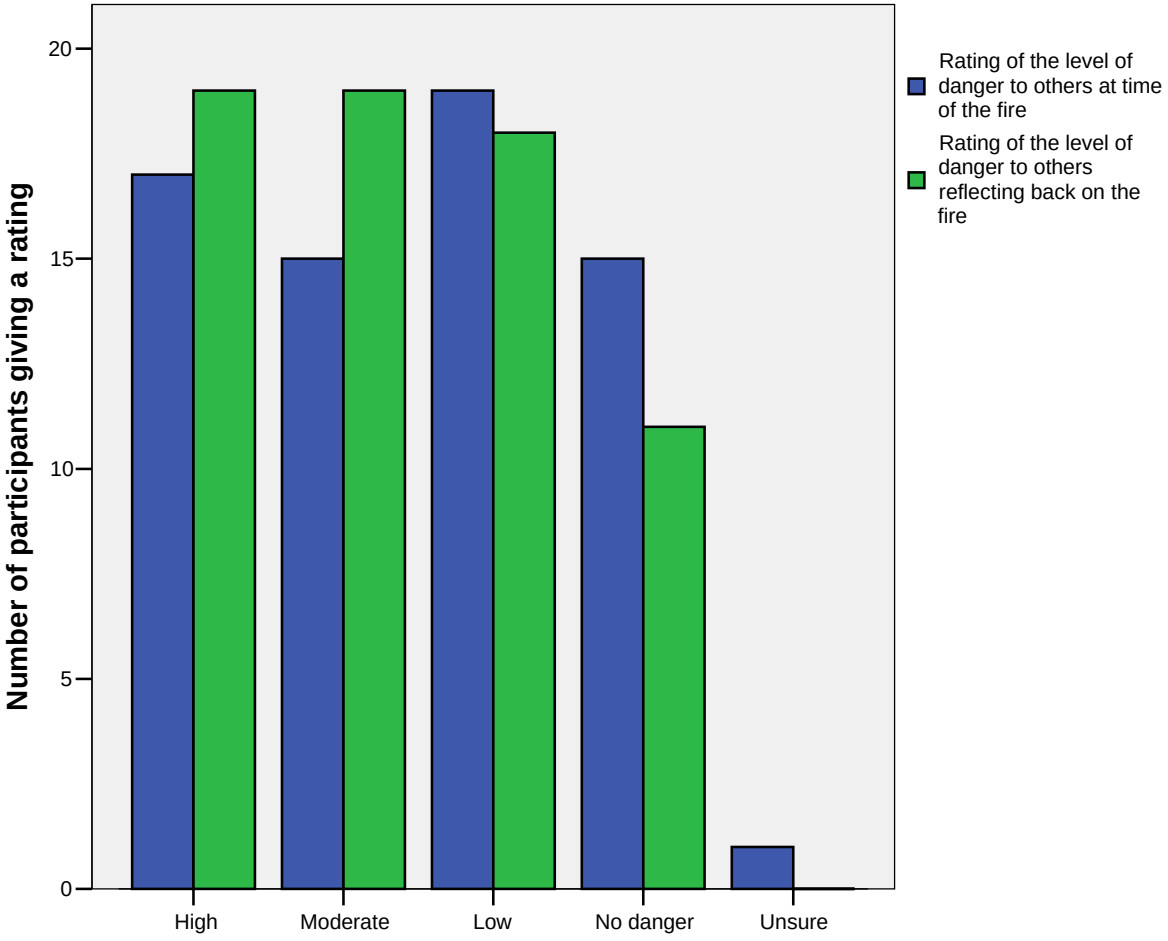

Figure 11. Frequency distribution of the interviewees perception of level of physical danger to others at the time of the fire and reflecting back on the unattended fire event (n= 67)

Figure 11 shows that slightly more participants rated the level of physical danger to others reflecting back on the event as moderate or high compared to their perception of danger to others at the time of the fire.

7.6.10 Time of day & season

Table 19 shows a peak in the number of unattended residential fires reported to occur between 4:00pm to 8.00pm and 12.00 to 4.00pm. An equivalent number of unattended fires were reported as occurring during the winter and summer months.

Table 19
Frequency data on the reported time of day and season in which the unattended residential fire occurred (n= 81)

Variable	Frequency	%
Time of Day		
8:00am-11.59am	6	8.1
12.00am-3.59pm	23	31.0
4.00pm- 7.59pm	35	47.3
8.00pm-11.59pm	10	13.5
12.00pm-7.59am	0	
Unknown	7	
Season		
Summer	17	35.4
Winter	17	35.4
Autumn	9	18.7
Spring	5	10.4
Unknown	33	

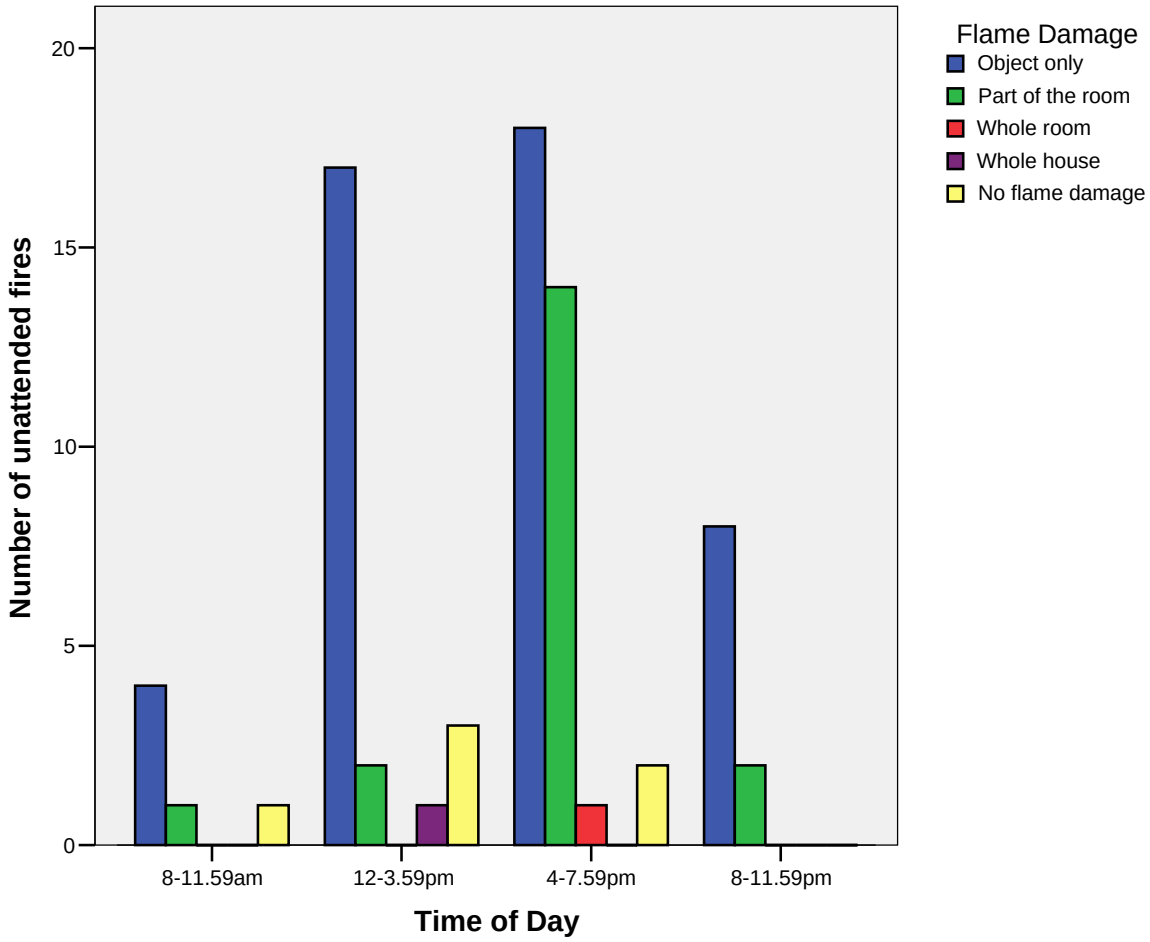

Figure 12. Frequency distribution of the time of day the unattended residential fire occurred and level of flame damage caused

Figure 12 shows that in the majority of unattended residential fires the flame damage was to the object only, or to part of the room; especially for fires unattended between 4pm and 7.59 pm.

7.7 Fire safety devices

In many unattended residential fires a smoke alarm was reported to have been present at the time of the fire, but did not operate as a result of that fire (33/ 78 = 42.3%); in a further 21 cases there was no smoke alarm present

at the time of the fire (21/78 = 26.9%) and in 20 cases an alarm was present and did operate as a result of the fire (25.6%) (See Table 20). For attended fires, in 47.8% of cases an alarm was not present at the time of the fire. Hence more attended fires had no smoke alarm than unattended fires. The majority of those who experienced a fire did not own a fire extinguisher or a fire blanket at the time of the fire event (80.2% and 88.1%).

Table 20
Frequency of fire safety devices present at the time of attended and unattended residential fires (n= 101)

Variable	Unattended	Attended	Total Frequency	%
Smoke Alarm				
Present:				
Working & Operated	20	6	26	25.7
Working but Did Not Operate	33	5	38	37.6
Working Status Unknown	2	0	2	2.0
Not Working	0	1	1	1.0
Not Present:	21	11	32	31.7
Unsure:	2	0	2	2.0
Fire Extinguisher				
Present:				
Working & Operated	4	2	6	5.9
Working but Did Not Operate	8	2	10	9.9
Working Status Unknown	1	0	1	1.0
Not Working	1	0	1	1.0
Could not locate at time fire	1	0	1	1.0
Not Present:	62	19	81	80.2
Unsure:	1	0	1	1.0
Fire Blanket				
Present:				
Did Use	5	1	6	5.9
Did not Use	3	2	5	5.0
Not Present:	69	20	89	88.1
Unsure:	1	0	1	1.0

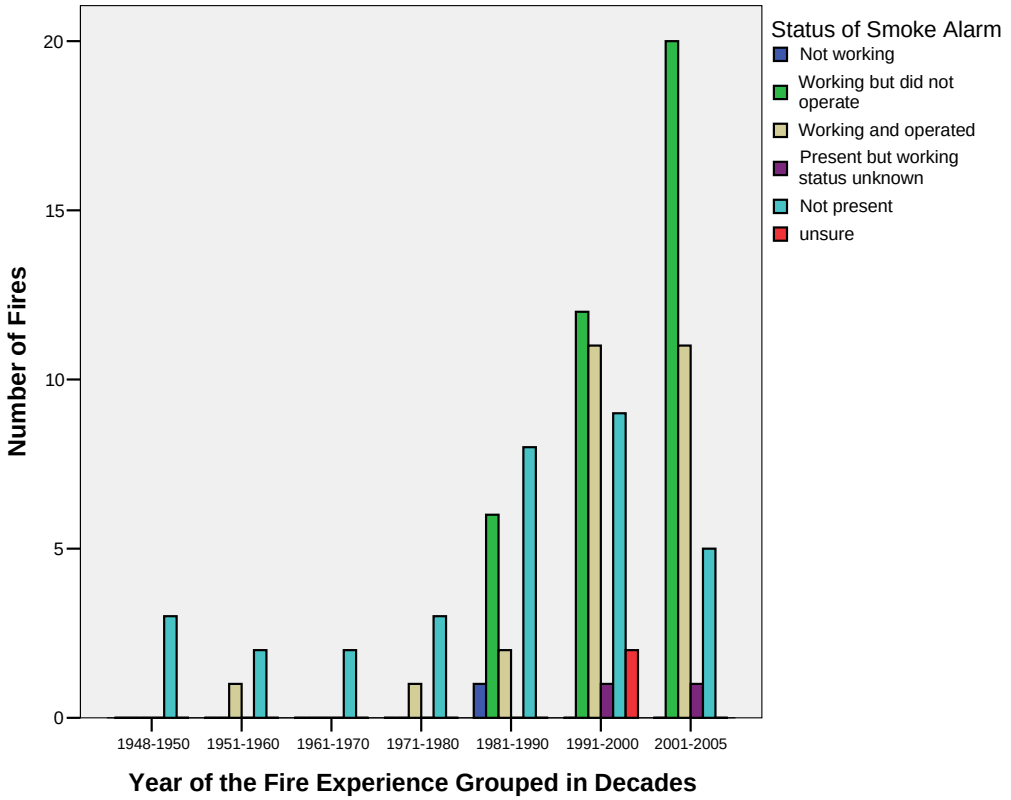

Figure 13. Frequency distribution of smoke alarm status at the time of the residential fire experience (n= 104)

Figure 13 shows that the fires reported before the year 1981 the fire affected household tended not to have a smoke alarm installed. There are more smoke alarms reported to be present in homes following the 1980's.

7.8 Demographics of the person responsible for the residential fire start

Table 21 shows the demographics of the person responsible for the fire start, at the time of the fire event. In 46 cases the participant interviewed was involved in the start of the fire (either attended or unattended) and gave information about their demographics at the time of that fire. The majority of persons responsible for the fire start were employed at the time of the fire event (56.5%).

Table 21

Descriptive statistics of the demographics of those responsible for the start of either an attended and unattended residential fire at the time of the event (N=46)

Variable	Frequency		%
Employment Status			
Employed	26		56.5
Not Employed	1		2.2
Not in Labor Force	19		41.3
Retired		2	
Stay Home Parent		14	
Student		3	
Occupation Type			
Senior Management & Professionals (Type A)	2		7.7
Managers & Associate Professionals (Type B)	9		34.6
Trades persons, Clerks, Skilled Office & Sales (Type C)	6		23.0
Machine Operators, hospitality, assistants, labourers (Type D)	9		34.6
Education			
No Qualification	25		54.3
Year 11 or Below		18	
Year 12 Completed		7	
TAFE	4		8.7
University	16		34.8
Apprentice	1		2.2
Cultural Background			
Country			
Born In			
Australia	46		73.0
Overseas	17		27.0
Mother			
Australia	35		55.5
Overseas	28		44.5
Father			
Australia	33		52.4
Overseas	30		47.6

7.9 A closer look at attended residential fires

Table 22 shows that in the majority of attended residential fire cases (78.3%) the fire brigade arrived at the scene while the fire was still burning; in a smaller number of cases the fire brigade arrived a short time after the fire had been extinguished by the occupants. Of the 23 participants interviewed that reported an attended fire experience, the majority felt that fire service attended was necessary (91.3%).

Table 22
Frequency data on attended residential fires (n= 23)

Variable	Total Frequency		%
Who Called Fire Services			
Person at Scene	13		56.5
Person not initially on scene	10		43.5
Neighbor		8	
Passerby		2	
When Did Fire Services Arrive?			
During Fire	18		78.3
Straight After Fires Extinguishment	5		21.7
Initial Action of Person Started the Fire			
Fight fire	2		
Observe fire	3		
Alert Others	2		
Evacuate	5		
Not aware of fire	3		
Unknown	8		
Participant Interviewed Feel Attendance Was Necessary?			
Yes	21		91.3
Out Control		16	
Check Property		2	
Life Danger		1	
No	2		8.7
Was Under Control		2	

7.10 Damage

For most unattended residential fires flame damage was confined to the object (50/79) 63.3%); in 26.6% (21/79) the flame damage spread to part of the affected room. Smoke spread in unattended fires was generally to part of the affected room (20/77 =26%). For attended fires, in most cases fire spread was to part of the effected room (9/23 =39.1%) and usually smoke spread to the whole house/ compartment (6/20= 30%). The majority of insurance claims were for attended fires (11/ 16 = 68.7%).

Although participants were asked to estimate in meters the size of the flame and smoke damage that occurred as a result of the fire, most found this question difficult to answer and in only 26 and 22 cases was there a response. For unattended fires in which an estimate was made, in most cases the flame damage ranged in size from 0.2-1.0 meters, in fewer cases the flame damage caused ranged from 1.5-6.0 and in very few cases the damage exceeded 10 meters.

Table 23
Frequency data on extent of flame and smoke damage caused by the residential fire and whether an insurance claim was made (n= 108)

Variable	Unattended	Attended	Total Frequency	%
Flame Spread				
Object	50	5	55	53.9
Part Room	21	9	30	29.4
Whole Room	1	6	7	6.9
Whole House/ Compartment	1	2	3	2.9
Past House/ Structure	0	1	1	1.0
No flame damage	6	0	6	5.9
Unknown			6	
Smoke Spread				
Object	14	2	16	16.4
Part Room	20	5	25	25.7
Whole Room	9	5	14	14.4
Whole House/ Compartment	1	6	7	7.2
Past House/ Structure	0	2	2	2.0
No smoke damage	33	0	33	34.0
Unknown			11	
Meters (Squared) Flame Damage				
0.2 - 1.0	11	0	11	42.3
1.5 – 6.0	6	3	9	34.6
10 – 50	2	4	6	23.1
Unknown			82	
Meters Smoke Damage				
0.2 - 1.0	2	0	2	9.1
1.5 – 6.0	10	2	12	54.5
10 – 50	4	4	8	36.4
Unknown			86	
Insurance Claim				
Yes	5	11	16	15.7
No	75	6	81	79.4
Unsure	1	4	5	4.9
Unknown			6	
$ Amount				
Less $500.00	0	1	1	
2,000 – 3,000	0	1	1	
10,000 – 50,000	1	0	1	
Unsure	4	3	7	
Unknown			6	

7.11 How the residential fires were extinguished

Table 24 shows that the most common method of extinguishment for all residential fires was to move the burning object (25.9%), followed by smothering the fire (20.2%), followed by fire services (16.3%), followed by the use of water from a household tap (12.5%).

Table 24
Frequency data showing the methods of extinguishment for attended and unattended residential fires (n= 104)

Variable	Frequency		%
Fire Services	**17**		**16.3**
Occupant makes no attempt fight fire	12		
Occupant Unsuccessful in Fire-Fight Attempt	5		
Fire garden hose		3	
Turning gas bottle off		1	
Turning power off + Garden Hose		1	
Moving Burning Object	**27**		**25.9**
Within Home			
To Sink	10		
Pan to sink & douse with water		7	
Pan to sink & fire blanket		1	
Burning Food sink & turn on safety switch		1	
Burning tea towel sink & flour on it		1	
To Floor	3		
Fling pan straight floor		2	
Fling pan floor & smother- then move outside & smother mat		1	
Away Source Heat	5		
Move burning tea towel away heat source		1	
Move pan/pot/wok off the stove		3	
Pull tray out		1	
Outside Home	9		
Pan outside & smother with pan lid		1	
Move burning boxes outside & douse water		1	
Clothing Outside		1	
Move burning clothing outside & douse water		1	
Pan outside & douse water		1	
Toaster outside & bang it		1	
Pan outside & shake it		3	
Spilt Fuel Moved Back to Correct Location	**2**		**1.9**

Wood back into pot belly stove		1	
Wood back into open fire		1	
Use Water from around Household	**13**		**12.5**
Tap water collected & Poured on fire		6	
Use of Garden Hose		7	
Smother			
Use of one medium:	**21**		**20.2**
Fire Blanket		3	
Cloth/ Blanket/ Clothing/ cushion		9	
Tea towels		4	
Lid on pan		2	
Talcum powder		1	
Garden Dirt		1	
Magazine		1	
Use of two mediums	**4**		**3.8**
Lid pan & wet cloth/blanket		2	
Wet cloth & salt		1	
Tea towel & flour		1	
Smother & Use of Water	**2**		**1.9**
Blanket & Garden Hose		1	
Blankets/ Table Cloth & Tap water		1	
Fire Extinguisher	**5**		**4.8**
Turn Off Power/ Source Heat	**10**		**0.9**
Turn off Stove/ Oven		4	
Turn Off Gas		3	
Switch off power at plug		2	
Disconnect house power		1	
Turn Power Off & Garden Hose	**1**		**0.9**
Fire Self-Extinguished	**2**		**1.9**

7.12 Probability ratios: Cooking fires vs. non-cooking fires

As shown in Table 25, Chi Squares were conducted for the demographics of the person who started a cooking fire and those responsible for the start of a non-cooking fire. There was a significant Chi Square association between the sex of the person and whether they were responsible for the start of a cooking fire. Females were significantly more often responsible for the start of a cooking fire than males within the sample (70% vs. 30%). In terms of ratios, females were involved in the start of 2.33 (70/30) as many cooking fire starts than males.

Age was re-grouped into 50 years and younger and 51 years and over so that Chi Square testing could be carried out. Results showed that there was a significant association between the age of the person and whether they were responsible for the start of a cooking fire. Persons aged 50 years and younger were significantly more often responsible for the start of a cooking fire than those 51 years and older (65% vs. 31%). Person 50 and under were 2.1 (65/31) times more often involved in the start of a cooking fire than those 51 and older.

Table 25
Chi-square test and relative risk for the group involved in the start of an cooking fire and the group who were not involved in the start of an cooking fire (n= 91)

Fire Type		Cooking Fire	Other Fire	P	Proportions
Sex					
	Female	46	19	.001	.70 (70%)
	Male	8	18		.30 (30%)
Age					
	50 under	49	26	.013	.65 (65%)
	51+	5	11		.31 (31%)
Born*					
	Australia	38	35	.005	.52 (52%)
	Overseas	17	10		.62 (62%)
Working					
	In work force	18	8	.607	.69 (69%)
	Not in workforce	14	6		.70 (70%)
Education					
	High-school	17	8	.529	.68 (68%)
	Further qualifications	8	6		.57 (57%)
Living Status *					
	Renting	11	3	.338	.78 (78%)
	Owning	18	9		.66 (66%)

** cell counts less than 5 (no adjustment applied)*

CHAPTER 8. DISCUSSION

8.1 The sample

Results from the comparison of this study's sample to the census data for Melbourne found that the sample was not representative of the population (see Table 2). All variables compared were found to be significantly different from the Melbourne population. For example, females aged 20 to 74 were overrepresented in the sample, especially from the ages of 35 to 45 years (See Figure 1). This over-representation is likely due to data collection being carried out in shopping centers; as females are generally more likely to shop than males.

Within the sample persons born overseas were slightly under-represented compared to their incidence in the overall Melbourne population. For those born overseas it is possible that English might not be their primary language; and there might have been fewer participants surveyed due to the language barrier between interviewee and interviewer. There was also found to be an over-representation of those with a university level education within the study sample; possibly because those familiar with the research process may have been more likely to complete a survey.

Persons classified as 'not in the labour force' included the retired, students, and stay at home parents. This group was found to be slightly under-represented in this study's sample. Of this group retired persons were the majority. It is possible that the researchers surveyed more retired persons, as they generally have greater time on their hands in comparison to parents; who might have been less likely to stop and complete an interview schedule if they had children to supervise. Persons unemployed were also over-represented in the study sample. This could be because persons not working would have more time to spend in a shopping centre, and hence more time to

stop and complete a fire safety and awareness interview schedule. The fact that unemployed persons were over-represented in the study sample may explain why 'renters' also made up more of the sample compared to their incidence in the overall population; as generally the unemployed are least likely to be home owners.

For persons within the sample that were in the workforce the analysis of occupation types showed quite a large under-representation of those in Type A occupations (which represents Senior Management and Professionals). In comparison those in Type D occupations, representing machine operators, hospitality workers, assistants, and laborers, were substantially over-represented. It may be more likely that people working in factories, and particularly those working in hospitality, were closer to shopping complexes and therefore more likely to have their lunch break at the complex. Type D occupations also included those working in retail, and since researchers were located within a shopping complex, it is no surprise that this group was over-represented.

The implications of the sample study not being representative of the Melbourne population will be discussed below in relation to specific fire related variables.

8.2 Comparison of the demographics between participants who had a fire experience and who had not had a fire experience

Chi-Square testing was conducted to determine whether there was a significant difference between the demographics of those who reported having had a residential fire experience in their adult lifetime (either attended or unattended) and those who did not report having a fire experience (see Table 4). In conjunction with Chi-square testing, ratios and proportions were

used to measure the extent of the difference between variables in which a significant association was found. Findings indicate that there was no significant difference between having had a fire experience and the demographics of all participants, except for the working vs. non-working variable and sex.

Results showed that significantly more females reported having had a fire experience in their adult lifetime compared to males. Of the females surveyed 22% reported having had a residential fire experience in which they were either responsible for the start, and/or extinguishment of the fire, or were an observer of the event, compared to only 14% of males. In addition, in terms of the ratio of males to females, females reported 1.57 times more fire experiences than males. In contrast to fatal fires, in which males are more often the victim, the current study findings indicate that females are experiencing a greater number of non-fatal fire experiences than males.

Results also revealed that participants not working at the time of the interview (including those not in labour force and the unemployed) were significantly more likely to report having had a fire experience (in which they were either responsible for the start, and/or extinguishment of the fire, or were an observer of the event) in their adult life time than those working. Of the participants not working 24% reported having had a fire experience compared to only 15% of person who were in paid employment and reported having had a fire experience. This finding is similar to that of the fatal fires that occurred in Australia during 1991 to 2005, in which a greater number of victims were not in the workforce at the time of the fire (Department of Emergency Services, 2003; Watts-Hampton, 2006). This might be because, similar to fatal fire cases, a person not working spends more time in their dwelling and therefore has had a greater probability of experiencing a fire event. However, the fires reported in this study were retrospective in nature and it is possible that the demographics of individuals interviewed were

different at the time of the fire experience. For example, a participant may have been currently working at the time of the interview; however at the time of their fire experience they might have been un-employed.

In terms of age, results of the current study showed that there was no difference between the elderly group and those 64 years and younger, in terms of reporting having had had a residential fire experiences during the adult life time. This finding indicates that persons 64 years and younger are also experiencing residential fires despite having lived less adult years compared to the elderly. Although the current study shows the chance of the elderly and non-elderly having a fire experience is similar, the elderly still make up the largest proportion of fatal fires victims; therefore the likelihood of become a fatality as a result of the fire is higher for elderly compared to others.

Due to the small number of attended fires within the sample (which was expected, as overseas data had previously shown that the vast majority of fires are unattended) the majority of the remaining discussion is based on unattended residential fires (in line with the main aims of the project).

8.3 Validity of unattended fire estimates

The current study found that of all residential fires, in which fire service attendance status was known, the vast majority of fires (81/104 =77.9%) were unattended (see Table 3). In terms of unattended fires, findings of the current study were closer in similarity to findings from the U.K. BCS and SEH (in which 78% of fires were unattended) (BCS, 2001), than findings from the U.S (showing 96% of fires were unattended) (U.S. Consumer Product Safety Commission, 1985). However, the methodologies utilized in overseas studies were different to that used in the current study. The U.K. study using

the BCS and SEH asked 30,000 and 18,000 participants to report on any fires experienced within the previous 12 months of the survey. The U.S Consumer Product Safety Commission (1985) asked 32,000 households to report on any fires experienced in the 3 months prior to the interview; however the Commission used the data from the three month period to make an overall estimation of fires occurring during the U.S. for a 12 month period. In summary, the U.S. and U.K. asked a large number of participants to report on fairly recent fire experiences. In contrast, the current study asked a smaller number of participants (500) to report on fire experiences from the age of 18 (fires over the adult lifetime). It is interesting to note that despite the U.K. and current study having very different sample sizes and a methodology difference of asking for 12 month fire reports compared to adult life time fire reports, that the exact same percentage of attended vs. unattended fires was obtained. Perhaps this shows the validity of participant's memory across the adult lifespan for fires is equivalent to 12 month validity.

In order to compare the current study findings to the U.S. and U.K. studies, the number of fire experiences reported twelve months prior to the administration of the interview schedule were considered alone. Results showed that 2.6% of participants surveyed (13 of 498) reported having had a residential fire experience in 2005 (data collection was carried out in late November and December of 2005) (see Figure 4). This is slightly higher than the U.K, in which 1.5% of survey respondents reported a fire experience. The U.S. study, on the other hand, showed a substantially higher (6.3%) number of survey respondents who reported a fire experience, which is likely due to the broader nature of the type of fires collected. In the U.S. fire experiences requested from interviewees included fire events that 'could' have caused damage to property if left unchecked were included. Fires in which food ignited briefly but caused no damage might therefore have been included and hence lead to a higher number of unattended fires being reported within the

sample, compared to the current study in which the fire had to have caused some damage.

It is also possible, however that in the current study, some fires (particularly those minor fires) were forgotten as participants were relying on retrospective memory, and some older adults were required to think back further in time than their younger counterparts. Although the current study results indicate that unreported fires are a much more frequent event than attended fires, the number of unattended fires might in fact be higher than 77.9%; as is possible that the number of unattended fires was underestimated.

Further evidence of the possible effect of memory in reporting fires is shown in Figure 3. The numbers of fire experiences reported are highest for the most current years, while the number of fires reported tends to taper off dramatically prior to 1980. Considering 82% of participants interviewed were over the age of 29 years (see Table 1) it is surprising that the number of fire reported prior to 1980 is so little. It is possible that participants were more likely to remember more recent experiences, as shown in the rise of fires, particularly for unattended fires, after 1981 to 2005.

In addition there is likely to be an underestimation of unattended fires (in terms of an overall population) because not many interviewees were older adults. That is the sample was not representative of the population in terms of age. Females aged 80 years of age are over, and males 65 to 74 years, were unrepresented in the study sample (See Figure 1). Previous research has shown that for the elderly the risk of dying in a residential fire becomes even greater as their age increases, with the death rate is four times the average at age 85 years in the U.S. (U.S. Fire Administration, 1999) and ten times higher for persons aged 80 plus compared to the 20 to 39 year age group in the U.K. (Holborn, 2001). In taking into account that unattended fires in the current

study might have been underestimated the true percentage probably lies between the U.K. and U.S. figures.

Only 8.4% of those who reported having had a residential fire experience reported having more than one experience (See Table 5). This finding falls between that of that of the British Crime Survey 2001/02 sweep in which only 12% of respondents reported experiencing more than one domestic fire and the U.K. SEH survey in which 6% reported more than one fire. However, as discussed earlier, the BCS and SEH asked participants to report on the number of fire experiences they had experienced 12 months prior to the interview; whereas the current study asked for experiences spanning the adult life span. It is possible unattended fires (particularly minor fires) were under reported in the current study.

In addition, it should be noted that younger participants had less adult years to report on; hence reported less fire events merely because they have had less time to experience more than one fire compared to older participants. This phenomenon is evident when examining the age of the participant reporting the fire experience (See Table 5) as no participants under the age of 41 reported experiencing more than one residential fire.

Also a validity issue to consider when examining risk factors of the fires reported in the current study is the characteristics of the sample. As discussed earlier on there is a sex bias, as females are over-represented within the sample. Other biases in the sample can be seen with an over-representation of persons born in Australia, those with university level education, the unemployed, and renters. When considering such biases in terms of what is known from the available literature, including fatal fires and overall attended fires, results from the current study must be interpreted with caution. For example, previous studies show the rate of fatal fires increases as age increases; in contrast the current study results indicate that unattended

fires are commonly occurring in age groups younger than the elderly (See Table 13). However, there was an under-representation of females 80 years and older and males 65 to 74 years of age (See Figure 1); thus because less persons in this age group were interviewed, this might have resulted in an under-representation of fires occurring in the elderly group.

Another variable to examine with caution is that of sex, as more females made up the study sample compared to their incidence in the overall population. Although more females were found to have been involved in the start of an unattended fire (See Table 13), this might be because a disproportionate number of females were interviewed compared to males.

Such validity issues will need to be taken into account in the interpretation of the current study results, and where possible, risk ratios will be conducted in order to measure the extent of the difference between variables by calculating the probability of an event occurring in one group compared to another comparison group. For instance, females were involved in significantly more cooking fires than males (See Table 25) and were found to be involved in the start of 2.33 (70/30) as many cooking fire starts than males.

8.4 Calculating the mean annual probability of having a residential fire experience throughout a lifetime

Incident rates help form an understanding of whether a problem exists that society is unaware of, and the magnitude of the problem. Findings so far have highlighted that a substantial number of unattended fires are occurring in Australian homes; and to determine the full scope of this problem it would be of further help to calculate the overall likelihood of an occupant having such an experience.

In comparison to previous unattended fire studies which collected fire data for specific time periods (for example, 3 month and 12 month time frames) and then projected the results to the entire population to determine overall incident rates for the U.S. and U.K; the current study collected fire experiences spanning over a participant's adult years. Collecting such data allowed for a new calculation method to be applied in order to determine the mean annual probability of having a fire experience (either attended or unattended) within the study sample.

Using a specific formula (See 7.3 Calculating the mean annual probability of having a residential fire experience throughout a lifetime), the mean annual probability of experiencing a residential fire across all participants and all unattended fires and attended fires, was determined (See Table 6). Findings showed that, as would be expected, the mean annual probability of having an unattended fire experience (0.8 fires per 100 adult years) was higher than the probability of having an attended fire experience (0.37 fires per 100 adult years). Hence occupants have a much higher likelihood of experiencing a residential fire in their adult lifetime, in which the occupants of the fire effected dwelling is able to extinguish the fire themselves; while there is a smaller likelihood of experiencing a fire that requires fire service assistance to control that fire.

In addition, results showed that participants had approximately a 50% chance (0 .6 fires per 50 adult years) of experiencing either an attended or unattended residential fire within their adult lifetime. The finding that half the population is likely to experience a residential fire in their adult years, and that the fire is most likely to be unattended, draws attention to the need for further investigation into such fire events. Furthermore, the high rate of unattended fires within the sample shows it is necessary to develop preventative interventions in order to decrease the incidence of these hazardous fire events.

8.5 Involvement of interviewed participant, where fire event occurred, and their memory of the event

Before examining the residential fire experiences more closely, information about the interviewed participants is considered (See Table 7). Results show that of those interviewed participants who reported a residential fire experience, the largest share were responsible for both the start and extinguishment of the fire (37/104= 35.6%), with a slightly smaller number of participants (26.9%) being involved in only the fire's extinguishment. Only 8.6% of participants reported being responsible for the start of the fire, but not the extinguishment of the fire; meaning that either fire services or someone else in the household extinguished the fire. These findings indicate that in most cases the person responsible for the fire start has managed to extinguish the fire themselves.

In the majority of fire cases the residential fire was experienced in the home of the participant interviewed (83.6%). It makes sense that participants are experiencing the majority of fire events in their own homes (rather than experiencing an event in somebody else's home as a visitor), as occupants generally spend a greater amount of time in their own dwellings than they would visiting.

Results also show that the more recently reported fire events are rated as being more reliable (See Figure 5). As time goes on it is possible some aspects of the fire event might have been forgotten or inaccurately recalled.

8.6 Unattended fire risk factors compared to the literature

The risk factors for unattended fires will be examined in terms of environmental and dwelling characteristics, room of fire origin and ignition sources, and occupant characteristics.

8.6.1 Environmental and dwelling characteristics

Results of the current study showed that the vast majority of unattended residential fires (90.1%) occurred within residential structures (indoors) (See Table 8). Compared to overseas unattended fire data, results from the current study fall in-between that of the U.S. and U.K. findings; in which 96.6% of residential fires occurred inside of U.S. dwellings (U.S Consumer Product Safety Commission, 1985) and in the U.K. findings from the SEH (2004/05) estimated that 89% of all domestic fires occurred inside the house. Findings of the current study indicate that only a small number of unattended fires are occurring in the yard surrounding the dwelling, and the problem of unattended fires is most often inside the home.

Results also show that for unattended fires the vast majority (88.9%) occurred within houses, compared to a smaller percentage occurring in flat/ units and apartment buildings (11.1%). However, participants living in houses were overrepresented in the study sample, which might account for the greater number of fires reported in houses. Therefore, generalization of this result to the overall population is limited and a comparison to Australian data for fatal fires and overseas unattended fire data is not valid.

The AFAC (2005) study found that fatal fires in Australia most often occurred in properties that were classified as owner-occupied (76%), with only 13% of fatalities occurring in rental properties, and 11% occurring in

public housing. The current study results found a higher number of fires (38.2%) occurred in rental properties and slightly lower number (62.8%) occurred on owner occupied properties, compared to fatal fire data. However, once again the sample was not representative of the overall population in terms of property ownership as renters were overrepresented which may explain why a higher number of unattended fires were found to occur on rented properties compared with fatal fire data. Therefore the comparison may not be valid.

8.6.2 Ignition sources/ Room of fire origin

8.6.2.1 Ignition sources

To date, the leading cause of unattended fires in Australia has remained unknown. However results from the current study have shown that, in line with findings from the U.S. and U.K., cooking is the leading cause of all unattended residential fires in a Victorian sample. In the U.S. cooking related fires made up 78% of unattended fires (U.S Consumer Product Safety Commission) and in the U.K. over half of all unattended fires (53%) were caused by accidents while cooking (Office of Deputy Prime Minister: London, 2006). The percentage of cooking fires in the current study lies between the U.S. and U.K. percentage; of the 81 unattended fires in which the cause of the fire was known, cooking fires made up 70.3% of all fires.

Distantly following cooking fires, the second and third leading cause of unattended fires was found to be heating fires and fires caused by children playing; making up only 6.2% of all fires each. Similarly, one U.K. study (BCS 2001/02) showed that the second leading cause of unattended fires was heating appliance related (inclusive of chimneys), which caused 9% of all fires. In contrast, results were different to that of the U.S. in which unreported

fires involving electrical wiring (6%) were found to be a distant second to cooking fires; and the U.K. SEH results that the second leading cause was also electrical equipment or wiring (11%). In the current study fires starting due to overheating or faulty electrical equipment or electrical overload ranked fourth in the leading causes of all unattended fire starts. Ranking equally with electrical fires were fires caused by petrol (when used for cleaning purposes or fueling a fire), candle fires and smoking fires (at 3.6% each).

The current study results also highlight that in Australia, similar to overall attended fires, in which cooking is the leading cause (SGIO, 2004), unattended cooking fires are also a problem. Considering that attended fires only make up a small proportion of fires in comparison to unattended fires, the current research results show that the cooking fire problem is even larger than previously thought and perhaps requires increased preventative measures.

In examining the unattended cooking fires more closely, results of the current study show that leaving cooking unsupervised (67%) was the leading cause of all cooking fires (See Table 9); followed distantly by cooking fires starting due to fat build up in cooking equipment (8.7%) and oil spilling on a operating gas stove (7%). These results cannot be compared with the unattended fire data from the U.K. because although cooking fires were the leading cause, further details regarding the cause of the cooking fires were not collected by the BCS (2001/02). In addition, results are not comparable to the U.S. unattended fire data, because the cause of the cooking fires were classified as being due to 'careless behaviour' with no further specification on the types of careless behviours involved (U.S. Consumer Product Safety Commission, 1985).

A comparison can also be made between the leading causes of unattended cooking fires and overall attended cooking fires. In Australia it is

unclear how many attended cooking fires start due to cooking being left unsupervised; however, results of unattended fires can be compared to that of overall attended fires in the U.S.. Current study findings show that in comparison to attended cooking fires in the U.S. (in which statistics by the United States Fire Administration, (2005) showed that of all attended cooking fires 30% were due to leaving cooking unsupervised); more than double the U.S. figure (67%) of unattended cooking fires started due to cooking left unsupervised. If it can be assumed that the U.S. attended fire figures can be generalized to Australia, it appears that when an occupant is faced with a cooking fire that starts because food was left unsupervised, they are most often able to control that fire themselves before the fire reaches the stage where fire brigade intervention is required.

In the current study of unattended cooking fires the location of the person responsible for ignition was also investigated. Results showed that in the vast majority of cases the person was in another room of the home or was located in the same room as the fire. Only in a small number of cases (12.3%) was the person outside the home (but still on the property). In comparison to attended cooking fires in New Zealand, Key Research and Marketing Ltd (1998) found the majority of cooks were in another room of the house or off the property altogether; with only 16% still in the room of ignition (the kitchen). Hence, in unattended fire cases the cook is usually located closer to the ignition point, compared to overall attended cooking fires (when assuming New Zealand data can be generalized to Australia). Being closer to the fire means the occupant may become aware of the fire faster (before the fire grows bigger) and therefore the occupant is more able to control the fire without assistance from the fire brigade.

In the current study the reason for cooks leaving their cooking unattended was also examined. Results showed that common distractions were the television and attending children. However, the reason for leaving

the cooking unsupervised was only given for a small number of participants (17 out of 38).

8.6.2.2 Room of fire origin

As would be expected, because the leading cause of unattended fires was cooking it is no surprise that the largest proportion of all unattended fires started in the kitchen (See Table 10). One of the major differences that can be observed here is that the common rooms in which fatal fires start are in locations in which persons in the room are likely to be sleeping. Compared to attended fires, the current results show the majority of fires are occurring in a location in which people are most likely to be awake; the kitchen area. In fatal fires in which the victim is sleeping at the time of a fire it is harder for that victim to react to the fire if not aware of that fire (in which the fire has a chance to grow in size before it is noticed). It therefore makes sense that fires which are successfully controlled by the occupant are occurring most often in a location in which the person is more likely to be awake at the time and hence able to react more quickly to that fire. In addition, it may also be more likely that occupants in another room at the time of a kitchen fire are still awake and aware, given that the majority of unattended fires are occurring during the day time hours.

8.6.2.3 Equipment involved

In line with the current study finding that the leading cause of unattended residential fires is cooking, of all unattended fires the equipment involved in the vast majority of cases was 'equipment used in cooking' (72.5%) (See Table 11). In addition of the unattended fires involving 'cooking equipment' the stove made up the largest proportion of all cooking

equipment involved in the fire start. This finding is similar to that of overall attended fires, in which the stove is the leading appliance involved in the start of cooking fires in the U.S. and New Zealand (US Fire Administration, 2005; Hall 2006; Key Research & Marketing Ltd, 1998).

The current study further examined the type of cooking that was being carried out on the stove at the time of the fire (see Figure 11). Findings show that of all stove fires, in the vast majority of cases (72.3%) a frying pan was being used at the time of the fire, followed by boiling pots which were involved in 21.3% of fires. Results are similar to that of Key Research and Marketing Ltd (1998) who found that out of 51 attended cooking related fires in New Zealand, the majority (64%) were due to frying, followed by boiling (35%). Frying fires have also been shown to be a problem in the U.K. in which chip or fat pan fires made up 30% of all attended cooking fires (Hall, 2006). Thus, like attended cooking fires overseas, unattended cooking fires are most often starting with the use of fry pans. This may be because frying is a common method of cooking, the fry pan is unconfined and open compared to an oven in which the heat is enclosed and oil and fat are highly flammable.

Additionally, current study results showed that for unattended fire cases, distantly following cooking equipment fires (at 6.2% each) was fires involving heating equipment, household appliances, and decorative and festive items. It is also no surprise heating equipment appears second, as heating fires ranked second in terms of the leading causes of unattended residential fires.

In examining the heating equipment fires more closely, although based on a small number of cases, open fire places were involved most the time, making up 3 of the 5 cases, followed by potbelly heaters and wood heaters (involved in 2 of 5 fires). There was no case in which a gas heater was involved. This finding is in line with that of fatal fires in that central heating

and associated equipment (hot piping and hot air ducts) were not the main equipments involved for heating fires cases. This is showing that heating systems with an open flame are more hazardous in the home than ducted heating systems.

8.6.2.4 Materials first ignited

In line with the finding that most fires are caused by cooking and the majority begin in the kitchen; results also show that in the vast majority of unattended fires the material first ignited is usually fats and food products; making up 58% of all materials first ignited (See Table 12). Of fats and food products, oil is ignited in the majority of fires (52.4%), followed by food products (20.6%). This coincides with the fact that the fry pan is most often the equipment involved, in which oil is regularly used to cook foods on such equipment. Similarly, the U.S Consumer Product Safety Commission showed that of unattended fires 'cooking materials' tended to be the material first ignited (in 76% of instances) and of cooking materials, usually food or grease was first ignited. In addition, results are similar to that of overall attended cooking fires, in which fats and oils have been found to be most often ignited first in cooking fires in the U.S. (US Fire Admin, 2005) and New Zealand findings (Key Research & Marketing Ltd, 1998). Such results highlight the hazardous nature of oil as an ignition factor (especially if left unsupervised).

In terms of the overall materials first ignited in fatal fires, because most fatal fires are caused by smoking and usually begin in the bedroom or living area; the materials usually first ignited are upholstered furniture and bedding (U.S. Topical research Series, 2005 Residential Smoking). In contrast, the current study found that of all materials initially ignited in unattended fires, furniture, fabrics, wood and paper were few. For instance, for unattended fires there was only one case where furniture was ignited and in no cases was

bedding ignited. Such results are in line with the fact that there were very few unattended smoking fires reported in the current study. These findings show that in unattended fires the materials first ignited imply more distance between the ignition source and the person involved in the fire start, whereas in fatal fires materials are those that are likely to be close to a victim's body.

8.6.2.5 Season

In examining unattended fires, an even number of fires was reported to have occurred during winter and summer (17 fires respectively 35.4%). There were 9 (18.7%) fires reported for autumn and 5 (10.4%) for spring (See Table 19). Such results are similar to that found for all attended cooking fires, with research generally showing that there is no seasonal trend for cooking fires. In contrast, the seasonal pattern for unattended fires in the current database is different to that of fires in which there are fatalities (where incidence rates usually increase in winter). This difference might be due to the fact that for unattended fires the majority of fires are cooking related; an activity that occurs constantly throughout the year. Whereas heating systems obviously increases during winter time and decreases during summer, leading to more fatal fires in the colder months.

In interpreting the frequency patterns found for season, it should be kept in mind that results was reported based on retrospective memory of the event. The small number of fires reported in autumn and spring might be under reported as participants might have based their memory of the event simply on whether it was cold or hot at the time. For example, a participant might have reported having a fire in winter because they remember the weather being colder, however it might have actually been autumn at the time. The same may apply for summer. This might explain the lower percentages in these months as past research finds generally equal number of fires in every season except for winter.

8.6.2.6 Time of day

Of 74 unattended residential fires, data shows that the majority of fires occurred during the daytime hours from 8.00 am to no later than 8.00pm (See Table 19). In addition, there was a peak in the number of fires occurring during 4:00pm- 7.00pm, in which almost half of all unattended fires (47.3%) occurred. The second peak was during 12.00-3.00pm, in which 31% of unattended fires occurred. Considering that the majority of unreported fires were cooking fires it makes sense that there the largest proportion of fires occurred during dinner time and lunch time.

In comparing these findings to that of fire data in which fatalities have occurred there is an clear difference in the time of day non-fatal fires are occurring; as research in Australia and overseas repeatedly shows that fatal fires occur most often during the nighttime hours in which occupants are more likely to be asleep (Brennan, 1999). Whereas the majority of unattended fires in the current database are occurring during day time hours in which occupants are likely to be awake and active and thus more able to deal with the fire.

In addition research has shown that the severity of the fire also coincides with the time the fires occur. Ducic and Ghezzo (1980) found that minor fires (defined as not considerable property damage) were generally more common between 1.00pm and 7.00pm, whereas the more serious fires (causing considerable damage) occurred more frequently between 7.01pm and 1:00am hours. Current study results show that for most fires occurring during the daytime hours (8.00am to 8.00pm) the flame damage did not spread past the object or past part of the room (See Figure 12).

8.7 Occupant characteristics

8.7.1 Age of person responsible for fire start

Fire fatality data examines the age of the victims dying in residential fires to determine which groups are most at risk in society. The current study, however, sought to investigate the age and sex of those involved in non-fatal unattended residential fires; in which an injury might or might not have been sustained by the occupant involved (See Table 13). Within the study sample it was important to determine whether certain groups in society are at more risk of experiencing an unattended residential fire because although there might not have been an injury sustained there certainly was some degree of damage as a result of the fire (the current study definition of a fire states there had to have been some degree of property damage).

For the current study age data was examined via the following categories including; children under 5 years of age and the elderly 65 and over (so that data would be comparable to fires in which there are fatalities), older children and teens (6-17), young adults (18-30), middle aged adults (31-50) and older adults (51-64). For the unattended fires results show that the highest proportion of those responsible for starting the fire were females aged 31 to 50 years of age (36.6%) followed by females 18 to 30 years of age (21.8%) and females aged 51 to 64 years and over (6/78=7.7%) (See Table 13). In comparison to fire fatality data (in which the very young and very old are most at risk), the current results show that those most at risk of experiencing an unattended residential fire are the middle aged and young adults. However, when interpreting these results it should be taken into consideration that fires started by children might be slightly underrepresented, as participants were asked to report only on fire experiences in their adult years.

Only a small number of elderly females (3.8%) and males 65 years and over (2.5%) had been responsible for an unattended fire start. However due to sampling bias these findings cannot be generalized to the overall population; hence risk ratios were conducted.

Because cooking fires were the leading cause of all fires, the groups were divided into those that had experienced an unattended cooking fire and those who had experienced a non-cooking fire. Chi-Square analyses were conducted for the demographics of the person who started a cooking fire and those responsible for the start of a non-cooking fire. When age was examined for those 64 years and younger versus 65 years and older, results were not valid due to a low cell count resulting from the small number of elderly persons in the sample. Age was therefore re-grouped into 50 years and younger and 51 years. Results showed that there was a significant association between the age of the person and whether they were responsible for the start of a cooking fire. Persons aged 50 years and younger were significantly more often responsible for the start of a cooking fire than those 51 years and older. Person 50 and under were 2.1 times more often involved in the start of a cooking fire than those 51 plus years (See Table 25).

Although the very young and elderly make up the largest proportion of those killed in fatal fires, current findings show they do not make up the largest proportion of those starting unattended fires within the sample. This might indicate that when the elderly do experience a fire it is more likely to be an attended fire than one in which they are successfully able to extinguish the fire themselves without outside need for assistance.

In comparison, middle aged adults and young adults are not represented as a high risk group for fire fatality; however results show that this is not because they are not experiencing fires, as they are still in fact involved in starting fires. The difference is that these experiences are

unattended because either the occupant themselves or another in the household was able to extinguish the fire without outside need for assistance.

8.7.2 Sex

For decades, it has been found that the victims of residential fires are more often male than female (Early & Hanzlick, 1987; Miller, 2005; Mierley & Baker, 1983; Reynolds, 2004; & U.S. Topical research Series, 2002 Fatal Fires). The only exception seems to be that females are at higher risk of death when considering persons over 65 years of age; and this is because there is usually a greater number of females making up the population in this age group.
In contrast to that of fatal fire data, results from the current database (see Table 13) show that for unattended fires the majority of occupants responsible for the fire start were female (74.3%), compared to a smaller number of males responsible for ignition (25.7%). However, this may be due to the fact that the current study sample was skewed towards females; thus relative risk analysis was conducted between those had a cooking fire and those who experienced a non-cooking fire. There was a significant association found between the sex of the person and whether they were responsible for the start of a cooking fire (See Table 25). Females were significantly more often responsible for the start of a cooking fire than males within the sample. Females were 2.33 times more often involved in the start of a cooking fire than males. Females might have had a higher probability of being involved in start a cooking fire than males because women engage in the activity of cooking more than men. In addition while females are engaging in the activity of cooking they might also be more often responsible for the supervision of children (especially young and middle aged women).

8.7.3 Family structure

In examining the family structure of those usually living in the fire affected dwelling (See Table 16) it is interesting to note that for unattended fires the highest proportion of households experiencing a fire were those in which children were living. The fact that a large percentage of fire affected households was comprised of homes with children living in the household, combined with the leading cause being unattended cooking fires suggests that perhaps children are providing a distraction for leaving cooking unattended.

8.7.4 Age and sex of the person who extinguished the fire

For unattended fires the age ad sex of the persons extinguishing the fire will be examined. Results show (see Figures 8 & 9) that for unattended fires the highest proportion of those responsible for extinguishing the fire was females aged 31 to 50 years of age, followed by males 31 to 50 years of age and females 18 to 30 years of age. When compared to the age and sex of those most often starting an unattended fire, results differ slightly as the groups most often starting the fire were females aged 31- 50 years of age followed by females 18 -30 years of age and females 51 to 64 years of age.

In addition findings indicate that in most cases the person responsible for starting the fire has also extinguished that fire, and for those who did not extinguish the fire somebody else in the household did. Although the dominant groups responsible for starting the unattended fire were females 31-50 years of age (29.9%), followed by females 18-30 years of age (20.6%), a lesser percentage in these groups were responsible for putting the fire out. Yet a higher percentage of males who started fire were involved in the extinguishment of the fire. Results show that although most women who start

fire are also extinguishing the fire, in some cases they are aided by another in the household, which is usually a male person. For example only 4 males aged 31 to 50 were responsible for starting an unattended fire, however 13 males in this age group were responsible for extinguishing an unattended fire.

There were three females and two males over 65 who were responsible for starting an unattended fire in the current study, however of the five cases only two managed to put the fire out themselves; indicating that like some instances in other age groups, somebody in the home is present to extinguish the fire for them. Thus having another person in the household at the time of the fire may reduce the risk of the fire becoming more serious, and with fatal fires, the risk increases when the elderly person lives on their own.

8.7.5 Cultural background and working status

Data on cultural background and the occupation type and education level at the time of the fire event was only collected for the participant who completed a Fire Safety and Awareness Interview Schedule. Of those interviewed 46 participants reported having had a fire in which they personally were involved in the start of that fire (See Table 7). Therefore the cultural background and occupation type of those occupants involved in the start of either an attended or unattended fire could only be analyzed for the 46 cases (See Table 21).

A previous fire fatality study conducted by the Australasian Fire Authorities Council (2005) found that of the fire deaths in Australia during 1996 to 2004 no occupation type dominated the victims. Findings from the current study show that of those responsible for the fire start there was a fairly even number of persons with Type B (34.6%), Type C (23%), and Type D (34.6%) occupations, with only 7.7% of those responsible had a Type A

occupation. Although the current results indicates that less persons working in a Type A occupation (including Senior Management & Professionals), are experiencing less fires, Type A occupations are heavily underrepresented (See Table 2) in the sample for Melbourne, which might be the reason for this finding.

Results also showed that most persons responsible for the residential fire start were employed at the time of the fire event (56.5%). While 41.3% of those responsible for the fire start were not in the labor force (including the retired, students, and stay at home mothers), and only one person was unemployed at the time of the fire (2.2%). This finding is a contrast to that of fatal fires in Australia in which fire fatality victims were more often not working at the time of their death. However, the current study results are based on only 47 cases only (information on the cultural background and occupation of the fire starter was not collected for the other fire cases) and further research is required to determine whether occupation and working status are risk factors in being involved in the start of a non-fatal fire that is either attended or unattended.

Results also show that of those responsible for the fire start the majority was born in Australia (73%). Research studies from the U.S. and New Zealand have found that there tends to be an overrepresentation of ethnic minorities in regards to residential fire injury and death. However, findings from Australia for July 1996 to the 30th of June 2004 showed that in regards to ethnicity AFAC found no particular ethnic group made up more fatalities than another. However such findings are indicative only, as the studies from overseas did not specify whether ethnic minorities were native-born or immigrants. The current study shows that persons born overseas are not experiencing the most residential fires. However it should be kept in mind that persons born overseas were underrepresented in the study sample.

8.7.6 Alcohol and fire risk

Results from the current study show that of all the residential fire experiences reported, alcohol was involved in very few cases. For unattended fires 5.3% (4/75) of cases alcohol was consumed by those present at the fire affected dwelling (See Table 18). For attended fires in only 4.5% (1/22) of cases alcohol was consumed by those present at the fire affected dwelling. In comparison to fatal fires, which research tends to show that a large number of victims are intoxicated at the time of the fire; in the vast majority of non-fatal residential fires the persons involved are not under the influence of alcohol at the time of the fire. This is possibly another reason why the occupant is able to extinguish an unattended fire successfully, as the majority are not intoxicated at the time and have more control over their behaviours and better reaction times. However, it should be noted that the survey relied on self-report and interviewees might have claimed not to have been under the influence of alcohol at the time of the fire to aviod coming across as irrisponsible.

8.8 Injuries

In only 9.6% of fire cases (in 3 attended and 7 unattended fires) was an injury reported (See Table 17). In 8.6% (7/81) of unattended fire cases an injury was reported, and in nearly all cases (6 of 7) the injury occurred as a result of a cooking fire. As cooking fires are the leading cause of fires, there is therefore more opportunity for an injury to be sustained. For unattended fires in most cases the person sustained the injury while fighting the fire.

Because of the relatively small number of injuries sustained as a result of cooking fires, findings indicate that occupants are generally more able to fight the fire without sustaining injury; as the majority of cases in which the fire was controlled by the occupant no injury was sustained (in 94.5% of cases).

However, when an injury is sustained, the injury is likely to be serious enough to warrant a visit to a local doctor or hospital (4 of 6). This reaffirms the importance of addressing unattended fires. In addition, cooking fires should be prevented earlier in adulthood (by changing the cook's behaviour) before persons reach an age in which they cannot deal effectively with the fire (perhaps becoming more likely to sustain an injury, or die from such injuries).

8.9 Fire cues

Findings from the current study (See Table 15) show that for unattended fires the person responsible for the fire start was most often alerted to the fire first. In addition, the majority of persons responsible for the fire start were alerted via seeing flames. The remaining fire cues were based on sensory abilities to detect a change in the environment; as the second most common method of being alerted was from smelling the fire, followed by verbal warning from another person. In only a small number of cases a smoke alarm was responsible for alerting occupants to the fire. Results therefore indicate that for unattended fires, the person who started the fire or someone else in the household who extinguished the fire were able to recognize one or more fire cues before the fire advanced to the point where a smoke alarm was activated and/ or they were unable to deal with the situation themselves.

In addition, the number of persons being alerted to the fire via a warning from another person at the scene relates to the risk factor of living

alone. Of all unattended fires, in only 4.9% of fires (4 cases) was the person living in the fire affected dwelling living alone (See Table 16). This finding shows that in the majority of unattended fire cases the occupant experiencing the fire is not living alone. Also considering that in a number of cases a person was warned of a fire via a verbal warning from another (18.9%) results do indicate that support networks in the household have lead to the early extinguishment of fires. Adding to risk of many elderly persons living alone who become fatalities is that they have no help in either the prevention or handling of an emergency situation (The United States Fire Administration, 1999).

8.10 Size of fire and insurance claims

For unattended fires (See Table 23) in the majority of cases (51.5%) the flame damage caused by the fire was confined to the object involved in the fire (for example, damage was confined to the pan or heater). Results show that while unattended fires are causing damage, the damage is less likely to spread beyond part of a room because the occupants have generally reached the fire at an early stage and were therefore able to extinguish the fire themselves without the need for assistance from the fire brigade. In the majority of unattended fire cases the smoke damage was 2.0-6.0 meters. Out of 81 unattended fire cases, in 5 instances (6.2%) an insurance claim was made for the damage caused by the fire, however in 4 of the 5 the participant could not remember the amount that was claimed.

8.11 Smoke detectors

Results of the current study show that in just over half (52.2%) of all attended fire cases no smoke alarm was present or an un-functional smoke alarm was present (see Table 20). In comparison, for unattended fire cases only 27.6% of dwellings had no smoke alarm present at the time of the fire. In other words the occupants experiencing the more serious fires (that result in fire brigade attendance) were least likely to own a functional smoke alarm.

Figure 12 shows that the fires reported before the year 1981 the fire affected household tended not to have a smoke alarm installed. Although smoke alarms were available since the 1920's, it was not until the mid 1970's that the need for smoke alarms was publicized by fire departments. Results also show more smoke alarms reported present in homes following 1981. This rise in smoke alarm ownership coincides with the regulation changes regarding the devices installation in Australia. In June 1993 the installation of smoke alarms in new homes became mandatory in Victoria 1997, and Victoria introduced yet another regulation stating that existing homes built before August 1997 must also be equipped with smoke alarms (Refer to Study Two: **Smoke alarm history and current law**). However, it should be noted that there were less fire experiences reported pre 1981 which might also account for less smoke alarms being reported during that time period.

8.12 Extinction of the fire

The main methods of extinguishment used by occupants was either to move the burning object (to either the sink or floor of the home, or to move the object outdoors) or to smother the fire (See Table 24). Of those who moved the burning object, it is a concern that in a number of instances the fire was extinguished via dangerous actions. For example of those who moved a

burning object, in 10 of the 27 cases the occupant moved the burning pan to the sink before either dousing with water, covering the fire in flour, or smothering the fire with a fire blanket. What is more of concern is that in three cases the occupant flung the pan straight to the floor, which could have been hazardous not only for injury, but also fire spread. In six further cases a burning pan was moved from the kitchen to outdoors.

According to the N.S.W. Fire Brigade (2002) occupants should never move a burning object and should not touch or move a burning pan or pot because hot oil ignites quickly (N.S.W. Fire Brigade, 2007). Considering the N.S.W. fire brigade advises that pans of hot or burning oil should never be carried through the house as this can lead to serious injuries, results of this study are of concern. Occupants are advised to turn the stove off and cover with a lid or a wet cloth or fire blanket and leave to cool down and occupants should never use water on an oil/ fat fire (N.S.W. Fire Brigade, 2007).

In addition, in a number of cases water and/or flour were used to smoother a cooking fire; two very hazardous methods of cooking fire extinguishment. The use of water on cooking fires is dangerous as any splashing may lead to the spread of fire via the ignition of surrounding combustibles. In addition, the use of flour to extinguish a cooking fire is also highly hazardous as an explosion could occur due to flour particles igniting.

Because of the high number of cooking fires occurring and because some occupants are engaging in incorrect methods of extinguishing such cooking fires it is suggested that occupants should be encouraged to keep a fire blanket in their kitchen (in an areas of easy access, but not too close to the stove because if there are flames the blanket may be unreachable). In Australia the Metropolitan Fire Brigade suggests the use of fire blankets rather than extinguishers in the home, as people require training to correctly use extinguishers.

8.13 Perception of danger

In the current study participants were asked to rate their perception level physical danger, to themselves and others at the time of the fire, and in reflecting back on the fire experience (See Figure 10 & 11). Results show that there is not a great change in participants' perception of the level of physical danger to themselves and others at the time of the fire and in reflecting back on the fire experience, for both attended and unattended fires.

For those perceiving the danger as low at the time of the fire, and low when reflecting back on the fire event, it is unlikely they will change hazardous behaviour if they feel the fire event was not threatening and fairly insignificant.

Hazardous habitual behaviours pose a significant risk factor (Miller, 2005); and in the context of fire such behaviours include leaving cooking unattended, placing heaters too close to flammable sources, misuse of heating appliances and excessive alcohol consumption; behaviours which a person might not perceive to be hazardous or problematic. It is for this reason the author suggest that further studies on cognitive processes supporting habitual processes should be carried out, especially with individuals from a low socio-economic background.

8.14 Summary of findings: Cooking fires and how to prevent them

In the analysis of unattended fires it is clear that cooking fires are a huge problem within Australia. From the findings already discussed above results indicate that the vast majority of unattended fires are caused by cooking on the stove left unsupervised by the cook; in which oil or food generally is the first material ignited. Although cooking habits may have changed over the years most cooking fires reported involved the stove, a common cooking appliance utilized in earlier decades and more recent decades.

Overall, results indicate that the majority of unattended fires are occurring during the hours in which occupants are most likely to be awake and active, and tend to show peaks around dinner and lunch time (in line with the leading cause of unattended fires being cooking fires).

In addition the profile of the cook most often involved in unattended cooking fire start is females under 50 years of age, who are most often distracted while in the kitchen, or are outside of the kitchen (but still within the dwelling) at the time of the fire. Households with children are especially at risk.

The flame damage caused by unattended fires is usually confined to the object only, in some cases damage extends to part of the fire affected room. The rate of injuries occurring as a result of unattended cooking fires was very low.

It is usually the person responsible for the unattended fire that is alerted to the fire first, and in the vast majority of cases they are alerted by seeing flames. Of concern is that the most common method of extinguishment for all fires was to move the burning object (especially in cases where a pan on

fire was flung to the floor), a dangerous method advised against by the fire brigade.

Because cooking fires are hazardous it is important to target prevention interventions, particularly aimed towards young and middle aged adults. In addition, because results show that many occupants are dealing with the minor cooking fires themselves it is important to educate people on how to safely and effectively fight a cooking fire should one occur. Considering that the correct method of extinguishing a cooking fire is to smother with a fire blanket or lid, fire blankets in kitchens are a solution in case fire does occur.

8.15 Development of an interview schedule

The use of a survey was an effective means of gathering detailed information on attended and unattended residential fires. The survey methodology allowed for the statistical analysis of all fire types, rather than being constricted to using medical records of those injured, or fire brigade records alone.

The developed survey is not limited to collecting data on domestic fires only, and can be utilized to investigate recreational fires, (e.g., camping) or workplace fires. Although workplace fires and recreational fires were not elaborated upon due to limitations in the scope and size of the project, future research may investigate such fires with use of the developed survey.

The data collected in the present study can be used as a basis to build up a larger database which would have a number of beneficial future uses. Not only can the database be used to determine a mean probability of having a fire experience, but could also be used to collect data for specific time frames. This would allow for further estimates to be made regarding incident

rates for unattended fires in Australia for such periods. With regular data collection the fire rate can be monitored to determine whether preventative measures are having an effect.

Furthermore, the development instrument can be used to collect unattended home fire data internationally and be used for cross-cultural comparisons.

8.16 Study limitations

There were a number of limitations in the use of The Fire Safety Awareness and Experience Questionnaire. The survey was quite long to complete for those participants who had a fire experience, particularly if they had more that one fire. In some cases participants were happy to answer the demographic questions, and to state they had had a fire experience, but were not willing to spend more time discussing the experience (occurred in 3 cases). In other cases some details were not given or missed during the interview if a participant was in a rush. However to cut down the survey further would have limited the amount detail obtained- details necessary to understanding the person's fire experience and to examine risk factors. To address this limitation participants were asked how many experiences they had had, and were told they did not have to talk about all of them if they did not wish to.

In addition, because participants were asked to report any fire experiences since the age of 18, older participants were required to think back over an extensive period of time. Memory decay problems might have lead to the under reporting of some fires, particularly minor events. However, a probing technique was implemented to help in memory recall (discussed in the methodology).

Another issue to highlight is that the survey relied on self-report from participants. There may have been certain questions answered by the participant in order to portray themselves, or their group, in a more favorable light (ie. social desirability bias). For example, interviewees might have claimed not to have been under the influence of alcohol at the time of the fire to aviod coming across as irrisponsible.

The validity of the conclusions of this study would be improved with a larger, more representative sample size. However, it is important to note that this project is a starting point to collecting data that currently does not exist in Australia, and the developed questionnaire could be used again nationally and internationally.

8.17 Future research

The current study in which data was collected from 498 participants shows potential trends. Further studies would add to the database to examine these trends further, perhaps even in different Australian states for a better understanding of those most at risk of experiencing an unattended residential fire. It is also important to further investigate how unattended fires are being extinguished, as the current data indicates that, especially in terms of cooking fires, occupants are not always carrying out the correct actions to extinguish the fire and perhaps the community needs to be reminded of correct procedures.

8.18 Conclusions

In conclusion, the findings from this study indicate a large proportion of fires occurring within Australian homes are unattended and 70% of these are cooking fires. More research on unattended fires involving a larger, more representative sample is needed to gain a better understanding of the overall nature of fire risk. The survey methodology is successful for research in this area and provides valuable detail for identifying risk factors.

CHAPTER 9. SMOKE ALARMS & MAINTENANCE PROCEDURES

Numerous researchers have found that the risk of becoming a fatality in a residential fire is higher when smoke alarms are not present (e.g., Ahrens, 2007; Reynolds, 2004) and that this risk can be substantially reduced by installing and maintaining a smoke alarm (Marshall, Runyan, Bangdiwala, Linzer, Sacks & Butts, 1998; & NFPA, 2005). Many countries have introduced legislation in which smoke alarm installation in residential dwellings is mandatory. Regulations may differ between countries in regards to who is responsible for the installation of detectors; for instance in rented dwellings either the owner or occupier may be responsible for ensuring their home is equipped with a functioning alarm.

9.1 Smoke alarm history and current law

Smoke alarms have been available as early as the 1920's; however it was not until the mid 1970's that the need for such devices was publicized by fire departments, insurance firms, and other groups within America (Giffen, Haro, Lethto, & Papastavrou, 1996). By 1975 the U.S. Building Officials and Code Administrators International (BOCA) building code was revised so that it became a requirement to install smoke alarms (protecting bedroom areas) in all one, two, and multi-family dwellings (McLoughlin, Marchone, Hanger, German, & Baker, 1985).

The Building Code of Australia (BCA) was also amended to make the installation of smoke alarms in new homes mandatory. Such BCA changes were implemented in Victoria in June 1993, with most other states introducing a similar requirement in November 1994. A national requirement was introduced in the BCA in 1996 (ABS, 2000). Not long after the changes, in 1997 Victoria introduced yet another regulation stating that existing homes built

before August 1997 must also be equipped with smoke alarms. South Australia adopted the same law in 1999 (Allianz, 2007). It was not until the 1st of May 2006 that NSW joined South Australia and Victoria in making smoke alarms a legal requirement in all residential dwellings; and in July 2007, Queensland also implemented such laws. According to this law it is an offence not to have smoke alarms installed in every storey of all homes and other shared accommodation buildings where people sleep. Additionally, it is an offence to interfere with or remove a smoke alarm unless for the purpose of maintenance or replacement (Signature Security, 2006).

There are a number of risk reduction activities that are generally promoted to the public in relation to the smoke alarm requirements. The first is the installation of the device(s), with the correct number of alarms and correct placement of alarms in the home. The second involves maintenance actions to reduce risk, including the periodic testing of alarms, cleaning of alarms, and changing the alarm batteries. The strategies used to encourage such actions include the local law (as discussed above) and reminders to test detectors and replace batteries (McKnight, Struttmann, & Mays 1995). Such strategies are conveyed to the public through public information and education campaigns that are usually conducted by fire departments, hospital burn units, health departments, and other agencies (McKnight, Struttmann, & Mays 1995).

9.1.1 Australian installation requirements

According to the Building Code Australia, smoke alarm requirements apply to the following building types: houses and townhouses, apartments and blocks of flats, residencies above shops and caretaker flats, and re-locatable homes (such as caravans) (NSW Government Department of Planning, 2006). In addition, it is the home owner's responsibility to make

sure smoke alarms are installed in their residencies. An owner is not required to install an alarm if their dwelling already contains one or more alarms that are in good working order and are in the correct locations (NSW Government Department of Planning, 2006).

Any alarm that complies with the Australian Standard AS 3786- 1993 may be installed. The alarm may be battery powered (9 volt batteries or long life 9volt lithium batteries) or hardwired (powered from homes main electricity supply) (NSW Government Department of Planning, 2006). Battery operated alarms are inexpensive and can be easily installed by the home owner without professional assistance. Hardwired alarms, on the other hand, need to be installed by a licensed professional. In most states elderly residents can call for assistance from local fire brigades to aid in alarm installation.

The regulations state that the number of smoke alarms to be installed depends on the size and layout of the dwelling; but generally smoke alarms should be installed in every corridor or hallway associated with a bedroom. If there is no corridor or hallway the alarm should be located in the area between bedrooms and rest of home (NSW Government Department of Planning, 2006). When possible, smoke alarms should not be placed near cooking appliances or bathrooms to reduce the likelihood of experiencing false alarms (burnt toast and steam from a bathroom might trigger the device). In cases where false alarms continue to sound the device should be moved to another location.

The smoke alarm requirements generally rely on community support for implementation of this legislation (NSW Government Department of Planning, 2006). If smoke alarm requirements are not adhered to a fine may be issued, however the regulations do not include inspection powers.

9.2 Maintenance of smoke alarms

Smoke alarm regulations do not stipulate how to carry out maintenance on the device. However, if the device is not maintained the alarm could cease to work; and the regulations do state the alarm must be functional (NSW Government Department of Planning, 2006). There are three main maintenance routines required; testing the alarm, changing batteries, and cleaning the alarm.

The alarm should be tested each week to ensure the battery and sounder are in working order (Metropolitan Fire Brigade, 2004). Smoke alarms can be tested by pressing the test button which triggers the alarm, if that alarm is functioning. Smoke alarms can also be tested by using artificial smoke. The occupant of the dwelling is responsible for the regular testing of the alarm.

Smoke alarm batteries should be changed yearly. In Australia, public information campaigns are used remind people to change their smoke alarm batteries when they change their clocks at the commencement or end of daylight saving time (MFB, 2004). Smoke alarms will usually emit a warning sound when the batteries need to be replaced (NSW Government Department of Planning, 2006). In contrast to 9volt batteries, lithium batteries are also avaliable and can power smoke alarms for about 7 to 10 years, lasting the life time of the alarm (alarms should be replaced by a new unit every 10 years) (Queensland Fire & Rescue Service, 2006). Removable batteries in hardwired smoke alarms powered by 240 volts also require annual battery changes (AFAC, 2006). In Australia, the responsibility for the annual replacement of batteries in smoke alarms is the owner in owner occupied dwellings, and in rental properties, the landlord.

In addition to regular testing, and annual batteries changes, smoke alarm should be cleaned monthly with a vacuum cleaner to remove dust build up that might effect smoke alarm performance (AFAC, 2006).

9.3 The effect of legislation on alarm ownership rates

As expected, since the implementation of smoke alarm legislation a steep rise in alarm ownership rates has been noted in the U.S. and Australia. For example, it was estimated that in the 1970's only 5% of U.S. households had installed detectors, compared with approximately 93% in 1993 (Giffen, Haro, Lethto & Papastavrou, 1996). For Melbourne, Victoria, the Australian Bureau of Statistics (1999) found that from October 1992 to October 1998 the proportion of households with smoke detectors rose from 32% to 84%.

9.4 Methodology used to determine smoke alarm ownership rates

Researchers (e.g., Harvey, Sacks, Ryan & Bender, 1998; & British Crime Survey 2001/02) have conducted numerous studies to determine smoke alarm ownership rates in particular areas. Survey methodology is generally used to collect such information; usually telephone interviews are carried out. For example, in the U.S. the Center of Disease Control and Prevention conducted a national random telephone survey (the Injury Control & Risk Survey) to collect a wide variety of injury and risk data from 5238 households residing in 50 states and the District of Columbia in 1994. From this data Harvey, Sacks, Ryan and Bender (1998) determined the proportion of homes with installed smoke alarms on the same floor as the occupants' bedrooms. Findings uncovered that the majority (91%) of surveyed households reported the presence of at least one installed smoke alarm on the same level of their homes as their sleeping area.

Similarly, in Britain, random telephone surveys (the British Crime Survey 2001/02) were conducted to collect information from respondents regarding the level of smoke alarm ownership in domestic properties. In total 76% of respondents stated they currently had a working smoke alarm in their home**,** a further 6% stated they had a smoke alarm fitted in their home but it was not currently working, and 18% had no alarm fitted.

In Australia in 2001, the Sweeny Research Group carried out a telephone survey of 1110 people in an investigation on attitudes and experiences of fires in the home (AAMI, 2002)**.** Data was collected on fire experiences and smoke alarm ownership. Participants included persons living in NSW, Victoria, the Australian Capital Territory, South Australia, Queensland, and Tasmania. Results showed that in 2001 81% of homes surveyed had at least one smoke alarm, with the typical Australian home having 1.8 smoke alarms. In terms of individual states South Australians lead the nation in ownership of smoke alarms (98% fitted detectors), in comparison to NSW which had the lowest percentage of fitted homes (67%). Ownership rates from 2001 data were also compared to that of 2000 data. Results showed that smoke alarm ownership fell in every state in 2001, except in Tasmania (rising from 82% to 91%). For the state of Victoria a 3% drop was noted, with 97% fitted in 2000, compared to 94% in 2001.

Although the results from telephone surveys appear to show high smoke alarm ownership rates, telephone survey data may not be representative of the overall population. In fact results from telephone surveys might show an overestimation of ownership rates, as those without telephones are excluded from the sample, and may be the occupants most likely not to own an alarm. For example, Douglas, Mallonee, and Istre (1999) conducted both a random telephone survey and a retrospective random household survey, in order to determine the validity of using phone surveys.

The surveys were used to determine the proportion of homes with functioning smoke alarms in a low income area (with a high rate of residential fire related injuries) in Oklahoma City. The telephone survey was conducted in February 1990 with 927 participants. Results of the phone survey showed 71% of households reported having functional smoke alarms; 18% did not have alarm; 9% did not know if the alarm was working; 2% said it did not work. Firefighters then carried out a household survey with 1413 randomly selected one and two family homes in August 1990. Results from the household survey showed that 66% reported having functioning alarms. Overall, self reported rates of functioning smoke alarms differed significantly between the telephone and household surveys (71% vs. 66%). The finding that a higher percentage of households reporting ownership in telephone survey, compared to ownership rates reported in home visits may be due to sampling bias by telephone surveys; as of the homes visited 16% (230/1413) did not have a telephone. It is likely the telephone survey overestimated the proportion of homes with functional alarms as the exclusion of those without telephones lead to a lower survey coverage of blacks, the poor, and the unemployed; the population less likely to have alarms.

9.5 Reasons for non-ownership

A number of studies have asked occupants who report that they do not own an alarm the reason for non-ownership. For instance, results from a survey conduced by the Center of Disease Control (CDC) in 1985, uncovered that of the 23.7% of 435 occupants in DaKalb County Georgia, United States who did not own a smoke alarm; the most common reasons given were: “keep forgetting/ putting off (51.5%)”, “not interested/ never thought about it (37.8%)”, “not my responsibility (24%)” and “cost (15.8%)”.

Similarly, British Crime Survey (2001/02) results showed one of the most common reasons for non-ownership was that the respondent simply "had not got around to it", or "kept forgetting to buy one" (23%). Another equally common reason for lack of an installed alarm was that the participant felt they and their family were not at risk of fire (24%).

In line with U.S. and British findings, in Australia the main reason given for non ownership, in a survey conducted by the Australian Bureau of Statistics (ABS) in October 1996, was 'having not got around to it' (47%). However this study was conducted in 1996, and although the national requirement had been introduced at this time (requiring all new homes have installed detectors) at this stage homes already built were not yet mandated to install alarms (ABS, 1998). This might explain the complacent attitude towards installation. Without the law as a driving force people may have been much more relaxed about not owning an alarm and not stringently ensuring installation of a device in their home.

A general theme in the above studies mentioned is that the most common reasons for non-ownership indicate a lack of interest and perhaps a sense of complacency regarding non-ownership. According to the Center of Disease Control (1985) a person's attitude to the importance of smoke detector ownership was related to prevalence, as households in which the respondent believed smoke detectors save lives were over twice as likely as other households to own smoke detectors (77.9 compared with 33.3%).

9.6 Does owning a smoke alarm mean it's in working order?

Although results from surveys show quite high smoke alarm prevalence rates in the U.S. and Australia, the presence of a smoke alarm does not necessarily mean that it is in working order. A number of studies have conducted home inspections to personally test alarms to determine their working status, or have requested the participant test their alarm while on the phone (preceding a telephone interview). Most of these studies have uncovered that occupants may own an alarm, but a substantial percentage of owned detectors are not in working order.

For instance, in 1985 the Center of Disease Control (CDC) conducted a country wide random digit dialing telephone survey which was followed by a home inspection in order to determine smoke alarm ownership and functionality. Interviews were conducted with 435 occupants in private residencies in DaKalb County Georgia, United States. Results from the survey indicated that reported smoke alarm ownership was 76.3%, with nearly 5% (15/332) of these owned detectors reportedly not yet installed. Following the completion of the phone survey a non-random home inspection follow up was conducted with 10.6% of the original respondents. Results from the inspections uncovered that nearly 30% of owners had non-functioning smoke detectors, although they reported having an installed detector in their home.

A similar result was uncovered in 1992 when Neily, Smith and Shapiro (1994) conducted in-home interviews followed by alarm testing. The smoke detector operability survey was carried out with 1,012 house holds from October 1 to December 23, 1992. A sample of 40 US postal zip codes were used for interviewing respondents in a primary sample, and in a sample of lower socioeconomic status households. In addition to the interview information gathered, the researchers tested each smoke detector with standard aerosol smoke and with the test button. Results revealed the 88% of

households had one or more smoke detectors; when these alarms were tested only 75% of installed detectors responded to the test; hence 25% of smoke alarms were found to be inoperable.

Douglas, Mallonee, and Istre (1999), discovered a 17% disparity between reported and tested functional status in their household survey of 1413 randomly selected one and two family homes in August 1990. Results from the household survey showed that 66% of occupants reported having functioning alarms; however when the alarms were tested, the number dropped to 49%.

Sharp and Carter (1992) also uncovered inconsistency between number of alarms and number of working alarms while conducting a study to measure the prevalence of smoke detectors among welfare recipients. One hundred and nine black women residing in inner-city Memphis, who were receiving aid for families with dependent children, were interviewed and their homes were inspected for functional smoke detectors. Forty of the 109 homes (36.7%) did not have smoke detectors. Of the 69 smoke detectors tested 17.4% did not work. According to the authors, respondents who said they had checked their detectors to see if they worked were significantly more likely to have functional smoke detectors, and 95 percent of participants with detectors were able to check them correctly.

9.7 Estimating the number of smoke alarms in working order based on maintenance behaviours

The Economic and Statistical Research group (2003) estimated the working order of alarms based on the maintenance behaviours of smoke alarm owners. In November 2003 the office of Economic and Statistical Research group conducted a telephone survey of 3300 respondents within

various regions across Queensland, in order to gather information from households on a variety of topics (including fire related issues). Findings showed that approximately four-fifths (80.2%) of households in Queensland had smoke detectors installed in their homes. In order to determine whether the reported alarms were functional or not researchers asked occupants whether they had done any maintenance on their detector/s. In an attempt to gain more accurate data on the working function of installed alarms, researchers regarded the alarm as in working condition if the respondent reported testing, vacuuming, or cleaning the alarm, or if they replaced the unit's battery or replaced the entire unit, in the last 12 months preceding the survey. Based on this information an estimated 72% of Queensland households were deemed to have an operational smoke alarm or detector. However such results must be viewed cautiously as these behaviours are based on self-report and may not be entirely accurate and such positive maintenance behaviours might be overestimated. In addition, results must be interpreted bearing in mind that poorer communities (without a telephone) may not be accounted for within the population.

9.8 Reasons for non-functioning alarms

Research studies typically show that the most common reasons why smoke alarms are not in working order is because the batteries are either missing, flat, or have been disconnected. Maintenance problems have been found in studies as early as 1985, for example McLoughlin, Marchone, Hanger, German, and Baker (1985) found that of 651 households inspected, in which there were 1028 smoke detectors, 863 (84%) sounded an alarm when tested. Among the battery powered detectors which were not functional 32% had no batteries, 51% had dead batteries and 17% had other problems.

A number of studies have investigated the reasons for non-functioning alarms in particular groups within the population; those with a low socio-economic status. For instance, Mickalide and Validzic, (1999) investigated the effectiveness of smoke alarm installation in low income homes across America. A total of 595 smoke alarms were installed in homes; 500 of these devices were tested 6 months later. The authors found that of the 84 (17%) which were non-functional most had missing or dead batteries or had been disabled. There were no cases found in which the alarm was malfunctioning because of dirt/ dust or insects. The follow up testing of alarms in this study was conducted not long after installation, and a substantial number of alarms were already not in working order. Therefore it could be expected that an even higher number of alarms might not be working over time. This study highlights the importance of placing alarms where nuisance activations are minimized to prevent battery disablement. Malfunction due to dust was not found, however the short period from installation to testing might not provide adequate time for the alarm to become dirty enough to be effected by dust partials.

Another study also investigated the long term functional status of smoke detectors distributed to high-risk households in eight areas of Minnesota, Cherokee County (North Carolina) and Oklahoma City (Oklahoma) (Shults, Sacks, Briske, Dickey, Kinde, Mallonee, & Douglas, 1998). In comparison to the work of Mickalide and Validzic, (1999) who conducted home visits after a 6 month period, home visits were conducted to check smoke detectors that were distributed 3 to 4 years previously. As expected, over a longer period of time between installation and the home visit an even greater number of alarms were found to be non-functional. The percentage of evaluation households with at least one working detector ranged from 58% in Oklahoma to 73% in North Carolina. In those households in which detectors were not working, in 73% of households the batteries were either missing or disconnected. When researchers replaced the batteries of such alarms 83%

regained function. The authors concluded that future programs should consider distributing detectors that do not require yearly battery changes or find effective ways to ensure the batteries are routinely replaced.

For circumstances in which smoke alarms have missing or disconnected power supplies, some studies have asked the occupant why the alarm had no power. Neily, Smith, and Shapiro (1994) found that of the 25% of alarms determined as non-functional in conducted home visits, nearly 20% of them did not have functioning power sources. Five percent of detectors had dead batteries, and almost 15% had missing or disconnected batteries, or were disconnected from AC power supply. When the authors asked the owners (whose devices had missing or disconnected power) why the alarm had no power, nearly half either forgot to replace the battery or did not know why the detectors battery or power supply was missing or disconnected; only a small number (5%) of detectors were disconnected due to nuisance alarms.

Similarly, Sharp and Carter (1992) found nuisance alarms to not be a major reason for non working smoke alarms. Results showed that detector location and the occurrence of false alarms while cooking were not related to the detectors working status. The authors found a relatively high proportion of smoke detectors with battery problems and hence suggest that programs to encourage battery replacement are needed.

9.9 The occurrence of nuisance alarms

As previously mentioned Neily, Smith, and Shapiro (1994) found that only 5% of detectors were disconnected due to nuisance alarms. Despite this finding the authors did find that false alarms were a common occurrence for all respondents; 51% of the sample had reportedly experienced alarms when there was no fire. The most common reason alarms were set off when there

was no fire was due to 'cooking' (80%), followed by low batteries (20%), followed by steam from bathrooms (6%). The alarms cited by most of those who said the cause were low batteries were most likely the signal or chirp that the alarm produces when battery power is low; of concern is it appears the low battery signal or 'chirp' was misunderstood and considered a nuisance alarm in 20% of cases.

Similarly, a substantial number of false alarm experiences were found in a 2004 survey conducted for the NFPA. Results showed that 40% of respondents with smoke alarms reported that one had sounded at least once in the past 12 months (Ahrens, 2004). Reasons for the false activations were similar to that of Neily, Smith, and Shapiro's (1994) findings; cooking (69%) battery problems (13%), and steam (5%). False alarms are a problem as they have the potential to create a sense of complacency, which may become dangerous.

9.10 Hardwired vs. battery operated

Research indicates that hardwired smoke alarms are more likely to be working than battery operated alarms when in-home testing is conducted. For example, Neily, Smith and Shapiro (1994) found 84% of AC powered alarms were functional, compared to 69% of battery powered alarms.

McLoughlin, Marchone, Hanger, German, and Baker (1985) found similar results as 81% of 791 battery powered detectors were in working order, while 92% of 237 wired detectors were working. According to the authors since the study showed that wired detectors are more likely to be working than battery powered detectors, building codes should require that detectors be wired into the household current.

Although hardwired alarms are more likely to be working, the alarm may still become un-functional if battery and maintenance procedures are not conducted; as indicated by the 16% and 8% of non functional hardwired alarms mentioned in the above studies. The NFPA caution that even hard wired alarm batteries must be replaced in accordance to manufacturer's instructions, which is usually annually (NFPA, 2005). The NFPA also suggest that another good option is the 10 year extended life lithium battery operated device.

According to the NFPA most residential dwellings in U.S. have battery powered smoke alarms that are not interconnected (Dobson & Jones, 2005). In Australia, estimates from a survey conducted by the Australian Bureau of Statistics (ABS) in October 1996 also showed the vast majority of detectors were battery operated (92.3%).

9.11 Residential and occupant characteristics and smoke alarm ownership

For those that do not own an alarm, non ownership is not spread evenly across the population. Although legal requirements do play an important role in smoke alarm ownership rates, residential characteristics and occupant demographics also affect the ownership rates of smoke detectors.

9.11.1 Residential characteristics

Repeatedly research studies show that rented dwellings are less likely to have an installed smoke detector compared to owned dwellings. For instance, in the U.S. Miller, Reisinger, Blatter and Wucher, (1982) found a higher prevalence of properly installed and operational detectors in owned homes (55%) compared to rented units and houses (18%). The overall low

percentage of alarm ownership in this study may be because the study was carried out not long after smoke alarm laws were implemented. In addition, the sample of participants in this study was recruited from pediatric clinics in which half the sample was offered the option of purchasing an alarm during their clinic visit.

Not long after the above study the U.S Consumer Product Safety Commission (1985) found a similar result. Although ownership rates were still estimated to be low at an overall 62% (which is possibly a reflection of the year), the authors also found that home owners (66%) were more likely than renters (59%) to have an alarm installed.

In Australia more recent results show the same pattern. The Australian Bureau of Statistics (1999) found that in Victoria as a whole, rented dwellings were less likely to have smoke alarms installed. In October 1998, 80% of rented dwellings had smoke detectors, compared to 86% of dwellings owned or being purchased by the occupiers. Similarly, in 2003 the Office of Economic and Statistical Research conducted a survey of 3300 respondents within various regions across Queensland. The office found that publicly rented households (87.5%) and households owned or being purchased by the occupant (82%) were more likely to have smoke alarms or smoke detectors installed than privately rented households (72.6%).

Research also tends to show that the older the dwelling the less likely it is to have an installed smoke detector. In an early study by the Center of Disease Control (1985), the analysis of residential and demographic characteristics of survey respondents also revealed a number of interesting factors associated with detector ownership. Residential findings uncovered that in dwellings less than ten years old, 89.9% had smoke detectors compared with 71.8% in dwellings ten years or older.

Harvey, Sacks, Ryan and Bender (1998) found that of the residential characteristics analyzed, results showed that 97% of respondents living in homes built in 1980 or later reported that their homes had installed smoke alarms, compared to 90% of homes built before 1950. In addition, households in rural areas were less likely to have installed smoke alarms than urban households (86% vs. 93%, $P<0.001$).

In November 2003 the office of Economic and Statistical Research found that Queensland homes built after 1997 were more likely to have an operational smoke alarm or detector (82.4%) than those built before 1997 (70.2%).

From these studies it appears that renters are either less likely to purchase a smoke alarm as they do not own the home (and therefore do not wish to spend money on improvements), or the owners of rented dwellings are not installing working alarms (as they should be). It should be kept in mind however, that NSW and Queensland had not yet implemented laws requiring existing dwellings to be equipped with an alarm; which might have lead landlords to be less likely to install at the time of the study. This might also explain why older homes in Queensland were more likely to be without alarms in 2003 (laws were not implemented until 2007). Another factor linked to renting and age of dwellings is the occupant's socio-economic status; poorer people may not own their own homes and might be more likely to live in older structures. For example the British Crime Survey (2001/02) found that smoke alarm in households in the following property type were less likely to have a working alarm: dwellings in fair (67%) or poor (63%) physical condition and privately rented accommodation (71%).

9.11.2 Occupant characteristics

Studies show that certain population sub-groups are less likely to own smoke alarms; namely households with lower incomes (McKnight, Struttmann, and Mays, 1995) and less education (Harvey, Sacks, Ryan & Bender, 1998; Sharp & Carter, 1992).

Harvey, Sacks, Ryan and Bender (1998) found level of education and household income related to alarm ownership. In dwellings in which no adults had graduated from high school 78% owned smoke detectors, in comparison to dwellings in which at least one occupant held a graduate degree 94% owned smoke detectors. In addition, the authors found that households which reported an income below the poverty line were less likely to own a detector that those at or above the poverty level (82% vs. 93%, $P<0.001$). Similarly, Shaw, McCormick, Kustra, Ruddy, and Casey, (1988) found that those who owned smoke detectors were more educated, had higher incomes, were most likely to own larger homes, and less likely to live in public housing.

In contrast to the association of low income and decreased smoke alarm ownership, occupant age has generally been shown to be not significantly associated with smoke alarm ownership (Center of Disease Control, 1986; McKnight, Struttmann & Mays, 1995). However, a survey conducted in NSW Australia in 2002 showed that a significantly greater proportion of people aged 35 to 44 years (77.1%) reported owning an installed detector compared with the overall state population (Center for Epidemiology & Research, 2005).

9.12 Rational for the current project

It is important to collect data for Australia which investigates not only alarm ownership rate, but that also considers the maintenance behaviours of those who own alarms; as previous research indicates that although an alarm might be installed in a household it might not be in working order. It is also vital to know whether Australian occupants are knowledgeable about how to maintain their smoke alarms appropriately.

9.13 Study two aims

The first aim is to determine the smoke detector ownership rate in an Australian sample. The second aim is to determine whether correct and regular maintenance behaviours are being carried out by those occupants who own a detector.

CHAPTER 10. METHODOLOGY

Five hundred participants, recruited form four shopping centers located in Melbourne, Victoria completed the interview schedule. From the data collected a descriptive analysis was conducted investigating the maintenance behaviours being carried out by those occupants who own a smoke detector.

The Fire Safety Awareness and Experience Interview Schedule was developed and consisted of four separate interview schedules. The first schedule, the demographic schedule, was the standard survey which all participants completed (see Appendix C). The survey collected information on whether the participant had experienced a fire, their current demographics, and smoke alarm maintenance information.

The smoke alarms and maintenance questions consisted of seven items (item 4 to 10) which included questions about the presence of smoke alarms in residential dwellings (which are compulsory), and respondent's knowledge on correct maintenance procedures, and their behaviour in carrying out these procedures in the home.

For a more detailed description of the methodology procedure please refer back to the Study One method section.

CHAPTER 11. RESULTS

11.1 Smoke alarm ownership

Table 26 shows whether a smoke alarm was reported as owned, and the type and number of alarms owned.

Table 26

Frequency (& %) statistics for self-reported smoke alarm ownership and type (N=499)

Variable	n	
Own Alarm		
Yes	477	(96.5%)
No	17	(3.5%)
Unknown	5	
Number Alarms Owned		
1	134	(29.3%)
2	185	(40.5%)
3	82	(17.9%)
4+	55	(12.0%)
Unkown	21	
Type Alarm Owned		
Battery Operated	344	(72.4%)
Hardwired	74	(15.5%)
Both Battery Op. & Hardwired	41	(8.6%)
Unsure	16	(3.3%)
Unknown	2	

The vast majority of participants stated that they owned a smoke alarm (477/494), compared to those who stated that they did not own an alarm (17/494). Most participants owned one or two smoke alarms (approximately two thirds of sample), while approximately one quarter of the sample owned three or more alarms.

Table 27 shows the reason for non ownership. Seven (of the total of 17) participants who did not own an alarm gave a response as to the reason why.

Table 27

Frequency statistics for reasons for non-Ownership (N=17)

Variable	n
Disconnected power supply due false alarms	2
Never got around to installing an alarm	2
Landlord has not installed an alarm	2
Not sure why	1
No response	10

11.2 Smoke alarm maintenance

Table 28 shows that, of those who own a smoke alarm, over three quarters stated that they change the batteries. A smaller percentage stated they do not change the alarm batteries (16.8%).

Table 28

Frequency statistics for smoke alarm maintenance: Battery changes (N=477)

Variable	n	
Change Battery?		
Yes	371	(77.9%)
No	80	(16.8%)
Just Moved In (not needed to yet)	6	(1.2%)
Unsure	19	(3.9%)
Unknown	1	
How Often		
When it Beeps	101	(27.2%)
Every Month	8	(2.1%)
Every 6 Months	80	(21.5%)
Once a Year	174	(46.9%)
Irregularly	8	(2.1%)

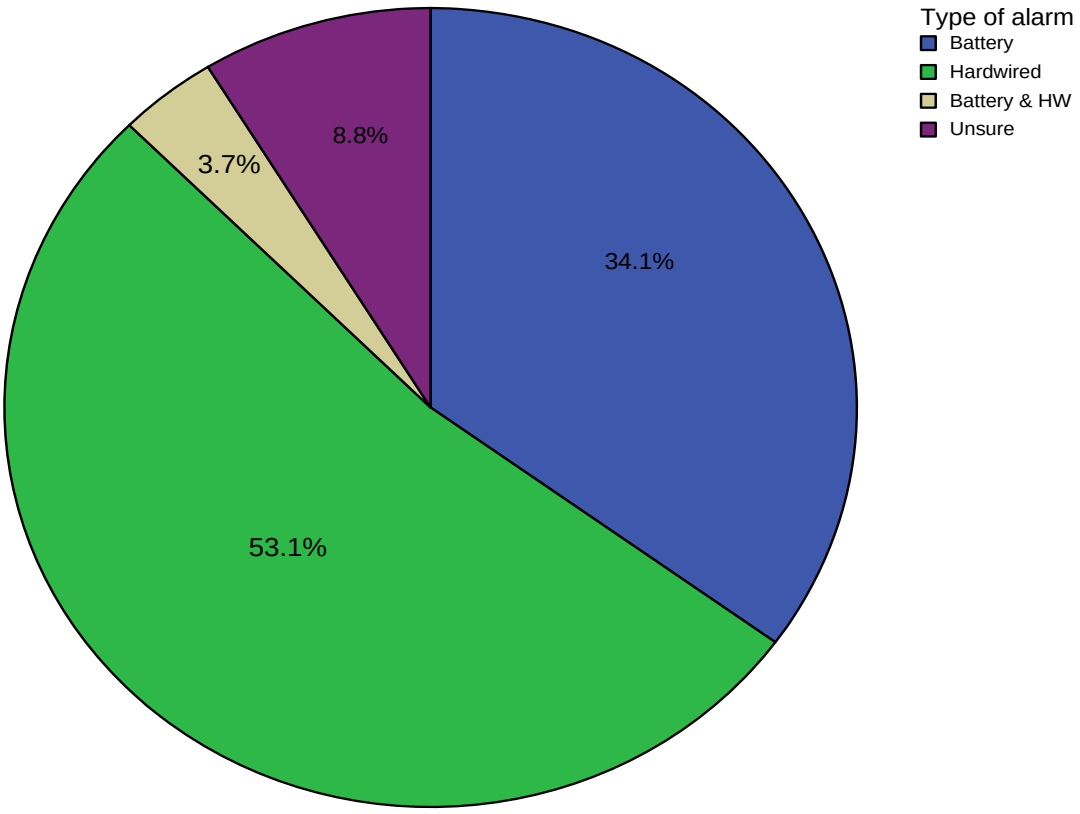

Figure 14.Type of alarm owned by occupants who do not change their batteries

Figure 14 shows that of 80 participants who report never changing their alarm batteries, over half owned hardwired detectors (53.1%), compared to (34.1%) who owned battery operated detectors.

Table 29 shows over half of those owning alarms stated that they test the devices. Three participants stated that they had just moved into their home and had not yet tested their alarm. Most persons test the alarm irregularly, only when they remember to do so. The majority of participants test the alarm by pressing the button on the device. A small portion of people believe that the alarm is 'tested' when it sounds due to cooking.

Table 29

Frequency statistics: Testing the alarm (N=477)

Variable	n	
Test Alarm?		
Yes	274	(62.2%)
No	166	(37.7%)
Just moved in (not needed to yet)	3	
Unsure	19	
Unknown	15	
If Yes How Often		
Daily	1	(.3%)
Weekly	12	(4.3%)
Every Month	58	(21.1%)
Every 6 Months	68	(24.8%)
Once a Year	59	(21.5%)
Irregularly	76	(27.7%)
If Yes Testing Method		
Press Button	213	(88.7%)
Burnt Toast/ Cooking	11	(4.5%)
Lighter/ Match	6	(2.5%)
Artificial Smoke	1	(0.4%)
Other	6	(2.5%)
Unsure	3	(1.2%)
Unknown	34	

Table 30 shows that the majority of participants stated that they do not clean their smoke alarms. Of those who do the most popular cleaning method was to wipe or dust the outside of the alarm.

Table 30

Frequency statistics: Cleaning (N=477)

Variable	n	
Clean Alarm?		
Yes	122	(27.8%)
No	316	(72.1%)
Just Moved In (not needed to yet)	5	
Unsure	26	
Unknown	8	
If Yes How Often		
Weekly	8	(6.5%)
Every Month	20	(16.3%)
Every 4 months	1	(0.8%)
Every 6 Months	20	(16.3%)
Once a Year	33	(27.0%)
Irregularly	40	(32.7%)
If Yes Cleaning Method		
Dust or Wipe Inside	31	(26.7%)
Dust or Wipe Outside	66	(56.8%)
Vacuum	18	(15.5%)
Soap & Water	1	(0.8%)
Unknown	6	

When age was categorized to decades results showed that all occupants aged 59 years and over reported owning smoke alarms (see Table 31). No specific demographic group stood out as having a greater number of persons not owning a smoke alarm.

11.3 Demographics & smoke alarm ownership

Table 31

Frequency statistics of person variables and smoke alarm ownership (N=494)

	Owns a Smoke Alarm?	
Variable	Yes	No
Age		
18-28	78 (92.8%)	6 (7.1%)
29-38	95 (95%)	5 (5%)
39-48	103 (98%)	2 (2%)
49-58	92 (97.8%)	2 (2.2%)
59-68	45 (100%)	0
69-78	35 (100%)	0
79-88	9 (100%)	0
Unknown	20	2
Education		
High School Not Completed	179 (98.9%)	2 (1.1%)
High School Complete	76 (90.5%)	8 (9.5%)
Apprentice	71 (97.3%)	2 (2.7%)
TAFE	125 (98.4%)	2 (1.6%)
University	16 (94.1%)	1 (5.8%)
Unknown	10	2
Workforce		
Employed	247 (95.3%)	12 (4.6%)
Unemployed	41 (93.2%)	3 (6.8%)
Not in Labor Force	146 (98.6%)	2 (1.3%)
Unknown	43	0
Cultural Background		
Country Born In		
Australia	354 (95.6%)	16 (4.3%)
Overseas	119 (99.1%)	1 (0.8%)
Unknown	4	0
Living Status		
Owner	305 (98.0%)	6 (1.9%)
Renter	123 (95.3%)	6 (4.6%)
Living Parents	49 (90.7%)	5 (9.3%)
Fire Experience		
Yes	107 (96.4%)	4 (3.6%)
No	370 (96.6%)	13 (4.4%)

Table 32 shows that there was a consistent number of persons not owning a smoke alarm living in houses and living in units, flats, or apartments.

Table 32

Frequency statistics of smoke alarm ownership and building type/ location (N=494)

	Owns a Smoke Alarm	
Variable	Yes	No
Building Type		
House	399 (96.3%)	15 (3.6%)
Unit/ Flat/ Apartment	65 (97%)	2 (3%)
Townhouse	12 (100%)	0
Caravan	1 (100%)	0
Area of Residency		
West Melb, Vic	47 (100%)	0
North West Melb, Vic	240 (96%)	10 (4%)
North Melb	49 (98%)	1 (2%)
North East Melb, Vic	107 (95.5%)	5 (54%)
Other Melbourne	17 (100%)	0
Regional Victoria	11 (100%)	0
Sydney	0	1 (100%)
Tasmania	2 (100%)	0
Unknown	4	0

11.4 Demographics & smoke alarm maintenance

Table 33 shows that a higher percentage of students and unemployed persons reportedly never change their alarm battery, compared to the employed, stay at home parents, and the retired. Results also show that the percentage of persons reportedly not changing their smoke alarms battery was fairly consistent across all groups of differing levels of education.

Table 33

Frequency statistics on smoke alarm owner demographics & battery changing behaviours (N=468)

Variable	Reported Frequency of Battery Changes			
	Correct time frame (yearly or sooner)	**Beeps**	**Irregularly**	**Never**
Education				
No Qualification	146 (59.3%)	52 (21.1%)	5 (2.0%)	43 (17.4%)
Year 11 or Below	109	30	4	31
Year 12 Completed	37	22	1	12
TAFE	38 (57.5%)	14 (21.2%)	1 (1.5%)	13 (19.6%)
University	27 (22.8%)	70 (59.3%)	0 (0.0%)	21 (17.7%)
Bachelor	26	69	0	21
Post-graduate	1	1	0	0
Apprentice	6 (46.1%)	6 (46.1%)	1 (7.6%)	1 (7.6%)
Employment Status				
Employed	149 (57.5%)	69 (22.6%)	3 (1.1%)	38 (14.6%)
Not Employed	24 (61.5%)	3 (7.6%)	1 (2.5%)	11 (28.2%)
Not in Labor Force				
Retired	45 (53.5%)	22 (26.1%)	3 (3.5%)	14 (16.6%)
Stay Home Mum	27 (69.2%)	4 (10.2%)	0	8 (20.5%)
Student	10 (55.5%)	2 (11.1%)	0	6 (33.3%)

Table 34 shows that the number of persons reportedly not testing their smoke alarms is fairly consistent across all groups in terms of employment status. In terms of education, only one person with an apprentice level education reported that they never test their smoke alarm; while a fairly equal number of people with no qualifications, TAFE qualifications, and university educated persons never test their smoke alarms.

Table 34

Frequency statistics of smoke alarm owner demographics & testing behaviours (N=456)

Variable	Reported Frequency of Testing Smoke Alarm				
	Correct time frame (weekly or sooner)	**Monthly t o 6 monthly**	**Yearly**	**Irregularly**	**Never**
Education					
No Qualification	9 (3.6%)	66 (26.9%)	25 (10.2%)	56 (22.8%)	89 (36.3%)
Year 11 or Below	8	45	16	39	65
Year 12 Completed	1	21	9	17	24
TAFE	0	23 (37.0%)	12 (19.3%)	7 (11.2%)	20 (32.2%)
University	3 (2.7%)	33 (29.7%)	20(18.0%)	12 (10.8%)	43 (38.7%)
Bachelor	3	31	20	12	43
Post-graduate	0	2	0	0	0
Apprentice	1 (6.2%)	2 (12.5%)	1 (6.2%)	1(6.2%)	11 (68.7%)
Employment Status					
Employed	2 (0.7%)	80 (31.2%)	35 (13.6%)	39 (15.2%)	100 (39.0%)
Not Employed	2 (5.2%)	8 (21.0%)	4 (10.5%)	6 (15.7%)	18 (47.3%)
Not in Labor Force					
Retired	6 (7.4%)	18 (22.2%)	11 (13.5%)	20 (24.6%)	26 (32.0%)
Stay Home Mum	1 (2.5%)	12 (30.7%)	7 (17.9%)	6 (15.3%)	13 (33.3%)
Student	0	3 (21.4%)	2 (14.2%)	3 (21.4%)	6 (42.8%)

Table 35 shows that across all groups (for both education level and employment status) the largest proportion of smoke alarm owners never clean their smoke alarms.

Table 35

Frequency statistics of smoke alarm owner demographics & cleaning behaviours (N= 461)

Variable	Reported Frequency of Cleaning a Smoke Alarm			
	Correct time frame (monthly or sooner)	**Yearly to 6 months**	**Irregularly**	**Never**
Education				
No Qualification	22 (9.1%)	28 (11.6%)	27 (11.2%)	163 (67.9%)
Year 11 or Below	17	22	20	109
Year 12 Completed	5	6	7	54
TAFE	2 (3.2%)	8 (13.1%)	3 (4.9%)	48 (78.6%)
University	4 (3.5%)	13 (11.6%)	10 (8.9%)	85 (75.8%)
Bachelor	4	12	9	84
Post-graduate	0	1	1	1
Apprentice	0	1 (6.6%)	0	14 (93.3)
Employment Status				
Employed	15 (5.9%)	37 (14.6%)	26 (10.3%)	174 (69.0%)
Not Employed	5 (12.5%)	3 (7.5%)	6 (15.0%)	26 (65.0%)
Not in Labor Force				
Retired	4 (4.9%)	8 (9.8%)	6 (7.4%)	63 (77.7%)
Stay Home Mum	4 (10.5%)	5 (13.1%)	1 (2.6%)	28 (73.6%)
Student	0	0	1 (6.2%)	15 (93.7%)

CHAPTER 12. DISUSSION

12.1 Ownership rates

Of the 493 participants interviewed, the vast majority (96.5%) stated that they owned a smoke alarm, compared to a very small percentage of participants who stated they did not own an alarm (3.5%). The finding that most occupants own detectors may be a result of the current laws governing alarm ownership and installation. Previous research studies of smoke alarm ownership tend to show an increasing percentage of ownership over the years, coinciding with such laws. As noted in the Introduction the ABS found a rise in alarm ownership in Victoria over a six year period (from October 1992 to October 1998) in which the proportion of Melbourne households with smoke detectors rose from 32% to 84%. Considering that the BAC regulations, that require alarms in all residential dwellings, were introduced in 1997 in Victoria, it is not surprising that by 2005 the large majority of occupants within the study sample were found to own detectors.

The Sweeny Research Group (2001) found in 2001 81% of homes surveyed had at least one smoke alarm. This finding represented all states in Australia, excluding Western Australia. In addition their findings indicated that for the state of Victoria a 3% drop was noted, with 97% fitted in 2000, compared to 94% in 2001. Compared to the Sweeny findings, ownership rates in the current study exceed that of the national rate for 2001, and were very similar to 2000 findings, in which 97% of Victorians owned alarms. Such high ownership rates found in a sample from Victoria may indicate the effectiveness of the introduced smoke alarms laws, as this state has had such a law for a substantial number of years (especially compared to states such as NSW and Queensland). In addition to the current smoke detector laws, the high percent of occupants owning alarms in Victoria could also be an effect of media campaigns and educational programs to promote alarm use.

Also similar to the Sweeny Research Group findings that the typical Australian home owns 1.8 smoke alarms, results from the current study show that most occupants (70%) own one or two smoke alarms. Whether the number of reportedly owned alarms was appropriate for the dwelling size; and whether the devices were correctly placed in occupant dwellings is unknown in the current study. As discussed in Section 9.1.1 the regulations state that in general alarms should be installed in every corridor or hallway associated to a bedroom and if there is no corridor or hallway, the alarm should be located in the area between bedrooms and the rest of the home. In future research studies regarding smoke alarm ownership it would be beneficial to ask occupants where their smoke alarm/s are located, and whether their home is a single story or double story home and perhaps the number of bedrooms within the dwelling.

12.2 Reasons for non-ownership

The percentage of non-ownership in this study was relatively low (17/494) at 3.5%; and although no solid conclusions can be drawn from the above responses, findings do give an indication that there is still a percentage (even though a small percentage) of occupants who are not adhering to the legislated requirements regarding alarm ownership. In addition, the reasons for non-ownership suggest that it is both home owners and landlords that might not be adhering to such laws. Although the results here are based on a very small number of participates (eight gave reasons for non-ownership), findings indicate that lack of an alarms might be due to a mixture of complacency and the effect of false alarms, and should be explored further in future research studies.

In the current study the answers for non-ownership (excluding the occupant who is deaf and uses other means of alarm appropriate to her needs) tend to point to a lack of interest and perhaps a sense of complacency towards alarm ownership. In the cases in which the detector was disconnected due to nuisance alarms, this may be due to occupants not being aware that they are required to move the alarm to another location in the dwelling under such circumstances. These results were similar to previous studies in which participants who did not own an alarm were asked why (Center of Disease Control, 1985, British Crime Survey, 2001/02; and ABS, 1996), the most common reasons for non-ownership tended to indicate a lack of interest and perhaps a sense of complacency. In such studies common responses for not installing the device were "keep forgetting" and "have not got around to it".

12.3 Limitations in determining ownership rates

Douglas, Mallonee, and Istre (1999) showed that the use of telephone surveys to determine alarm ownership may have validity limitations in that those of a lower socioeconomic status may be underrepresented (and are the persons more likely not to own an alarm). The current survey methodology utilized face-to-face interviews, which was an advantage compared to the use of telephone surveys as participants who might not own a telephone could be included in the sample. However, the use of a shopping complex sample does create other limitations, which have been discussed in Section 8.3.

As highlighted in Section 9.4 previous research indicates that occupants with low socioeconomic status, and those less educated, are most likely not to own a smoke detector. The current study did not find such a direct relationship; in fact those who did not complete high school had a very high rate of smoke alarm ownership. Moreover to be considered is that when Melbourne occupant characteristics were compared with current census data

from the Australian Bureau of Statistics results showed a slight over representation of more highly educated (university students/ graduates) and a under representation of those unemployed (indicating low income). Therefore the number of people owning alarms may be slightly overestimated.

In addition, it is the responsibility of the owner of the dwelling to ensure smoke alarm/s are installed in their residence and not following such regulations is against the law and attracts a fine. The reported ownership rates in the current study were quite high, however one must keep in mind that such findings are based on self-report. It is therefore possible that some occupants might have reported owning an alarm even if they do not, perhaps due to a reluctance to admit to not adhering to the law or looking irresponsible.

12.4 Are alarms in working order?

The finding that the vast majority of homes in this study were equipped with smoke alarms, though positive, does not mean the alarms are in working order. The face-to-face interviews in this study were conducted in shopping complexes and therefore testing of smoke alarms could not be conducted; and as discussed in the introduction, owning a smoke alarm dose not necessarily indicate that the device is in working order. In the studies reviewed in Section 9.6 a disparity of about 17- 30% was found between alarms owned and alarms in working order in the general population. Based on these previous studies, it is possible to estimate that of the 96.5% (477/494) alarms reportedly owned in the current study, only 66 -79% might be in working order.

The Economic and Statistical Research (2003) group estimated the working order of alarms reported as owned by occupants based on the maintenance behaviours of smoke alarm owners. The alarm was estimated to be functional if the respondent reported testing, vacuuming, or cleaning the alarm, or if they replaced the units battery or replaced the entire unit, in the last 12 months preceding the survey. If applying this notion to the following study results, the prevalence of functional smoke alarms is likely to be substantially lower than the number of owned smoke alarms; as 37.7% of occupants have reported never testing their alarm, 16.8% reportedly never changed their alarm batteries and 72.1% never cleaned their alarms. Based on this research it is estimated that the reduction of the number of smoke alarms in working order is approximately 17% - 38% in the current study; as those who never test their alarms or change their alarm batteries are probably the same group who do not own a functional alarm.

Although estimates can be made regarding the number of alarms in working order, follow up home visits to test alarms is the most accurate way to determine the functional status of owned alarms, and was not conducted in this study.

12.5 Maintenance behaviours

12.5.1 Testing of alarms

Results from this study show that although a high percentage of occupants report owning a smoke alarm, and although it is the responsibility of the occupant to test their alarm regularly, over one third of owners are not testing their alarms (37.7%). Of those who are testing their alarms three quarters are not doing so regularly enough, within the required minimum monthly time frame. It is therefore possible that the smoke alarms which are

not being tested might not be in working order as Sharp and Carter (1992) found that respondents who said they had checked their detectors to see if they worked were significantly more likely to have functional smoke detectors.

There was also found to be a smaller percentage of occupants who reported testing methods that could be dangerous, for example burning paper underneath the smoke alarm, or using matches or lighters, but these were in a small number of cases. These testing methods could be hazardous as the alarm or rest of the house could be set alight. The majority of occupants who test their alarms knew to press the button (88.7%). Artificial smoke was reportedly utilized in only one case.

According to correct smoke alarm maintenance procedures the alarm should be tested once per month. Responses to how often testing is conducted were fairly spread from monthly, to half yearly, to yearly, to irregularly. Although over half of occupants report testing their alarms, due to the variety of responses regarding how often the alarm is tested, results show that occupants might be confused as to how often testing should be conducted, or don't consider it important enough to do monthly.

It might also be likely that those who test their alarm in the correct time frame once monthly, weekly or daily (25.7%), might be more likely own alarms that are in working order, while the remaining 46.3% of occupants who test their alarms half yearly to yearly, and irregularly (27.7%), might be less likely to have an alarm in working order, as they do not test regularly enough to guarantee the status of the device.

12.5.2 Battery replacement

Of 80 occupants who reportedly never change their alarm batteries, most were those who own hardwired alarms (53.1%) compared to those who own battery operated alarms (34.1%). For those who reported never changing their alarm battery, when asked why, the majority stated that they did not need to change the battery because the alarm is hardwired. Another participant stated that he did not need to change the battery because his dogs would alert him in the event of a fire. One person reported the MFB change the alarm in her home. This finding shows that a number of occupants with hardwired alarms may not be aware that although the alarm has a direct power supply from their homes the battery still needs to be replaced on a regular basis.

Previous studies (e.g., Neily, Smith & Shapiro, 1994; McLoughlin, Marchone, Hanger, German & Baker, 1985) have shown that wired detectors are more likely to be working than battery powered detectors upon testing; however hardwired detectors were found to not always be in working order. If hardwired detectors are never tested and battery changes never carried out there is the possibility they may not be in working order. In addition results show a higher percentage of hardwired detectors are not having battery changes, compared to battery operated devices. Occupants living in new homes with hardwired detectors may be ignorant of the fact that hardwired detectors also need battery replacements (the Australian Standards require that smoke alarms that are hardwired have a backup battery). This might be a problem if the use of hardwired alarms appears to be increasing.

In October 1996 the Australian Bureau of Statistics (ABS) in October 1996 showed the vast majority of detectors were battery operated (92.3%). The current study findings show that most occupants own battery operated smoke

alarms (72.4%), followed by hardwired alarms (15.5%), followed by both battery and hardwired (8.6%). The findings of the current study (in which the percentage of battery operated alarms is decreased compared to ABS 1996 findings) may indicate that hardwired alarms are on the increase, as more new houses are built over the years the number of hardwired alarms is on the increase.

12.5.3 Cleaning

Despite the fact that smoke alarms should be cleaned once a year with a vacuum cleaner (to remove particles that might affect smoke alarm performance) only a one quarter of occupants who own an alarm clean the alarm. The majority of participants appear not to have knowledge that the alarm should be cleaned. When occupants were asked if they clean their alarm a common response was "I didn't know you had to clean it". In addition, of those that did report cleaning their alarms only small percentages are cleaning their alarm correctly, by vacuuming (15.5%). Over half of the occupants who clean their alarms reported dusting or wiping the outside of the alarm (56.8%) which may not be effective in removing dust inside the device which might interfere with the alarm's functional status. This indicates that many occupants are not knowledgeable on how to clean their alarm effectively, or that they must clean the alarm at all.

12.6 Occupant characteristics

The results of this study show that the occupants who do not own an alarm tend to be young and middle aged adults, as 7.1% of adults aged 18-28 do not own an alarm and 5% of those aged 29-38 are non-owners. Interestingly, all occupants aged 59 to 88 years of age reported owning an alarm. In comparison to the study conducted by the Center for Epidemiology

& Research, (2005) in which 22.9% of 35 to 44 year olds did not own a smoke alarm in 2002, of those in the current study in a similar age group (39-48 years) only 2% did not own alarms. However, current study results are based on a sample not representative of the population in terms of age (see Figure 1).

Of those who did not own an alarm, the unemployed had the highest percentage of non-ownership (3/41) at 6.8%, followed by employed persons (13/247) at 4.6% and those not in the labor force (2/146) at 1.35%. Although no known past studies have examined ownership in terms of 'unemployed' vs. 'employed', this result is in line with other studies which have found that lower socioeconomic status to be related to non-smoke alarm ownership.

The demographics of occupants who own a smoke alarm and their corresponding maintenance behaviours were also examined. Results showed that a higher percentage of students (33.3%) and unemployed persons (28.2%) reported that they 'never' change their alarm battery, compared with the employed, stay at home parents, and the retired (See Table 33). In addition, in terms of testing the alarm, once again a higher percentage of students (42.8%) and unemployed persons (47.3%) reportedly 'never' test their smoke alarms compared with other groups (See Table 34); and the vast majority of students reportedly 'never' clean their alarms.

Although these results indicate that a high percentages of students are not conducting smoke alarm maintenance procedures compared to other groups, this might be because students are more likely to be living at home with their parents. It is therefore possible that the head of the household (a parent) maintains the smoke alarm, rather than the student.

Results also showed that slightly more unemployed persons stated they do not test their alarm or change the batteries of their alarm compared to

the employed, stay at home parents, and the retired. Previous studies have shown that certain population sub-groups are less likely to own smoke alarms; in particular households with lower incomes (McKnight, Struttmann, and Mays, 1995). This is likely due to the fact poorer households may not be able to afford to purchase a smoke alarm; and this might also be a reason the unemployed may not be actively changing the alarm batteries due to the cost of having to do so if the alarm is not working.

It is important to recognize however that even though a slightly greater percentage of students and unemployed persons are not testing their alarms, when examining each group separately (the retired alone or the employed for example) the percentage of persons who never test their alarms make up the largest proportion within all groups. Similarly, within each group (no matter type of employment status) the largest proportions of occupants are not cleaning their alarms (See Table 35). This finding indicates that there is no one specific group within society that requires more information on correct smoke alarm testing and cleaning procedures, but rather the community as a whole should be targeted.

In terms of education level results showed that the percentage of persons reportedly not changing their smoke alarm batteries was fairly consistent across all groups (See Table 23); with the exception of apprentices (only one person of 14 reported never changing batteries in their alarm). Similar results were found for those who never test their alarm and who never clean their alarm (See Table 34 and 35). Apart from apprentices, the percentage of those not conducting such maintenance procedures was fairly consistent across all groups (whether university educated or no further qualifications). Apprentices (similar to students) might also be more likely to be living at home with their parents; hence a higher percentage reportedly never clean or test their smoke alarms because they might not be the head of the household (a parent might be responsible for this task).

To summarise, results indicate that apart from students (who might not be head of household and are living with their parents) the unemployed showed a higher percentage of occupants reported they do not change their alarm batteries, compared to the employed and those not in the labour force. Hence, support measures could be targeted at this group, particularly if the unemployed are unable to cover the cost of replacing alarm batteries on a yearly basis. However, when considering smoke alarm testing and cleaning maintenance procedures, there is no one group in particular that needs to be targeted, rather there is a need for the community as a whole to be educated in relation to the correct maintenance practices.

12.7 Future research

The current study found that a number of people are not aware that hard wired detectors require battery replacements. Perhaps in future alarm ownership studies it would be beneficial to ask a question whether hardwired detectors require battery changes or testing to uncover further the true understanding people who have of such devices. This is particularly important to know as more new houses are being installed with hardwired devices.

In addition, future research could also test knowledge such as whether the occupant realizes most alarms have 10 year lifespan and should be replaced thereafter, and whether occupants are aware of how long they have had their current alarm.

Other questions that should be incorporated into future studies include not only the number of alarms, but where they are positioned in the household. Also asking the age of the house will give an indication whether

older homes are still the ones more likely not to be equipped with an alarm. A wider study within Victoria with a greater sample number could also look to see if there is a difference between suburbs within Victoria that might or might not be related to SES. The current study could not analysis location due to small sample size.

12.8 Conclusions

Of the 493 participants interviewed, the vast majority stated that they owned a smoke alarm, compared to a very small percentage of participants who stated they did not own an alarm (3.5%). Most of the occupants interviewed reported owning one or two smoke alarms. Reasons given for non-ownership tended to imply a mixture of complacency and lack of interest; and should be explored further in future research studies. Results from this study show that although a high percentage of occupants reportedly own smoke alarms over one third of owners are not testing their alarms and of those who are testing their alarms three quarters are not doing so regularly enough. Seventeen percent of those occupants who own alarms never carry out battery changes. Results indicate that occupants with hardwired alarms may not be aware that although the alarm has a direct power supply from their homes the battery still may need replacing on a regular basis. Despite the fact that smoke alarms should be cleaned once a year with a vacuum cleaner only one quarter of occupants who own an alarm clean the alarm and even less use a vacuum cleaner. Due to overall poor maintenance procedures in regards to testing the alarm, battery changes, and cleaning the alarm, the number of units that are functional may be a great deal less that the number of alarms reported to be owned by occupants (17% never change their alarm battery and a further 38% of owners do not test their alarms).

CHAPTER 13. SUMMARY & FUTURE ISSUES

13.1 Summary of findings

This project included two studies: in the first study the aim was to develop the Fire Safety Awareness and Experience Interview Schedule and to determine whether the risk factors for attended fires (in which there are fatalities or injuries) are different to the risk factors of residential fires not attended to by the fire brigade. Additionally, the first study aimed to determine the incidence of unattended residential fires by retrospective report from adults since the age of 18. The second study aim was to determine whether correct and regular maintenance behaviours were being carried out by occupants who own a smoke alarm.

Findings from Study One showed that participants had approximately a 50% chance of experiencing either an attended or unattended residential fire within their adult lifetime; and the mean annual probability of having an unattended fire experience (0.8 fires per 100 adult years) was over twice as much as the probability of having an attended fire experience (0.37 fires per 100 adult years).

In addition, of all residential fires in which fire service attendance status was known, the vast majority of fires (78%) were unattended. Results also revealed the majority of unattended fires were caused when cooking was left unsupervised by the cook; and oil or food was usually the first material ignited. Of concern is the number of instances in which the unattended fire was extinguished via dangerous actions (i.e. moving the burning object to the sink or floor of the home). It is therefore important to educate people on how to safely fight a cooking fire, should one occur, and occupants should be encouraged to have a fire blanket in an accessible location in their kitchens.

Findings from Study Two revealed that the vast majority of the sample (96%) reported owning a smoke alarm. However, almost one quarter of owners are not testing their alarms and 17% are not carrying out battery changes.

13.2 Improvements to the overall structure of the questionnaire and items

Although the use of The Fire Safety Awareness and Experience Questionnaire was an effective means of gathering detailed information on attended and unattended residential fires, there were a number of limitations.

In terms of structure, the survey was quite long to complete for those participants who had a fire experience, particularly if they had more that one fire (as one questionnaire had to be completed for each fire). In some cases participants might have reported having had no fires to avoid completing the questionnaire. To address this limitation, future studies could ask participants to report the number of attended or unattended fires they had experienced, even if they do not wish to go into detail. This allows incident rates to still be calculated more accurately, with an overall number still reported rather than a false zero.

Because the survey was quite lengthy to complete it was important that the survey was easy for researchers to fill out (hence saving time and increasing the likelihood of participants giving detailed information regarding any fire experiences). To enhance the surveys ease of use, some questions (previously open-ended) were given tick box responses; thereby decreasing the survey's completion time. It is also important that the researcher is highly familiar with questionnaire items; so that if a participant explains their experience in a different order to the questions on the survey

there are no missed items (and information may be completed after the interview if required).

Another important issue to address relates to the structure of the demographic survey. Initially demographic items were the first questions presented to participants, followed by smoke alarm maintenance items. However, midway through data collection the survey was re-structured as to collect smoke alarm data first, then demographics. This change was made to help build a rapport with interviewee and so they understood what the survey asking of them before answering the more personal demographic questions.

Another issue to highlight is that the survey relied on self-report from participants. There may have been certain questions answered by the participant in order to portray themselves, or their group, in a more favorable light. For example, interviewees might have claimed not to have been under the influence of alcohol at the time of the fire to avoid coming across as irresponsible. Or interviewees might state they have a functioning smoke alarm installed in the home, because they know it is against the law not to. It is therefore important when conducting the survey that participants are assured that the information they give the researcher is confidential and names are not required.

Another interview schedule amendment involved the omission of a previously included question. A question item asked participants whether there was any drug use at the time of the fire. It was determined this question would not collect any valuable information as participants reaction to this question indicated discomfort to being asked. This possibly is related to the venue type used to collect data, shopping complexes, in which there was not much privacy (data collection methods discussed further in below).

In terms of Study Two questionnaire items, future data collection regarding smoke alarm installation and maintenance might benefit from gathering some additional data. The current study found that a number of people are not aware that hard wired detectors require battery replacements. Perhaps in future alarm ownership studies it would be beneficial to ask a question whether hardwired detectors require battery changes or testing to uncover further the true understanding people who have of such devices.

In addition, future research could also test knowledge such as whether the occupant realizes most alarms have 10 year lifespan and should be replaced thereafter, and whether occupants are aware of how long they have had their current alarm.

Other questions that should be incorporated into future studies include not only the number of alarms, but where they are positioned in the household. Also asking the age of the house will give an indication whether older homes are still the ones more likely not to be equipped with an alarm.

13.3 Future data collection methodologies

The current study results showed a relatively smaller probability for experiencing either an attended or unattended fire in Australia (0.6 fires per every 50 adult years), compared to the U.S. (7.8 fires per every 50 adult years) and U.K. findings (12.8 fires per every 50 adult years). The reason for this difference may be attributed to the difference in the definition of a fire event and memory decay.

The U.S. study, for instance, showed a substantially higher (6.3%) number of survey respondents who reported a fire experience, which is likely to be due to the broader nature of the type of fires collected. In the U.S. study the fire experiences requested from interviewees included fire events that

'could' have caused damage to property if left unchecked. Fires in which food ignited briefly but caused no damage might therefore have been included and hence lead to a higher number of unattended fires being reported within the sample, compared to the current study in which the fire had to have caused some damage.

The difference in fire probability may also be due to the fact that in the current study, some fires (particularly minor fires) were forgotten as participants were relying on retrospective memory. Because participants were asked to report any fire experiences since the age of 18, older participants were required to think back over an extensive period of time. Memory decay problems might have lead to the under reporting of some fires, particularly minor events. There are a number of ways to address this limitation.

When asking a participant to report on any fires they might have experienced it is important to probe the person and provide examples to elicit a person's memory of the event. For instance, if a participant initially states that they have not had a fire experience, probe for a second time and provide some examples (i.e. a cooking fire that blackened a pan, any small fires that contributed to an item smoldering in the home, a small camping fire, etc). Probing is particularly helpful, as minor fire events may be more easily forgotten or might not initially be recognized as a fire event by the participant (particularly if they felt they were in control of the fire).

Another issue regarding memory decay relates to the period of time (preceding the interview date) that participants are required to think back to, and thus report on, any fire experiences. The current study found that the probability of experiencing a fire of unattended or attended fires (0.6 fires per every 50 adult years) was comparatively smaller that the U.K and U.S. findings. In contrast to the U.S. and U.K. methodologies, asking participants for fire experiences occurring in the 3 to 12 months prior to the interview, the

current study required participants to report any fire they had experienced during their adult years. It is therefore possible that the number of fires were underreported due to the effect of memory decay. Further evidence of memory decay in the current study is evident in the graph (See Figure 3, Section 7.2.2) that depicts a decrease in the number of fires spanning back.

In order to decrease the effects of memory decay future studies could limit data collection to a smaller time frame (rather than life span used in the current study). Considering the U.S. Commission found the effects of memory decay even in a twelve monthly period (in which the incidence of reported fires decreased dramatically from months one to 12 in the 1974 database); perhaps collecting data in a three month (or shorter) period would help minimize this problem further in the future. However, if using the three month reporting approach one must take into account the seasonal nature of the time period in which participants are asked to report on (as the climate might also affect fire incident rate), and also include a very large sample to elicit sufficient number of fire experiences.

13.4 Recruitment

Also a limitation of the current study is the characteristics of the sample. As discussed earlier on there is a sex bias, as females are over-represented within the sample. Other biases in the sample can be seen with an over-representation of persons born in Australia, those with university level education, the unemployed, and home renters. This is due to data collection being carried out in shopping centers; for instance females are generally more likely to shop than males. When considering such biases in terms of what is known from the available literature, including fatal fires and overall attended fires, results from the current study must be interpreted with caution.

Future studies should therefore aim to recruit subjects that are reprehensive of the overall population concerned. This might be achieved by accessing not only shopping centers, but other venue types that might provide access to large groups of people from a variety of differing demographic backgrounds. For instance, collecting data at a venue in which more senior citizens are likely to attend.

The validity of the conclusions of this study would also be improved with a larger, more representative sample size. Hence, more research on unattended fires involving a larger, more representative sample is needed to gain a better understanding of the overall nature of fire risk. However, it is important to note that this project is the first to collect data that previously was not available in Australia, and the developed questionnaire could be used again nationally and internationally.

13.5 Use of face-to-face questionnaire data collection

Conducting face-to-face interviews was found to be quite effective in the collection of data in the current project. One advantage of this method is that it allowed for probing to take place, gaining clarity in the information received by the interviewer during the completion of the questionnaire. In addition, probing was particularly important in getting the participant to think about, and remember, any fire experiences (particularly minor) that might not have been remembered in the first instance.

In comparison to a mailing method of survey data gathering, or an internet online method, researchers are relying on a person to read and comprehend a paragraph or two explaining types of fires the researcher is looking; which might not be as affective (as lose the probing interaction). Additionally, with face-to-face interviews (if conducted efficiently by the

interviewer) a participant may be more likely to comple multiple surveys rather than relying on a person to fill several lengthy questionnaire on their own, if they had multiple fire experiences.

Another advantage of face-to-face interviews was that data could be collected on the spot, rather than relying on participants to send back mail out surveys or complete an online survey. Interviewing participants also saved the cost of surveys as the researcher could fill out only the type and number of surveys required (i.e. only the demographic survey if a person reported no fire experience). If relying on mail outs, the cost and paper waste would be considerably high for this reason.

A caution to the use of internet and mailing methodology is that it might only attract persons to complete the survey if they have had a fire experience. Face-to-face approach and contact allowed for researchers to recruit both persons who had had a fire or not, thereby decreasing sampling bias.

One advantage mailing surveys or surveys on the web have over face-to-face interviews, is that participants might be more honest in their answers (reducing social desirability bias). However, one must be cautious in sampling bias as some groups of people might not have access to the internet (for example the elderly) thereby under representing certain risk groups.

Telephone survey methodology might also be an effective way to reach a large number of participants, while allowing the researcher to conduct the interview themselves. However such a method may have quite a low response rate and be unrepresentative.

Overall face-to-face interviews allowed the researchers to gain detailed information on participant fire experiences on the spot, allowed for only the

surveys required to be used (without the cost of paper waste) and aided in decrease bias by recruiting persons who have and have not had a fire experience (incidence purposes). Allows for probing to increase persons memory of any fire events. Visit a wide range of venues to better reach overall pop rather than recruiting from one type public area.

13.6 Conclusion

Although the sample was not representative of the overall population in terms of age, the findings have revealed that cooking fires are a hazardous problem. The results from this project can be used to help prevent cooking fires in Australia and the developed interview schedule can be used to collect comparison data from other States and Territories. Furthermore, the development instrument can be used to collect unattended home fire data internationally.

The developed survey is not limited to collecting data on domestic fires only, and can be utilized to investigate recreational fires, (e.g., camping) or workplace fires. Although workplace fires and recreational fires were not elaborated upon due to limitations in the scope and size of the project, future research may investigate such fires with use of the developed survey.

The data collected in Study One can be used as a basis to build up a larger database which would have a number of beneficial future uses. Not only can the database be used to determine a mean probability of having a fire experience, but could also be used to collect data for specific time frames. This would allow for further estimates to be made regarding incident rates for unattended fires in Australia for such periods. With regular data collection the fire rate can be monitored to determine whether preventative measures are having an effect.

In addition the data collected in Study Two can also be used to build up a larger database to determine the rate of smoke alarm ownership and maintenance adherence and frequency of in Australian homes.

Furthermore, the development instrument can be used to collect un-attended home fire data internationally and be used for cross-cultural comparisons.

CHAPTER 14. REFERENCES

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CHAPTER 15. APPENDICES

15.1 Appendix A: Consent Forms

Victoria University of Technology
Information for Firefighters Involved in Focus Groups

INFORMATION TO FOCUS GROUP PARTICIPANTS:

My name is Michelle Barnett, I am a PhD student, supervised by Professor Dorothy Bruck and Andrew Jago, School of Psychology, Victoria University. As part of a joint project between the Metropolitan Fire Brigade and Victoria University we would like to invite you to participate in a focus group which will discuss topics on fire safety, awareness, and experience in the home.

The objectives of the focus group are to discuss fire safety, awareness, and experience in the home.

The information received as part of your participation in the focus group will enable us to develop a questionnaire which will help us gain a clearer understanding of the residential fire problem within Melbourne, Victoria. In addition, the information obtained from the questionnaire will allow for improvements in preventative strategies aimed at reducing the rising incidences of home fires within Victoria.

We are looking for firefighter educators who are able to attend one focus group at the Melbourne Metropolitan Fire Brigade during March. The focus group will run for approximately 45 minutes and lunch will be provided.

All information provided to us will become group data and no individuals will be identified at any stage of the research.

The Victoria University Ethics Committee has approved this research and requires all participants to complete the attached consent form.

If you want a copy of the finalized version of the questionnaire, this will be made available to you by contacting myself via e-mail at michelle.barnett@research.vu.edu.au.

Should you have any queries/ concerns regarding the manner in which the focus group is conducted please do not hesitate to contact myself via e-mail (michelle.barnett@research.vu.edu.au) or Dorothy Bruck on 9919 2336.

Thanking you
Yours sincerely,

Michelle Barnett

CERTIFICATION BY PARTICIPANT

I, _____
certify that I am voluntarily giving my consent to participate in a focus group looking at fire safety, awareness, and experience in the home, being conducted at Victoria University by Miss Michelle Barnett.

I certify that the objectives of the focus group, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the research, have been fully explained to me by Miss Michelle Barnett and that I freely consent to participation involving the use on me of these procedures.

Procedures: Participation in a focus group to discuss fire safety, awareness, and experience in the home. There are no risks associated with your participation.

I certify that I understand the broad nature of the focus group, and can contact the researchers if I have any questions and I understand that I can withdraw from the focus group at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Signed: **.....** **}**

Date: **.....**

Any queries about your participation in this project may be directed to the researcher (Michelle Barnett: michelle.barnett@research.vu.edu.au). If you have any queries or complaints about the way you have been treated, you may contact the Secretary, University Human Research Ethics Committee, Victoria University of Technology, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03-9688 4710).

Victoria University of Technology
Information for Participants Involved in Focus Groups

INFORMATION TO FOCUS GROUP PARTICIPANTS:

My name is Michelle Barnett, I am a PhD student, supervised by Professor Dorothy Bruck and Andrew Jago, School of Psychology, Victoria University. As part of a joint project between the Metropolitan Fire Brigade and Victoria University we would like to invite you to participate in a focus group which will discuss topics on fire safety, awareness, and experience in the home.

The information received as part of your participation in the focus group will enable us to develop a questionnaire which will help us gain a clearer understanding of the fire problem within Melbourne, Victoria. And ultimately allow for improvements in preventative strategies aimed at reducing the rising incidences of home fires within Victoria.

We are looking for participants who are aged between 20 to 65 years who are able to attend one focus group at Victoria University, St Albans Campus during March of this year. Focus groups will consist of 7 to 8 individuals and participants will be asked to discuss what is known about fire starts in the home, the extinguishment of fires in the home, and personal experience with home fire situation/s. The focus group will run for 30 to 45 minutes depending on your experience of any fires. If you agree to participate you will be contacted via e-mail or telephone with an option of dates which may be attended (for your convenience). A snack will be provided.

All personal details provided to us will remain strictly confidential and individual information supplied during the focus group will not be identifiable.

If you want a copy of the finalized version of the questionnaire, this will be made available to you by contacting myself via e-mail at michelle.barnett@research.vu.edu.au.

Should you have any queries/ concerns regarding the manner in which the focus group is conducted please do not hesitate to contact myself via e-mail (michelle.barnett@research.vu.edu.au) or Dorothy Bruck on 9919 2336.

Thanking you
Yours sincerely,

Michelle Barnett

CERTIFICATION BY PARTICIPANT

I,

_____

certify that I am at least 18 years old* and that I am voluntarily giving my consent to participate in a focus group looking at fire safety, awareness, and experience in the home, being conducted at Victoria University by Miss Michelle Barnett.

I certify that the objectives of the focus group, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the research, have been fully explained to me by Miss Michelle Barnett and that I freely consent to participation involving the use on me of these procedures.

Procedures: Participation in a focus group at Victoria University, St Albans Campus during March 2005 to discuss fire safety, awareness, and experience in the home.

I certify that I understand the broad nature of the focus group, and can contact the researchers if I have any questions and I understand that I can withdraw from the focus group at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Date of Birth:

_____

E-mail Address:

_____

Contact Phone number:

_____

Signed: **.....** **}**

Date: **.....**

Any queries about your participation in this project may be directed to the researcher (Michelle Barnett: michelle.barnett@research.vu.edu.au). If you have any queries or complaints about the way you have been treated, you may contact the Secretary, University Human Research Ethics Committee, Victoria University of Technology, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03-9688 4710).

15.2 Appendix B: The Fire Safety Awareness and Experience Interview Schedule

Participant Id:……

Interviewee:

☐ *Was* approached by a researcher **or**

☐ Approached the researcher

FIRE EXPERENCE INTERVIEW SQUEDULE

Some people have experienced unintended fires that are major, and some that are small. We are interested in knowing about both. Even if you think the fire was small, we would still like to know about it. This interview will take about 5 to 7 minutes for each fire.

1. Have you experienced any unintended fires since the age of 18?

☐ No → **Proceed to Demographic Information**

☐ Yes → I will ask you for some information about each fire. We will start with the most severe fire first.

2. How many fire experiences have you had since the age of 18, and on which of the following property types did these fires occur:

☐ Residential → Number of residential fires _____

☐ Workplace → Number of workplace fires _____

☐ Recreational → Number of recreational fires _____

3. Total number of fires reported: _____ ***(Fill in at end of interview)***

SMOKE ALARMS & DEMOGRAPHIC INFORMATION

4. Do you have a smoke alarm in your home?

- ☐ Yes → How Many?.....
- ☐ No → Why?.....
- ☐ Unsure

5. How often do you change the **battery**?

- ☐ When the alarm beeps
- ☐ Every 6 months
- ☐ Irregularly- *Just when I remember to do so*
- ☐ Unsure
- ☐ Monthly
- ☐ Once every year- *End of daylight savings*
- ☐ Never

6. How often do you **clean** your smoke alarm?

- ☐ Weekly
- ☐ Every 6 months
- ☐ Irregularly- *Just when I remember to do so*
- ☐ Unsure
- ☐ Monthly
- ☐ Once every year- *End of daylight savings*
- ☐ Never

7. How do you clean it?

- ☐ Dust/ wipe the outside
- ☐ Vacuum
- ☐ Dust/ wipe the inside
- ☐ Other…….

8. How often do you **test** your smoke alarm?

- ☐ Weekly
- ☐ Monthly
- ☐ Every 6 months
- ☐ Once every year- *End of daylight savings*
- ☐ Irregularly- *Just when I remember to do so*
- ☐ Never
- ☐ Unsure

9. How do you test your smoke alarm?

- ☐ Press the button
- ☐ Hold a lighter under the alarm
- ☐ When the toast gets burnt/ when I'm cooking
- ☐ Other …….

10. Is your alarm 9Volts stand alone or 240 Volts hard wired?

- ☐ 9Volts Stand Alone
- ☐ Both
- ☐ 240Volts Hardwired
- ☐ Unsure

11. Sex:

- ☐ Male
- ☐ Female

12. In what year were you born?

13. What is your current education level?

- ☐ Completed year _____ of high school
- ☐ Tafe studies
- ☐ University studies
- ☐ Other ……

14. What is your current occupation?

15. Were you born in Australia?

☐ Yes ☐ No → **(b) If no**, in which country were you born?.....

16. Were your parents born in Australia?

☐ Yes

☐ No] → **(b) If no**, in which country were they born?

(mother)……..

(father)……

17. What is your current postcode? ____ ____ ____ ____

18. In what type of building do you live?

☐ House ☐ Townhouse

☐ Unit/ Flat ☐ Apartment

☐ Other……

19. Are you:

☐ A home owner ☐ Renter

☐ Living with parents

☐ Other……..

15.3 Appendix C: The RESIDENTIAL Fire Safety Awareness and Experience Interview Schedule

Participant Id:……..

Fire No: ….……

RESIDENTIAL INTERVIEW SCHEDULE

20. Did the fire start in your home or someone else's home?

☐ Your home ☐ Partners home

☐ Parents home ☐ Friends home

☐ Other……..

21. What type of home was it? *(Where applicable, in buildings with more than one level, note floor number).*

☐ House ☐ Townhouse

☐ Unit/ Flat ☐ Apartment → How many levels? ____
→ Which level did the fire start on? ____

☐ Other…….

22. At the time of the fire you were:

☐ A home owner ☐ Visitor

☐ Renter ☐ Neighbor

☐ Living with parents ☐ Passerby

☐ Other……..

23. What is the postcode/ or suburb of the area in which the fire started?

_____ _____ _____ _____

24. Who was usually living in the home?

☐ Living Alone ☐ Flat mate/s _____

☐ Mother/ Father + ____ *(number of children)* child/ children

☐ Other ……

25. Were you involved in the:

☐ Start of the fire ☐ Extinguishment of the fire

☐ Both start/ exting ☐ An observer of the event

26. Who was in the home when the fire started?

27. Who was in the same room/ outdoor area when the fire first started?

28. Did the fire start indoors or outdoors?

☐ Indoors ☐ Outdoors

29. If the fire started indoors, in which room did it start? **If the fire started outdoors**, where did it start? (includes areas of open space- used for specific purposes)

30. What was the **Age** and **Sex** of the person who started the fire?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

31. How did the fire start/ what actions lead to the fire start?

32. What activity were you doing at the time the fire started?

33. What activity were others doing at the time the fire started?

34. What equipment was involved in the fire start ?

- ☐ Stove (electric *or* gas?)
- ☐ Frying pan
- ☐ BBQ
- ☐ Unsure
- ☐ Cigarette
- ☐ Matches
- ☐ Lighter
- ☐ Other/ s ……

35. What material/ object ignited first (e.g. oil/ fat/ fry pan etc)?

36. How was the person who **started** the fire alerted to the fire?

- ☐ Seeing the fire
- ☐ Seeing smoke
- ☐ Verbal warning from another person
- ☐ Other……
- ☐ Smoke alarm
- ☐ Smell smoke/ burning
- ☐ Unsure

37. How was the person who **extinguished** the fire alerted to the fire?

- ☐ Seeing the fire
- ☐ Seeing smoke
- ☐ Verbal warning from another person
- ☐ Other……
- ☐ Smoke alarm
- ☐ Smell smoke/ burning
- ☐ Unsure

38. Who was alerted to the fire first?

☐ Person who stared the fire ☐ Person who extinguished the fire

☐ Both starter and extinguisher ☐ An observer of the event

☐ Unsure

39. What were your actions when alerted to the fire?

40. What were the actions of other people present, when alerted?

41. What was the **Age** and **Sex** of the person who extinguished the fire?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

☐ Nobody extinguished the fire

42. How was the fire extinguished?

43. Had you had any fire safety training before this fire event?

☐ No ☐ Yes → If yes, what type of training? ……

☐ Just from the media -general safety ads / warnings

44. (a) Were there safety equipment/ devices in the home at the time of the fire?

☐ Yes ☐ No **(Go to Q 45)**

☐ Unsure

(b) If yes, what fire safety equipment/ devices were in the home at the time of the fire?

☐ Smoke Alarm ☐ Fire blanket

☐ Fire extinguisher ☐ Sprinkler System

☐ Other…….

☐ No equipment/ devices

(c) Were the fire safety equipment/ devices **in working order** at the time of the fire?

Smoke Alarm……. ….Yes/ No/ Unsure

Fire Extinguisher……..Yes/ No/ Unsure

Sprinkler System …….Yes/ No/ Unsure

(d) Did the fire safety equipment/ devices **actually operate**?

Smoke Alarm……. ….Yes/ No/ Unsure

Fire Extinguisher……..Yes/ No/ Unsure

Sprinkler System …….Yes/ No/ Unsure

45. Had there been any alcohol use at the time of the fire?

(a) You → ☐ Yes **(b)** Others → ☐ Yes

☐ No ☐ No

☐ Unsure ☐ Unsure

46. (a) Was the Fire Brigade called?

☐ Yes **(Go to Q c)**

☐ No → **(b) Why not?** …… **(Go to Q47)**

(c) If yes, did the fire brigade attend the scene?

☐ Yes ☐ No

(d) How long after the fire did you call the fire brigade?

☐ During the fire ☐ Straight after the fire was extinguished

☐ Within an hour of the fires extinguishment ☐ Hours later

(e) Who called the fire brigade?

☐ Yourself

☐ Someone else living in the household → Who? ……..

☐ Neighbor ☐ Visitor

☐ Passer-by ☐ Other ……

(f) Did you feel their attendance was necessary?

☐ Yes ☐ No

(g) Why/ Why not?

47. (a) Was anyone injured due to the fire?

☐ Yes **(Go to Q b)** ☐ No **(Go to Q 48)**

(b) If yes, who was injured?

☐ Person who stared the fire ☐ Person who extinguished the fire

☐ Both starter and extinguisher ☐ An observer of the event

(c) What was the **Age** and **Sex** of the person/ s injured?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

3. Male/ Female……. Age……..

(d) What injuries were sustained ?

	Person 1	*Person 2*	*Person 3*
Asphyxia due to smoke inhalation	☐	☐	☐
Small burns	☐	☐	☐
Scalds	☐	☐	☐
Unconscious	☐	☐	☐
Wound/cut	☐	☐	☐

Other …….

(e) How bad were the injuries?

	Person 1	*Person 2*	*Person 3*
Minor *(medical care not necessary)*	☐	☐	☐
Mild *(Quick medical care advisable, e.g. fractures, lacerations)*	☐	☐	☐
Severe *(Immediate medical care necessary, potentially life threatening)*	☐	☐	☐

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(f) How were you/ they injured?

	Person 1	*Person 2*	*Person 3*
☐ Escaping	☐	☐	☐
☐ Rescue	☐	☐	☐
☐ Fighting the fire	☐	☐	☐

Other ……

(g) Was medical attention sought after?

☐ Yes ☐ No

48. (a) What type of damage was there to objects and/or property (e.g. blackened pan, singed clothing, and smoke damage to walls)?

Flame damage to:

…….

……..

Smoke Damage to:

……

……

(b) Was there **flame** damage:

☐ The object

☐ To part of the room

☐ To the entire room

☐ To the entire house/compartment *(e.g. apartment or home)*

☐ To the entire floor *(multi-storey building)*

☐ To the entire structure *(multi-storey building*)

☐ Moved past the house/ structure (multi-storey building)

☐ No flame damage

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(c) Was there **smoke** damage:

☐ The object

☐ To part of the room

☐ To the entire room

☐ To the entire house/compartment *(e.g. apartment or home)*

☐ To the entire floor *(multi-storey building)*

☐ To the entire structure *(multi-storey building*)

☐ Moved past the house/ structure (multi-storey building)

☐ No flame damage

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(d) How many square meters **flame damage** was there? ……..

(e) How many square meters **smoke damage** was there?.....

(f) Do you think that if you/ or others **did not intervene with the fire**, that it is **likely** there would have been **major property damage**?

☐ Highly Likely ☐ Not likely

☐ Very likely ☐ Not sure

☐ Moderately likely

49. (a) Was an insurance claim made?

☐ Yes **(Go to Q b)** ☐ No **(Go to Q 50)**

☐ Unsure

(b) Do you remember how much the insurance claim paid out? **$_____.00**

50. (a) What do you think the level of physical danger was to yourself and/ or others ***at the time*** of the fire?

	Yourself	*Others*
High……	☐	☐
Moderate ……..	☐	☐
Low ……..	☐	☐
No danger …….	☐	☐
Unsure …….	☐	☐

(b) What do you think the level of physical danger was to yourself and/ or others ***reflecting back*** on the event?

	Yourself	*Others*
High……	☐	☐
Moderate ……..	☐	☐
Low ……..	☐	☐
No danger …….	☐	☐
Unsure …….	☐	☐

51. In what year did the fire occur?

52. In what **season** did the fire occur?

☐ Summer ☐ Winter

☐ Autumn ☐ Spring

☐ Unsure

53. What time of day was it when the fire started?

☐ 8am – 11am ☐ 8pm -11pm

☐ 12pm -3pm ☐ 12am – 3 am

☐ 4pm -7pm ☐ 4am – 7am

☐ Unsure

54. What was your **occupation** <u>at the time of the fire</u>?

55. What was your **education level** at the time of the fire ?

☐ Completed year _____ of high school ☐ Tafe studies

☐ University studies ☐ Other…….

56. How reliable is your memory of the fire experience?

☐ Very reliable

☐ Reliable

☐ Moderately Reliable

☐ Unreliable

☐ Unsure

15.4 Appendix D: The RECREATIONAL Fire Safety Awareness and Experience Interview Schedule

Participant Id:……..

Fire No: ….……

RECREATIONAL INTERVIEW SCHEDULE

20. On what type of recreational land did the fire start?

☐ Retail	☐ Offices
☐ Education	☐ Institutional (e.g. Hospital)
☐ Camping Site	☐ Hotel
☐ Park	☐ Restaurant
☐ Caravan Park	☐ Other……..

21. In what type of building/ area did the fire take place?

☐ Single level building → ☐ Free standing

☐ Joined to other buildings

☐ Multi-level building → How many levels? ____

→ Which level did the fire start on? ____

☐ Open land

☐ Tent

☐ Caravan

☐ Other……

22. At the time of the fire you were:

☐ Visitor to the site ☐ Passerby

☐ Patient ☐ Other……..

23. What is the postcode/ or suburb of the area in which the fire started?

_____ _____ _____ _____

24. Approximately what was the total number of people usually using the building/ area?

25. How many people were present at the time of the fire?

26. Were you involved in the:

☐ Start of the fire ☐ Extinguishment of the fire

☐ Both start/ exting ☐ An observer of the event

27. Who was in the same room/ outdoor area when the fire first started?

28. Did the fire start indoors or outdoors?

☐ Indoors ☐ Outdoors

29. If the fire started indoors, in which room did it start? **If the fire started outdoors**, where did it start? *(includes areas of open space- used for specific purposes)*

30. What was the **Age** and **Sex** of the person who started the fire?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

31. How did the fire start/ what actions lead to the fire start?

32. What activity were you doing at the time the fire started?

33. What activity were others doing at the time the fire started?

34. What equipment was involved in the fire start ?

- ☐ Stove (electric *or* gas?)
- ☐ Frying pan
- ☐ BBQ
- ☐ Unsure
- ☐ Cigarette
- ☐ Matches
- ☐ Lighter
- ☐ Other/ s ……

35. What material/ object ignited first (e.g. oil/ fat/ fry pan etc)?

36. How was the person who **started** the fire alerted to the fire?

- ☐ Seeing the fire
- ☐ Seeing smoke
- ☐ Verbal warning from another person
- ☐ Other……
- ☐ Smoke alarm
- ☐ Smell smoke/ burning
- ☐ Unsure

37. How was the person who **extinguished** the fire alerted to the fire?

☐ Seeing the fire ☐ Smoke alarm

☐ Seeing smoke ☐ Smell smoke/ burning

☐ Verbal warning from another person ☐ Unsure

☐ Other……

38. Who was alerted to the fire first?

☐ Person who stared the fire ☐ Person who extinguished the fire

☐ Both starter and extinguisher ☐ An observer of the event

☐ Unsure

39. What were your actions when alerted to the fire?

40. What were the actions of other people present, when alerted?

41. What was the **Age** and **Sex** of the person who extinguished the fire?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

☐ Nobody extinguished the fire

42. How was the fire extinguished?

43. Had you had any fire safety training before this fire event?

☐ No ☐ Yes → If yes, what type of training? ……

☐ Just from the media -general safety ads / warnings

44. (a) Were there safety equipment/ devices in the home at the time of the fire?

☐ Yes ☐ No **(Go to Q 45)**

☐ Unsure

(b) If yes, what fire safety equipment/ devices were in the home at the time of the fire?

☐ Smoke Alarm ☐ Fire blanket

☐ Fire extinguisher ☐ Sprinkler System

☐ Smoke detector ☐ Other……..

☐ No equipment/ devices

(c) Were the fire safety equipment/ devices **in working order** at the time of the fire?

Smoke Alarm……. …. Yes/ No/ Unsure

Smoke Detector……. ….Yes/ No/ Unsure

Fire Extinguisher…….. Yes/ No/ Unsure

Sprinkler System ……. Yes/ No/ Unsure

(d) Did the fire safety equipment/ devices **actually operate**?

Smoke Alarm……. ….Yes/ No/ Unsure

Smoke Detector……. ….Yes/ No/ Unsure

Fire Extinguisher……..Yes/ No/ Unsure

Sprinkler System …….Yes/ No/ Unsure

45. Had there been any alcohol use at the time of the fire?

(a) You → ☐ Yes ☐ No ☐ Unsure

(b) Others → ☐ Yes ☐ No ☐ Unsure

46. (a) Was the Fire Brigade called?

☐ Yes **(Go to Q c)**

☐ No → **(b) Why not?** …… **(Go to Q47)**

(c) If yes, did the fire brigade attend the scene?

☐ Yes ☐ No

(d) How long after the fire did you call the fire brigade?

☐ During the fire ☐ Straight after the fire was extinguished

☐ Within an hour of the fires extinguishment ☐ Hours later

(e) Who called the fire brigade?

☐ Yourself

☐ Someone else in the building/ area → Who? ……..

☐ Passer-by ☐ Other ……

(f) Did you feel their attendance was necessary?

☐ Yes ☐ No

(g) Why/ Why not?

47. **(a)** Was anyone injured due to the fire?

☐ Yes **(Go to Q b)** ☐ No **(Go to Q 48)**

(b) If yes, who was injured?

☐ Person who stared the fire ☐ Person who extinguished the fire

☐ Both starter and extinguisher ☐ An observer of the event

(c) What was the **Age** and **Sex** of the person/ s injured?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

3. Male/ Female……. Age……..

(d) What injuries were sustained ?

	Person 1	*Person 2*	*Person 3*
Asphyxia due to smoke inhalation	☐	☐	☐
Small burns	☐	☐	☐
Scalds	☐	☐	☐
Unconscious			
Wound/cut			

Other ……

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(e) How bad were the injuries?

	Person 1	*Person 2*	*Person 3*
Minor *(medical care not necessary)*	☐	☐	☐
Mild *(Quick medical care advisable, e.g. fractures, lacerations)*	☐	☐	☐
Severe *(Immediate medical care necessary, potentially life threatening)*	☐	☐	☐

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(f) How were you/ they injured?

	Person 1	*Person 2*	*Person 3*
☐ Escaping	☐	☐	☐
☐ Rescue	☐	☐	☐
☐ Fighting the fire	☐	☐	☐
☐ Other _____	☐	☐	☐

(g) Was medical attention sought after?

☐ Yes ☐ No

48. (a) What type of damage was there to objects and/or property (e.g. blackened pan, singed clothing, and smoke damage to walls)?

Flame damage to:…….

……..

Smoke Damage to: ……

……

(b) Was there **flame** damage:

☐ The object

☐ To part of the room

☐ To the entire room

☐ To the entire house/compartment *(e.g. apartment or home)*

☐ To the entire floor *(multi-storey building)*

☐ To the entire structure *(multi-storey building*)

☐ Moved past the house/ structure (multi-storey building)

☐ No flame damage

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(c) Was there **smoke** damage:

☐ The object

☐ To part of the room

☐ To the entire room

☐ To the entire house/compartment *(e.g. apartment or home)*

☐ To the entire floor *(multi-storey building)*

☐ To the entire structure *(multi-storey building*)

☐ Moved past the house/ structure (multi-storey building)

☐ No flame damage

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(d) How many square meters **flame damage** was there? ……..

(e) How many square meters **smoke damage** was there?.....

(f) Do you think that if you/ or others **did not intervene with the fire**, that it is **likely** there would have been **major property damage**?

☐ Highly Likely ☐ Not likely

☐ Very likely ☐ Not sure

☐ Moderately likely

49. (a) Was an insurance claim made?

☐ Yes **(Go to Q b)** ☐ No **(Go to Q 50)**

☐ Unsure

(b) Do you remember how much the insurance claim paid out? **$_____.00**

50. (a) What do you think the level of physical danger was to yourself and/ or others ***at the time*** of the fire?

	Yourself	*Others*
High……	☐	☐
Moderate ……..	☐	☐
Low ……..	☐	☐
No danger …….	☐	☐
Unsure …….	☐	☐

(b) What do you think the level of physical danger was to yourself and/ or others ***reflecting back*** on the event?

	Yourself	*Others*
High……	☐	☐
Moderate ……..	☐	☐
Low ……..	☐	☐
No danger …….	☐	☐
Unsure …….	☐	☐

51. In what year did the fire occur?

52. In what **season** did the fire occur?

☐ Summer ☐ Winter

☐ Autumn ☐ Spring

☐ Unsure

53. What time of day was it when the fire started?

☐ 8am – 11am ☐ 8pm -11pm

☐ 12pm -3pm ☐ 12am – 3 am

☐ 4pm -7pm ☐ 4am – 7am

☐ Unsure

54. What was your **occupation** at the time of the fire?

55. What was your **education level** at the time of the fire ?

☐ Completed year _____ of high school ☐ Tafe studies

☐ University studies ☐ Other…….

56. How reliable is your memory of the fire experience?

☐ Very reliable

☐ Reliable

☐ Moderately Reliable

☐ Unreliable

☐ Unsure

15.5 Appendix E: The WORKPLACE Fire Safety Awareness and Experience Interview Schedule

Participant Id:……..

Fire No: ….……

WORKPLACE INTERVIEW SCHEDULE

20. On what type of work place did the fire start?

☐ Retail ☐ Offices

☐ Education ☐ Institutional (e.g. Hospital)

☐ Factory ☐ Warehouse

☐ Restaurant ☐ Other……

21. In what type of building/ area did the fire take place?

☐ Single level building → ☐ Free standing

☐ Joined to other buildings

☐ Multi-level building → How many levels? ____

→ Which level did the fire start on? ____

☐ Open land

☐ Other……

22. At the time of the fire you were:

☐ Employee ☐ Employer

☐ Maintenance/ Contractor ☐ Other……..

23. What is the postcode/ or suburb of the area in which the fire started?

_____ _____ _____ _____

24. Approximately what was the total number of people usually using the building/ area?

25. How many people were present at the time of the fire?

26. Were you involved in the:

☐ Start of the fire ☐ Extinguishment of the fire

☐ Both start/ exting ☐ An observer of the event

27. Who was in the same room/ outdoor area when the fire first started?

28. Did the fire start indoors or outdoors?

☐ Indoors ☐ Outdoors

29. If the fire started indoors, in which room did it start? **If the fire started outdoors**, where did it start? *(includes areas of open space- used for specific purposes)*

30. What was the **Age** and **Sex** of the person who started the fire?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

31. How did the fire start/ what actions lead to the fire start?

32. What activity were you doing at the time the fire started?

33. What activity were others doing at the time the fire started?

34. What equipment was involved in the fire start ?

- ☐ Stove (electric *or* gas?)
- ☐ Frying pan
- ☐ BBQ
- ☐ Unsure
- ☐ Cigarette
- ☐ Matches
- ☐ Lighter
- ☐ Other/ s ……

35. What material/ object ignited first (e.g. oil/ fat/ fry pan etc)?

36. How was the person who **started** the fire alerted to the fire?

- ☐ Seeing the fire
- ☐ Seeing smoke
- ☐ Verbal warning from another person
- ☐ Other……
- ☐ Smoke alarm
- ☐ Smell smoke/ burning
- ☐ Unsure

37. How was the person who **extinguished** the fire alerted to the fire?

- ☐ Seeing the fire
- ☐ Seeing smoke
- ☐ Verbal warning from another person
- ☐ Other……
- ☐ Smoke alarm
- ☐ Smell smoke/ burning
- ☐ Unsure

38. Who was alerted to the fire first?

☐ Person who stared the fire ☐ Person who extinguished the fire

☐ Both starter and extinguisher ☐ An observer of the event

☐ Unsure

39. What were your actions when alerted to the fire?

40. What were the actions of other people present, when alerted?

41. What was the **Age** and **Sex** of the person who extinguished the fire?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

☐ Nobody extinguished the fire

42. How was the fire extinguished?

43. Had you had any fire safety training before this fire event?

☐ No ☐ Yes → If yes, what type of training? ……

☐ Just from the media -general safety ads / warnings

44. (a) Were there safety equipment/ devices in the home at the time of the fire?

☐ Yes ☐ No **(Go to Q 45)**

☐ Unsure

(b) If yes, what fire safety equipment/ devices were in the home at the time of the fire?

☐ Smoke Alarm ☐ Fire blanket

☐ Fire extinguisher ☐ Sprinkler System

☐ Smoke detector ☐ Other……..

☐ No equipment/ devices

(c) Were the fire safety equipment/ devices **in working order** at the time of the fire?

Smoke Alarm……. …. Yes/ No/ Unsure

Smoke Detector……. ….Yes/ No/ Unsure

Fire Extinguisher…….. Yes/ No/ Unsure

Sprinkler System ……. Yes/ No/ Unsure

(d) Did the fire safety equipment/ devices **actually operate**?

Smoke Alarm……. ….Yes/ No/ Unsure

Smoke Detector……. ….Yes/ No/ Unsure

Fire Extinguisher……..Yes/ No/ Unsure

Sprinkler System …….Yes/ No/ Unsure

45. Had there been any alcohol use at the time of the fire?

(a) You → ☐ Yes **(b)** Others → ☐ Yes

☐ No ☐ No

☐ Unsure ☐ Unsure

46. (a) Was the Fire Brigade called?

☐ Yes **(Go to Q c)**

☐ No → **(b) Why not?** …… **(Go to Q47)**

(c) If yes, did the fire brigade attend the scene?

☐ Yes ☐ No

(d) How long after the fire did you call the fire brigade?

☐ During the fire ☐ Straight after the fire was extinguished

☐ Within an hour of the fires extinguishment ☐ Hours later

(e) Who called the fire brigade?

☐ Yourself

☐ Someone else in the building/ area → Who? ……..

☐ Passer-by ☐ Other ……

(f) Did you feel their attendance was necessary?

☐ Yes ☐ No

(g) Why/ Why not?

47. (a) Was anyone injured due to the fire?

☐ Yes **(Go to Q b)** ☐ No **(Go to Q 48)**

(b) If yes, who was injured?

☐ Person who stared the fire ☐ Person who extinguished the fire

☐ Both starter and extinguisher ☐ An observer of the event

(c) What was the **Age** and **Sex** of the person/ s injured?

1. Male/ Female……. Age……..

2. Male/ Female……. Age……..

3. Male/ Female……. Age……..

(d) What injuries were sustained ?

	Person 1	*Person 2*	*Person 3*
Asphyxia due to smoke inhalation	☐	☐	☐
Small burns	☐	☐	☐
Scalds	☐	☐	☐
Unconscious			
Wound/cut			
Other	……		

(e) How bad were the injuries?

	Person 1	*Person 2*	*Person 3*
Minor *(medical care not necessary)*	☐	☐	☐
Mild *(Quick medical care advisable, e.g. fractures, lacerations)*	☐	☐	☐
Severe *(Immediate medical care necessary, potentially life threatening)*	☐	☐	☐

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(f) How were you/ they injured?

	Person 1	*Person 2*	*Person 3*
☐ Escaping	☐	☐	☐
☐ Rescue	☐	☐	☐
☐ Fighting the fire	☐	☐	☐
☐ Other _____	☐	☐	☐

(g) Was medical attention sought after?

☐ Yes ☐ No

48. (a) What type of damage was there to objects and/or property (e.g. blackened pan, singed clothing, and smoke damage to walls)?

Flame damage to:…….

……..

Smoke Damage to:

……

……

(b) Was there **flame** damage:

☐ The object ☐ To the entire house/compartment *(e.g. apartment or home)*

☐ To part of the room ☐ To the entire floor *(multi-storey building)*

☐ To the entire room ☐ To the entire structure *(multi-storey building*)

☐ Moved past the house/ structure (multi-storey building)

☐ No flame damage

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(c) Was there **smoke** damage:

☐ The object

☐ To part of the room

☐ To the entire room

☐ To the entire house/compartment *(e.g. apartment or home)*

☐ To the entire floor *(multi-storey building)*

☐ To the entire structure *(multi-storey building*)

☐ Moved past the house/ structure (multi-storey building)

☐ No flame damage

* *Based on the Fire Incident Data Coding Guide categories (National Fire Protection Association, 1985).*

(d) How many square meters **flame damage** was there? ……..

(e) How many square meters **smoke damage** was there?.....

(f) Do you think that if you/ or others **did not intervene with the fire**, that it is **likely** there would have been **major property damage**?

☐ Highly Likely

☐ Very likely

☐ Moderately likely

☐ Not likely

☐ Not sure

49. (a) Was an insurance claim made?

☐ Yes **(Go to Q b)**

☐ Unsure

☐ No **(Go to Q 50)**

(b) Do you remember how much the insurance claim paid out? **$_____.00**

50. **(a)** What do you think the level of physical danger was to yourself and/ or others ***at the time*** of the fire?

	Yourself	*Others*
High……	☐	☐
Moderate ……..	☐	☐
Low ……..	☐	☐
No danger …….	☐	☐
Unsure …….	☐	☐

(b) What do you think the level of physical danger was to yourself and/ or others ***reflecting back*** on the event?

	Yourself	*Others*
High……	☐	☐
Moderate ……..	☐	☐
Low ……..	☐	☐
No danger …….	☐	☐
Unsure …….	☐	☐

51. In what year did the fire occur?

52. In what **season** did the fire occur?

- ☐ Summer
- ☐ Winter
- ☐ Autumn
- ☐ Spring
- ☐ Unsure

53. What time of day was it when the fire started?

- ☐ 8am – 11am
- ☐ 8pm -11pm
- ☐ 12pm -3pm
- ☐ 12am – 3 am
- ☐ 4pm -7pm
- ☐ 4am – 7am
- ☐ Unsure

54. What was your **occupation** at the time of the fire?

55. What was your **education level** at the time of the fire ?

- ☐ Completed year _____ of high school
- ☐ Tafe studies
- ☐ University studies
- ☐ Other…….

56. How reliable is your memory of the fire experience?

- ☐ Very reliable
- ☐ Reliable
- ☐ Moderately Reliable
- ☐ Unreliable
- ☐ Unsure

15.6 Appendix F: Census data comparison for West Melbourne and the North Western Melbourne.

Table F1 shows the demographics of participants living in West Melbourne (n=47) were compared to the census data specific to this region. Age, Education, Occupation Type, and Employment Status were all found to be significantly different from the population. Culture and dwelling type was not significantly different from the population.

Table F1

Difference Between Sample and Actual Population for West Melbourne (N=47)

Variable	n	Expected	P
Sex			
Female	30 (63.8%)		
Male	17 (36.2%)		
Culture (Birth Place)			
Australia	31 (66%)	30.7	.930
Overseas	16 (34%)	16.3	
Mothers Birth Place			
Australia	22 (47.8%)	---	
Overseas	24 (52.2%)	---	
Fathers Birth Place			
Australia	23 (51.1%)	---	
Overseas	22 (48.9%)	---	
Education			
No Qualification	30 (65.2%)	30.8	
Year 11 or Below	17 ---		
Year 12 Completed	13 ---		
TAFE	3 (6.5%)	8.3	.004
University	11 (23.9%)	4.8	
Bachelor	11 ---		
Post-graduate	0 ---		
Apprentice	2 (4.3%)	---	
Occupation Type			
Type A	0		
Type B	8 (28.6%)	3.8	.015
Type C	10 (35.7%)	16.9	

Type D	10 (35.7%)	7.3	
Employment Status			
Employed	28 (62.2%)	26	
Not Employed	8 (17.8%)	2.5	.000
Not in Labor Force	9 (20%)	16.6	
Retired	---		
Stay Home Parent	---		
Student	---		
Dwelling Type			
House	40 (85.1%)	38.6	
Town House	2 (4.3%)	3.2	.765
Flat/Unit/Apartment	5 (10.6%)	5.2	
Other (Caravan)	0 (0%)	---	
Living Status			
Home Owner	26 (55.3%)	31.6	
Renting	15 (31.9%)	9.4	.036
Living with Parents	6 (12.8%)	---	

Table F2 shows the demographics of participants living in North Western Melbourne (n=250) were compared to the census data specific to this region. Age, Culture, Education, Occupation Type, and Employment Status were all found to be significantly different from the population. Living status was not significantly different from the population.

Table F2

Difference Between Sample and Actual Population for North-Western Melbourne (n=249)

Variable	n		Expected	P
Sex				
Female	161	(64.7%)	126.5	.000
Male	88	(35.3%)	122.5	
Culture (Birth Place)				
Australia	192	(77.7%)	165.5	.000
Overseas	55	(22.3%)	81.5	
Mothers Birth Place				
Australia	139	(57%)	---	
Overseas	105	(43%)	---	
Fathers Birth Place				
Australia	134	(55.4%)	---	
Overseas	108	(44.6%)	---	
Education				
No Qualification	142	(58.9%)		
Year 11 or Below	101	---		
Year 12 Completed	41	---		
TAFE	31	(12.9%)		
University	58	(24.1%)		
Bachelor	57	---		
Post-graduate	1	---		
Apprentice	10	(4.1%)	---	
Occupation Type				
Type A	1	(0.7%)	30.7	.000
Type B	40	(30%)	13.9	
Type C	34	(25.5%)	61.9	
Type D	58	(33.6%)	26.6	

Employment Status				
Employed	133	(55%)	133.8	.001
Not Employed	25	(10.3%)	12.6	
Not in Labor Force	84	(34.7%)	95.6	
Retired	46	---		
Stay Home Mum	22	---		
Student	16	---		
Dwelling Type				
House	217	(87.1%)	199.6	.006
Town House	5	(2%)	18.8	
Flat/Unit/Apartment	26	(10.4%)	28.3	
Other (Caravan)	1	(.4%)	2.3	
Living Status				
Home Owner	170	(68.3%)	168.3	.071
Renting	52	(20.9%)	53.7	
Living with Parents	27	(10.8%)	---	

15.7 Appendix G: Fires excluded from the analysis

From a sample of 498 participants a total of 135 fires were reported (including either residential, recreational and workplace fire experiences). Five of these fire experiences (3.7%) were excluded from the analysis because the fire reported did not meet the criteria defined.

One participant reported two events; on two separate occasions oil in a frying pan ignited, however there was no flame or smoke damage in either case; the definition of a fire in the current study is that there had to be some degree (even if minor) of property damage. In another case a participant reported an instance where oil splattered from a hot barbeque, however there was no flame, smoldering, or singeing (also a reporting criteria for the current study). In another instance a fire had been deliberately lit with intention to cause damage (arson); as papers within a bin at shopping complex had been set alight. Another fire was a deliberately lit car fire. The current study is investigating fires in which damage is unintended.