Examination of risk factors and mental health status in an adult accidental fire death population 1998 -2005.

Theresa Watts-Hampton

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Abstract

Through the use of Coroner's records the research has demonstrated that people who die in residential fires display a number of environmental, demographic and/or behavioural risk characteristics. The current research has been organised into two studies. Study one had two aims with the first aim to develop the Victoria University (VU) Coroner's Accidental Fire Fatality Database. This would then provide a comprehensive record of all adult fire deaths that occurred in Victoria, Australia between January 1998 and February 2005. The second aim was to use this database to examine risk factors for the overall adult accidental fire fatality population (N = 101). Study two focused on the mentally ill and the aim was to examine whether the mentally ill (MI) (n = 55) compared to the non-mentally ill (NMI) (n = 46) exhibited different risk characteristics. Results indicated this fire death population was overrepresented by males, cigarette smokers, the mentally ill, people not in paid employment, and those aged over 80 years when compared to their proportion of the general Victorian population. When relative risk ratios were calculated it was found that the MI group were 7.9 (CI 95% 2.0-31.8) times more likely than the NMI group to have combined alcohol and drugs prior to their death. The MI were 5.9 (CI 95% 1.9-18.4) times more likely to have a history of careless smoking, a 2.2 (CI 95% 1.4-3.5) increased chance of having a cigarette as an ignition factor and were 3.6 (CI 95% 1.7-7.8) times more prone to have been acting abnormally prior to the fire than the NMI group. Future fire safety measures can be improved by taking into account these risk factors to target campaigns or to tailor interventions that have an effect on the most vulnerable in our community in the context of their environment.

DECLARATION OF CANDIDATE

"I, Theresa Watts-Hampton, declare that this report does not incorporate any materials previously written by another person except where due reference is made in the text".

"I further declare that this study has adhered to the ethical principles as established by the Human Experimentation Ethics Committee of Victoria University".

Signature **……**

Date **……..**

ACKNOWLEDGEMENTS

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My children deserve the warmest thanks of all for surviving the year with most of their sanity and humour still intact.

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1.0 GENERAL INTRODUCTION

No-one believes they will ever have to live through a residential fire let alone die in one. These are events that people always think will happen to someone else and yet fire is the ninth leading cause of death in women aged 15 to 44 years in the world (Stathakis & Scott, 1999). Even though fire is not one of the top 10 causes of death for men it is recognised in the literature that men are more likely than women to die in a residential fire (Barillo & Goode, 1996).

Coroner records have been used to develop an improved understanding of why such fire fatalities deaths occur, not just in the context of the individual but also at a community and state level. The information obtained from Coroner records can then be used by community and government leaders towards educating and designing prevention plans targeted to vulnerable groups within the population.

1.1 The role of the Coroner

Coroner records are very important as they provide data that can be used to create a profile of a fire death victim. The Coroner's job is to determine cause and method of death based on police reports, specialist reports and also reports from families, friends and others who have knowledge of the victim or the event (Brice, 2000; Dudley, Kelk, Florio, Waters, Howard, & Taylor, 1998; Stathakis & Scott, 1999). No sole event is likely to be attributed as the cause of a fire, rather many factors come into play before the actual fire including: human behaviour, presence of an ignition source, and availability of

materials. As such it is a series of events, some more significant than others, that can have an accumulative effect leading to a fatal fire.

Coroners are not the source of expert knowledge, rather they are the instrument by which the information and conclusions that expert witnesses bring to the process can be converted to the broader community sense and understanding (Hallenstein, 1990; Loveridge, 1998). The aim of the Coroner is to draw together experts' materials and conclusions to analyse, learn and understand the event being investigated specifically with a view to prevent future tragedies (Hallenstein; Loveridge).

The Coroner's Act 1985 (1985) enables the Coroner to investigate the circumstances of death, determine the facts, and outline the findings in a formal enquiry. These findings are then used by others to apportion the blame, draw legal conclusions and undertake appropriate action. A Coroner in Victoria has a law degree and is not a medical expert in causes of death. The Victorian Institute of Forensic Pathology provides the medical scientific aspect of the Coronial enquiry (Hallenstein, 1990).

The advantage of using Coronial records to help prevent future deaths is that the process is not limited by legal considerations of evidence as is required in a court of law. Instead the Victorian Coroner's Act 1985 allows for the Coroner to not be bound by the rules of evidence. The process can be determined in any manner that is considered reasonable by the Coroner (Hallenstein, 1990). Another advantage of the Coroner's process is that it is not limited to one case at a time but rather it enables the investigation of many cases together. This allows for public hearings that can take into consideration the broader issues and the likely impact at a community level.

1.2 Coronial fire studies and reports

To date there has been limited known research specifically into the behavioural aspects of fire death victims obtained through Coronial records. In Australia, Brennan and Thomas have been the leading researchers utilising coroner data to develop a picture of who is dying in residential fires. Overseas this type of study has also been restricted to a very small number of studies including Runyan, Bangdiwala, Linzer, Sacks, and Butts (1992), Barillo and Goode (1996), Marshall, Runyan, Bangdiwala, Linzer, Sacks, and Butts (1998), and Taylor, Manifold and Lodge (2001). The information extracted from this body of research has helped build an overall picture of who would be more likely to die in a residential fire. This information has been presented in terms of demographics such as age, sex, and occupation, and has considered a number of risk factors.

Such research has been important in identifying individual factors that influence the start of fires and the tragic outcomes that occur for both survivors and victims. This knowledge is vital when constructing a human response model for predicting behavioural responses as well as the creation of safety education programs (Brennan, 1999).

Coronial evidence provides a more complete picture on the death and the events leading up to the death compared to fire brigade statistics. Generally, fire fighters only have knowledge of the events that occurred in the field during the fire incident. They do not have access to important information such as whether the victim had a mental illness. They are not likely to know whether the victim was incapacitated by alcohol and generally do not know at the time how the fire started and whether the victim was involved in the fire start. This in-depth qualitative information can only become known

through the Coronial investigation involving witnesses, expert witness, family and friends (Hallenstein, 1990). Coroner's have the ability to draw together large amounts of information from a number of different sources to give a comprehensive look at not only the cause of death but also the contributing factors (Hallenstein).

1.3 Current research

The current research has been organised into two studies. The first study is described in Chapters 2, 3, 4, and 5. This study investigated the risk factors for dying in a fire for the overall adult fire accident population. The second study described in Chapters 6, 7, 8 and 9, focused on the mentally ill and the aim was to examine whether the mentally ill compared to the non-mentally ill exhibited different risk characteristics. Chapter 10 provides a general discussion in which the findings from both studies are combined and discussed. Limitations and future directions are also discussed prior to the conclusion.

2.0 ADULT ACCIDENT FIRE FATALITY DATABASE: INTRODUCTION

For fire to exist there must be an interaction of fuel, oxygen and an ignition source. These elements are often united as a result of human behaviour (Barillo & Goode, 1996). There are certain environmental, behavioural and demographic characteristics of fire victims that have been shown to have universal relevance to residential fire fatalities (Gulaid, Sattin, & Waxweiler, 1988). Some of these factors can be linked to the cause of the fire, others to the inhibition of an effective response and some factors that are linked to both (Brennan, 1999). The following review will present the key risk factors for dying in a residential fire as determined by the known literature on fire death populations.

2.1 General risk factors

Studies have shown that fire fatality risk factors can include age (Brennan, 1999), being male (Marshall et al., 1998), living in poor quality housing, poor housekeeping that results in the prevention of safe egress during a fire, and engaging in risky behaviour likely to increase the risk of a fire starting (e.g., smoking, overloading power points) (Barillo & Goode, 1996). Other contributing factors include acts likely to inhibit a successful response (e.g., substance use, sleeping) and acts of omission (e.g., lack of

supervision of children who had access to smoker's materials, deadlocked doors with no ready access to the keys in an emergency) (Barillo & Goode; Brennan; Marshall et al.).

To develop an understanding of risk factors that put people at risk of dying in a fire it is necessary to review the literature on specific risk factors.

2.2 Specific risk factors

2.2.1 Sex

Brennan (1999) has shown that the Victorian Coronial data from 1990-1995 has shown that males made up 58% of these fire fatalities. Marshall et al. (1998) study indicated that 65% of victims were male. Barillo and Goode (1996) and Taylor et al. (2001) had similar findings of 59.8% and 60% respectively of fire victims being male. However, the literature has failed to compare these findings to the actual proportion of males in the population of these different countries. It is therefore very difficult to judge whether these figures are a true overrepresentation of males. It is possible that these figures are the same as the proportion of males in a given population and hence it is not necessarily a risk factor in these populations.

2.2.2 Age

From the coronial data and medical examiner reports, risk factors have emerged that show that the very young (<5 years) and the elderly (>65 years) are specifically at risk of dying in a residential fire (Brennan, 1999; Gulaid et al., 1988). Graham (1998) believes that the very young and older adults tend to be overrepresented in fire fatalities

as they often lack the capacity to undertake reasoned, independent escape action during a fire. Again no comparison had been conducted into census data to determine the actual proportion of those dying in residential fires to their actual proportion of the general population.

2.2.3 Individual health factors

Marshall et al. (1998) recognised that people with a mental illness are vulnerable to dying in a residential fire due to cognitive impairment but no explanation is given to why this might be. Runyan et al. (1992) and Marshall et al. found that having a physical or cognitive impairment was an important predictor of dying in a fire. Unfortunately, these studies failed to separate out the occurrence of physical or cognitive impairment. Therefore, it is unknown at this point whether it is the physical impairment, cognitive impairment or both that is the risk factor for dying in a residential fire.

2.2.4 Asleep or awake

Brennan (1999) found that 86% of fire death victims in her study were asleep during night time fires (8pm-8am) whilst interestingly 31% of victims were asleep during a day-time fire (8am-8pm). Brennan identified that three-quarters of those asleep never moved from their original location. This suggests that those who were asleep may have succumbed to the effects of the fire without ever waking. Even when smoke alarms were present they may not have been adequate to wake people who were asleep, smoke affected, impaired by alcohol or drug use, and the hearing impaired (Ball & Bruck, 2004).

2.2.5 Alone at time of fire ignition

Studies by Runyan et al. (1992) and Marshall et al. (1998) determined respectively that 52% and 41% of their victim populations were alone at the time of the fire ignition.

2.2.6 Intimate with the fire ignition

Brennan and Thomas (2001) using Brennan's 1999 Coronial data findings have suggested that 80% or more of fatal fires involved the victim being intimately involved with the ignition. Intimate with the fire was defined as the person being in close physical proximity to the fire ignition. Victims who dropped a cigarette on themselves, people whose clothes caught fire whilst cooking and those who fell onto heaters/open fires were considered intimate with the fire.

2.2.7 Not in paid employment

For fires that occurred in Queensland from 1991-1996, over half the victims were not in the workforce at the time (Department of Emergency Services, 2003). No other known study has identified not being in paid employment as a potential risk factor.

2.2.8 Time and season of fire

Barillo and Goode (1996) identified that 51% of fatal fires examined had an onset time between 11pm and 7am whereas 81% of Brennan's (1999) sample of fatal fires occurred between 8pm and 8am. Non-fatal residential fires in comparison had a peak incidence time of 6pm to 7pm coinciding with cooking dinner (Barillo & Goode).

Fire fatalities have an element of seasonal risk with fatal fires being more common during the winter months. These were most often due electrical accidents and overloading of power points (ABS, 2000; Barillo & Goode, 1996; Department of Emergency Services, 2003; Gulaid et al., 1988).

2.2.9 Smoke alarms

Runyan et al. (1992) determined in their study that only 18% of fatal house fires had a smoke alarm present at the time of the fire. Marshall et al. (1998) found working smoke alarms were installed in 10% of the 155 fatal fire households reviewed. From the 94 Victorian fatal household fires examined by Brennan (1999), alarms were determined to have operated in 5% of these households.

2.2.10 Cigarette smoking

Smoking materials have been implicated in the majority of fire fatalities (Barillo & Goode, 1996; Brennan, 1999). Interestingly though, smoking materials are not the leading cause of non-fatal fires instead cooking, electrical, appliance and heating fires predominate in residential non-fatal fires (Fahy & Molis, 2004; Mierley & Baker, 1983; Taylor et al., 2001).

Data extracted by Stathakis and Scott (1999) indicated that the majority of fatal residential fires that occurred in Victoria between 1989 and 1995 were caused by a cigarette (62%) with almost 25% occurring as a result of smoking in bed and 8% as a result of a cigarette being dropped onto the victims' clothing.

Coronial data has shown that victims who have died as a result of a fire caused by a cigarette often had a history of falling asleep smoking, dropping lit cigarettes or not putting cigarettes out properly (Brennan, 1999; Brennan & Thomas, 2001). The previous experience of a fire did not change the behaviour. For each fire where the damage was limited and the fire had self-extinguished, the person has failed to recognise the danger and does not then modify or stop the behaviour (Brennan & Thomas).

In 132 fire fatalities examined by Brennan (1999), careless use of smoking materials was implicated in over half of these fatalities. A history of at least one other previous fire incident was found for seven of the 39 victims (17.9%) known to be drunk at the time. Of those where alcohol use was absent only two of the 65 victims (3%) had a previous history of careless smoking.

Data collected by the U.S. Federal Emergency Management Agency showed that smoking materials were responsible for 4% of all residential fires in 2002 (U.S. Fire Administration, 2005). However cigarettes were deemed to be responsible for 19% of all fatal fires. The fatality rate caused by smoking can be seen to be almost five times higher than the overall residential fire rate (U.S. Fire Administration).

Cigarette smoking combined with alcohol consumption has been found to increase the likelihood of the risk of a fire, fire injury and fire fatality (U.S. Fire Administration, 2003). Cigarette smoking whilst consuming alcohol represents a dangerous combination. Alcohol consumption decreases a person's chances of detecting, reacting, and escaping a fire (U.S. Fire Administration). There is an increased risk of the person falling asleep, becoming unbalanced and tripping over. The cigarette provides a potential ready-made fire ignition factor (U.S. Fire Administration).

Like Australia, cigarettes and tobacco products are the leading cause of fire deaths in the U.S.A. (Alpert, Carpenter, Connolly, Rees, & Wayne, 2005). As a result of the high rate of fatalities occurring due to inappropriately discarded smoking materials, the development of fire safe cigarettes has been initiated in New York. If the cigarette is not smoked, they will extinguish automatically by restricting oxygen to the burning ember (Alpert et al.). Fire safe cigarettes are now law in several American states.

2.2.11 Alcohol

In Brennan's 1999 Coronial study, 31.8% of the victims aged over 15 had a blood alcohol content of greater than 0.10g/100ml. Blood alcohol content (BAC) is measured in grams of alcohol per 100 millilitres of blood. Mierely and Baker (1983) established that 39% of their fire death population had a BAC over 0.05 whereas a study by Marshall et al., (1998) identified that 53% of their fire fatality sample were intoxicated with BAC readings over 0.11.

However, the role of alcohol in fire fatalities is often underestimated as BAC levels are not obtained from victims who do not die immediately but die later in hospital and in situations where it is not possible to obtain samples from the victim (Brennan, 1999).

Runyan et al., (1992) believed that the presence of an alcohol-impaired person was the strongest independent risk factor for dying in a fire when fatal fires were compared to non-fatal fires.

2.2.12 Drug use

Studies by Brennan (1999) and Marshall et al. (1998) indicated that victims were tested for drugs and that they believed some victims were likely to be impaired by drug and alcohol/drug use. However, neither study indicated exact numbers of people or types of drugs used. Impairment by drug use has been indicated as a risk factor in dying in a residential fire. As yet there has been no known in-depth analysis conducted into the types of drugs and interaction with each other and alcohol that results in a person being at risk of dying in a residential fire.

2.2.13 Underrepresented risk factors and gaps in the literature

There are potentially more risk factors that have yet to be explored. Certainly, more research needs to be conducted into the impact of cognitive and physical impairment to determine separately the actual risk potential of these factors for dying in a residential fire. A more in-depth study is required to examine the effect of a person's behaviour and mental health status and the risk of dying in a residential fire. Intimacy with the fire and whether or not victims were alone at the time of the fire are another two areas that are underrepresented in the literature. Not being in paid employment has received very little known research to date and yet it is an area that is certainly related to the fact that the elderly are at greater risk of dying in a fire. The elderly are not likely to be in paid employment due to their age.

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Behaviour prior to the fire ignition has not been examined in any known study. Examples are given of specific victim's irrational behaviour (Brennan, 1999; Fahy & Molis, 2004) prior to the fire but no study has analysed the behaviour displayed by the total fire death population

2.3 Aims

The initial aim was to develop a Coroner's database for all adult accidental fire deaths that occurred in Victoria between January 1998 and February 2005.

This Coroner's database was then used to analyse the data on fire deaths to enable interpretation and understanding of fire risks presented by different demographic, environmental and behavioural factors. These risk factors examined included being male, impaired health status (physical and mental), over the age of 65, night-time of fire (8pm-8am), winter, cigarette as the ignition factor, absence of a working smoke alarm, not in paid employment, alone at time of fire ignition, intimate with the fire ignition, being asleep at time of fire ignition, being a cigarette smoker, alcohol, and/or drug use. Further to this it was aimed to go beyond the known literature and investigate potential risk factors for dying in a residential fire including behaviour prior to the fire, history of careless smoking and smoking prior to the fire.

2.4 Hypotheses

It was hypothesised that the adult accidental fire death victims would demonstrate risk factors consistent with what has been presented in the literature. Risk factors were hypothesised to be specifically: being male, impaired health status (physical and mental), over the age of 65, night-time of fire (8pm-8am), winter, cigarette as the ignition factor, absence of a working smoke alarm, not in paid employment, alone at time of fire ignition, intimate with the fire ignition, being asleep at time of fire ignition, being a cigarette smoker, alcohol, and/or drug use. It was further hypothesised that factors not specifically identified in the literature including acting abnormally prior to the fire, history of careless smoking and smoking prior to the fire would prove to be risk factors in a fire death population.

3.0 ADULT ACCIDENTAL FIRE FATALITY DATABASE: METHOD

3.1 Database sample

An "overall" Coroner's database of fire death victims was constructed using Victorian Coroner reports for all fire related deaths from 7th January 1998 to the 27th February 2005. This database was developed utilising the resources of the Centre for Environmental Safety and Risk Engineering (CESARE)[1].

Initially, all victims who were identified as being part of a fire process were included in the "overall" database. Decisions were then made to exclude murder and suicide victims as the intent of this study was to explore the causes of accidental fire deaths. Neither suicide nor murder can be construed as accidental. Also excluded were those who died prior to a fire occurring and not as a result of the fire. Children were also excluded as the purpose of this study was to examine only adult accidental deaths. This created a database for all accidental fire deaths of people aged 18 and over.

From the initial 173 cases obtained from the Victorian Coroner' Court a total of 101 adult fatalities were identified where the death was not deliberate, but rather deemed by the Coroner to be accidental. The victims ranged in age from 20 through to 92 years of age, with a mean age of 56.8 (SD=19.6). There were no identified cases of fire fatalities for adults aged 18 or 19 years old. Table 3.1 presents the average age, age range and

[1] The candidate was one of a team of three researchers who developed the overall database. The candidate then created the Adult Accidental Fire Fatality Database from the overall database.

standard deviation of males and females for the Victoria University (VU) Coroner's Adult Accidental Fire Fatality Database.

Table 3.1.

Average age (years) and age range of males and females for the VU Coroner's Adult Accidental Fire Fatality Database (N=101).

	Total number (%)	Mean Age (SD)	Age range
Males	72 (71.3)	52.5 (19.3)	22-92 years
Females	29 (28.7)	67.5 (15.9)	20-85 years

As can be seen in Table 3.1 the majority of victims were male and were younger on average, than the female victims.

3.2 Database Sections

The VU Coroner's Adult Accidental Fire Fatality Database was constructed according to factors relating to four main areas. The four main areas, the fire incident, the witnesses, the escaped occupants and the victim each had variables that were specific to them respectively. The major variables have been summarised in Appendix A, Table A.1.

The fire incident section focused on the physical aspects of the fire, whereas the victim section considered behavioural, physical and demographic aspects. The escaped occupants and the witness sections described actions and locations of those who escaped and those witnesses who undertook an action to help victims before, during and after the fire.

3.3 Procedure

The VU Coroner's Adult Accidental Fire Fatality Database does not contain the names of the victims, rather an incident number was created by combining the date of the fire and the time of the fire to create a number that was unique to the fire incident. The majority of the information coded into the database was at a nominal level of measurement due to the qualitative nature of the data. For the fire incident itself, the U.S. National Fire Protection Association (NFPA) 901, Uniform Coding for Fire Protection was used to code information relating to the burnt structure, fire start/spread, materials that burnt and room of fire origin. This allowed consistency with international coding and industry standards.

Specific coding was developed by CESARE for the VU Coroner's Adult Accidental Fire Fatality Database, and included describing actions that occurred before and during the fire and observed behaviour prior to fire ignition. From a possible 100 variables, 19 variables were chosen to be the most relevant for this particular study based on previous research, for example time of fire (e.g., Brennan, 1999), alcohol (e.g., Marshall et al, 1998) and age (e.g., Gulaid et al., 1988).

3.4 Data analysis

Variables were included on the basis of having been identified in the literature as an established risk factor or perceived as a potential risk factor. Frequencies were recorded for these identified variables and all statistical assumptions were checked.

Appendix B contains the SPSS printouts for the univariate statistics and shows that no assumptions were violated. Chi-Square Test of Independence and relative risk ratios (RRR) were then calculated. Statistics were run using SPSS for Windows version 14.0 adopting an alpha of .05 for significance.

3.4.1 Coding

A person was determined to be mentally ill if there was a definite diagnosis (1) or if it was determined based on the qualitative evidence obtainable that there was the possibility of an undiagnosed mental illness (2) being present. To achieve a ranking of one, the Coroner's records had to reflect that there had been a recognised mental illness diagnosis made by a GP, mental health service, psychiatrist or other similarly qualified healthcare professional. A ranking of two was given to those cases where the qualitative evidence strongly suggested an undiagnosed mental illness. This information was obtained from police, friends or family, autopsy reports and psychotropic medication detected through a toxicology report. Information from family/friends or police may have demonstrated that the victim had a long history of alcohol abuse but the victim had never sort help and had never received a diagnosis of an alcohol disorder. It was important to prevent the database subgroups being invalid by placing potentially undiagnosed mentally ill cases into the control group. Appendix C provides a breakdown for every case and the ranking it was given (Table C.1). The victims were coded as *mentally ill (ranking 1 & 2) or no evidence of mental illness (ranking 4).* A victim was given a

ranking of three when the cause of death was not accidental, for example, suicide or murder.

The victim was classified as either acting normally (for them) or *abnormally* (yes/no) prior to the fire. Abnormal behaviour was defined using qualitative information obtained through the Coroner reports. If reports indicated that the victim displayed unusual behaviour leading up to the fire, then the victim was recorded as displaying abnormal behaviour. This included behaviours such as acting intoxicated before the fire or acting irrationally including refusing to leave during the fire.

Physical illness was initially categorised in terms of whether they had a heart/circulation/respiratory disorder, liver/hepatitis C disorder and other as these were the main types of illnesses present in the victims. For the final analysis the victims were either coded as yes or no for a *physical illness* being present.

The age of the victim was initially coded in age groups such as 18-44, 45-64, and over 65 years old. For the purpose of dichotomous coding, the victims were then placed into the *under or over 65 age group* as the existing literature had used over 65 years of age to refer to the elderly in the population.

Victims determined to be unemployed, retired, studying, home makers, or on a pension were coded as *not in paid employment*. All those who had part-time, full-time work or self-employed were deemed to be *in paid employment*.

All victims were placed in the category of whether or not they were *alone at the time of the fire.* A person was coded as being *intimate with the fire* if they were in the immediate vicinity of the fire for example if they dropped a lit cigarette on themselves, or they were cooking and as a result a fire started due to their clothes catching fire.

Assumptions were made for coding that the victim was *smoking prior to the fire* if the fire investigation report indicated that the fire started from a carelessly discarded cigarette/smoking material and there were no other smokers present in the house at the time. *A history of careless smoking* was recorded where witnesses presented information of previous fires caused by the victim smoking. This included statements about clothes/night gowns with cigarette burns, cigarette burns in furniture and carpet and previous fires.

Ignition factor was initially analysed using four possibilities: cigarette as ignition factor, combustibles to close to the heat, electrical (e.g., electrical fault) and other (e.g., fuel spilled). For the purpose of the final analysis, only a *discarded cigarette* (yes/no) was used as it was determined to be the largest contributor to fatal residential fires in previous studies.

Time of fire was analysed using a break-up to represent a day-time fire (8am-8pm), and a night-time fire (8pm-8am). For the final analysis, time of fire was coded as either a *day or night- time fire*.

Smoke alarms were initially coded as present and working, present and not working, not present, or not applicable. Not applicable represented circumstances where fires occurred in areas that a smoke alarm would not necessarily be found (e.g., house veranda, back yard). For the final analysis as dichotomous measures were needed it was felt that the *presence of a working smoke alarm* (yes/no) was of most interest. Where the smoke alarms were coded as not applicable they were placed into the "no" category.

Determination of alcohol and drugs being present was obtained from toxicology reports conducted on the deceased. A victim was coded yes/no for *blood alcohol content*

(>0.1g/100ml). None of the victims with alcohol in their system had a BAC less than 0.05. It was felt that those persons with a BAC over 0.05, based on the legal definition (Road Safety Act, 1986) were intoxicated.

The drug variable was, initially, condensed to indicate that a person had no drugs, prescription/illegal drugs, or multiple drugs in their system. The final analysis concentrated on whether *drugs were present* (yes/no), not what types were present. The drugs present in the victims included benzodiazepines, selective serotonin reuptake inhibitors (SSRI), tetracyclics, narcotic/analgesics, sedative/hypnotics and illegal drugs such as marijuana and heroin.

3.5 Tests of design issues

As the data in the Coroner's database was nominal, the Chi-Square Test of Independence was deemed to be the most appropriate non-parametric statistic to handle this form of data. The Chi-Square Test of Independence is simply a comparison of the observed frequencies and the expected frequency for each variable examined. It can only show that there is a significant association but not where the association lies. A significant Chi-Square statistic, i.e., $p<.05$, indicates the existence of the association between the explanatory variable and the response variable.

After identifying the association, the association was then measured using the relative risk ratio (RRR) (Cho, 1997). RRR were conducted on the variables where there was a significant Chi-Square association was found. This allowed a clearer picture of the differences between the two groups to be developed.

Simply put, the RRR is the probability of an event occurring in one group compared to another group. In a hypothesis testing framework, the null hypothesis is accepted if the relative risk ratio is one, alternatively if the risk factor excludes one then the null hypothesis can be rejected in favour of the alternative hypothesis (Jenkins, Bebbington, Brugha, Farrell, Lewis, & Meltzer, 2003). In other words, a relative risk of one indicates there is no difference between the groups. If the relative risk is greater than one, then there is more chance of the event occurring in the group of interest compared to the control group. Conversely if the relative risk is less than one, then the event is less likely to occur compared to the control group.

Critics of this approach have argued that to justify rejecting the null hypothesis the risk ratio should be greater than two. Davies, Crombie and Tavakoli (1998) argued that if the base level of risk is low, then a small proportionate increase in risk may have little practical significance. Thus, there are problems with the blanket approach of using two as it does not take into account base rates and sample sizes. This argument does not effect this current study as RRR were only run on variables where there was a significant association found after performing a Chi-Square Test of Independence and RRR findings under two were therefore accepted as significant on this basis.

3.6 Ethics approval

Ethics approval to proceed with the development of the VU Coroner's Adult Accidental Fire Fatality Database was obtained from the Victoria University Human Experimentation Committee in 2005 (Appendix D).

4.0 ADULT ACCIDENT FIRE FATALITY DATABASE: RESULTS

4.1 Descriptive statistics

Table 4.1 summarises the findings of the single coded variables that had yes/no response, for example mentally ill or not mentally ill. These results are presented as the identified risk factor, for example not being in paid employment. The results are presented in order of highest to lowest observed percentages. Cases where information was not available, for example where a BAC could not be determined on a victim because there was no toxicology report available, were excluded.

Table 4.1 *(Single coding) variable risk factors for the VU Coroner's Adult Accidental Fire Fatality Database.*

Variable	Observed percentage
Smoke alarm not present/not working	84.2
Not in paid employment	82.2
Alone at time of fire ignition	80.2
Male	71.3
Intimate with fire ignition	71.3
Asleep at time of fire ignition[2]	65.9
Time of fire (8pm-8am)[3]	59.8
Cigarette smoker	59.4
Blood alcohol content (>0.01g/100ml)[4]	55.4
Mentally ill	54.5
Cigarette smoking prior to fire ignition	52.5
Only drugs in system[5]	46.6
Physically ill	45.5
Abnormal behaviour prior to fire ignition[6]	34.3
History of careless smoking	13.8

From Table 4.1 it can be seen that the majority of the victims did not have a working smoke detector, were not in paid employment, were alone at the time of the fire ignition, were intimate with the fire ignition and were male. The majority of this fire death population were mentally ill.

Table 4.2 summarises the findings for variables with multiple responses. Multiple response variables included those variables with more than two responses, for example season of fire had four options for when the fire occurred.

[2] 19 cases were excluded as it was not known their asleep/awake status at time of fire
[3] 4 cases were excluded as time of fire was unknown
[4] 9 cases excluded where toxicology reports were not available or not undertaken
[5] 9 cases excluded where toxicology reports were not available or not undertaken
[6] 25 cases excluded where information was not obtainable on their behaviour prior to the fire

Table 4.2 *(Multiple coding) variable risk factors for the VU Coroner's Adult Accidental Fire Fatality Database.*

Variable	Observed percentages
Age groupings:	
18-44	31.7
45-64	27.7
> 65	40.6
Season of fire:	
Summer	19.8
Autumn	22.8
Winter	41.6
Spring	15.8
Ignition factor:	
Discarded cigarette	54.5
Combustibles too close to the heat	18.8
Electrical (electrical faults, short circuit, design fault)	12.9
Other (fuel spilled, improper fuelling technique, cutting/welding)	13.9
Alcohol and drugs[7]:	
Neither alcohol nor drugs	24.7
Alcohol and drugs	23.7
Either alcohol or drugs	51.6
Total: Alcohol and/or drugs	75.2

From Table 4.2 it can be seen that the elderly (aged over 65 years) were overrepresented in fatal fires. The fire fatalities were characterised by victims who had a fire started by a discarded cigarette. Over three-quarters of the fire death population had alcohol and/or drugs in their system.

Males were found to represent a very large proportion of these fire fatalities. In light of this unexpected finding, Chi-Square Test of Independence and RRR were run on a dichotomous database (Table 4.3) to determine what risk factors were associated with males being more at risk of dying in a residential fire compared to females. Variables are listed in Table 4.3 in order of the highest to lowest observed percentages found for males.

[7] 8 cases were excluded where toxicology reports were not available or were not undertaken

Table 4.3 *Variable percentages for male and female groups of victims.*

Variable	% in males	% in females
Smoke alarm not working/not present	87.5	75.9
Alone at time of fire ignition	83.3	72.4
Not in paid employment	76.4	96.6
Intimate with fire ignition	75.0	62.1
Asleep at time of fire ignition[8]	72.1	47.6
Cigarette smoker	66.7	41.4
Night-time fire (8pm-8am)[9]	66.2	44.8
Blood alcohol content (>0.01g/100ml)[10]	62.7	36.0
Cigarette as fire ignition factor	62.5	34.5
Cigarette smoking prior fire ignition	61.1	31.0
Only drugs in system[11]	43.3	48.0
Acting abnormally[12]	50.0	20.0
Physically ill	47.2	41.4
Age: > 65 years	29.2	69.0
Alcohol and drugs in system[13]	25.0	20.0
History of careless smoking	22.2	27.6

It can be seen from Table 4.3 that the majority of male fire fatality victims were aged less than 65 years at the time of their death whereas the majority of female victims were aged over 65 years. An independent t-test with alpha level set at .05 showed that there was a significant difference between the mean age of males and females dying in a residential fire ($t(99)=-3.68$, $p=.001$). More fire victim males were smoking cigarettes before the fire than females who died in a fire. Male fire victims were also most likely to have been drinking or to have taken drugs prior to the fire compared to the female fire fatality victims.

[8] 18 cases were excluded when it could not be determined if they were asleep/awake at the time of the fire
[9] 4 cases were excluded as the time of fire was unknown
[10] 8 cases were excluded as BAC levels were not obtained or not available
[11] 4 cases were excluded as Toxicology reports were not obtained or not available
[12] 25 cases were excluded as there was no information available on their behaviour prior to the fire
[13] 8 cases were excluded as Toxicology reports were not obtained or not available

A series of Chi-Square Tests of Independences were then run to determine which of the identified variables had a significant association. RRR were then run on those variables with a significant Chi-Square. The Chi-Square Test of Independence and RRR results are presented in Table 4.4. Variables were presented in order of highest to lowest RRR findings.

Table 4.4 *Chi-Squares and RRR for males and risk factors.*

Males	χ^2	*p*	RRR	95% CI
Acting abnormally before fire ignition	5.44	.03	2.50	1.00-6.24
Cigarette smoking prior to the fire ignition	7.50	.01	1.97	1.11-6.24
Cigarette as the fire ignition factor	6.54	.02	1.81	1.06-3.09
Blood alcohol content (>0.01g/100ml)	5.25	.03	1.74	1.00-3.03
Age of victim (under 65)	13.58	.01	1.66	1.21-2.28
Cigarette smoker	5.48	.03	1.61	1.01-2.56
Not in paid employment	5.74	.02	0.79	0.68-0.92
Asleep at time of fire ignition	4.17	.06		
Night-time fire (8pm-8am)	3.85	.07		
Smoke detector not working/not present	2.10	.23		
History of careless smoking	0.33	.61		
Physical illness	0.29	.66		
Alcohol and drugs in the system	0.25	.79		
Drugs in system	0.16	.81		
Alone at time of fire ignition	1.55	.27		
Intimate with fire ignition	1.69	.23		

From Table 4.4 it can be seen that males who died in a fire were more likely to in paid employment compared to females who died in a fire. Males who died in a fire were also more likely to have been behaving abnormally before the fire, be smoking cigarettes prior to the fire ignition, have a cigarette as an ignition factor, have alcohol in their system, be less than 65 years old and be a cigarette smoker compared to the female fire fatality victims.

5.0 ADULT ACCIDENT FIRE FATALITY DATABASE: DISCUSSION

5.1 Hypothesis outcome

It was hypothesised that adult accidental fire death victims would demonstrate a number of risk factors for dying in a fire. Frequency analyses identified and confirmed that being male, mentally ill, not in paid employment, alone at time of fire ignition, asleep at time of fire ignition, intimate with fire ignition, being a cigarette smoker, smoking cigarettes prior to the fire, not having a working smoke detector, being aged over 65 years old, night-time fire, fire occurring during winter, having alcohol and/or drugs in their system were all likely to be risk factors for dying in a fire. Having a history of careless smoking and acting abnormally were not identified as risk factors for this fire death population.

5.2 Overall risk factors

The finding that over 71.3% of fire victims were male was consistent with previous findings that males were overrepresented in residential fire fatalities (Barillo & Goode, 1996; Marshall et al., 1998; Taylor et al., 2001). The fact that males were overrepresented in fatal residential fires is further supported by the fact that males only constitute 49% of the Victorian population (ABS, 2001).

RRR indicated that males who died in a fire were 0.79 times more likely than females who died in a fire to be in paid employment. Therefore, not being in paid employment was not identified as a risk factor for males. Male fire victims were found to be significantly younger than female fire victims at the time of their death. RRR showed that male fire victims were more likely to be behaving abnormally prior to the fire, cigarette smokers, smoking prior to the fire ignition, have a cigarette as the ignition factor and to have consumed alcohol prior to the fire. These risk factors have been implicated in fire fatalities (e.g., Brennan, 1999; Stathakis & Scott, 1999) and the fact that male fire victims were shown to undertake these behaviours more so than female fire victims put them at greater risk of dying in a residential fire. Females had a different set of risk factors related to being aged over 65 years.

A Cause-specific analysis conducted by Berkman, Melchior, Chastand, Niedhammer, Leclerc, and Goldberg (2004) found that socially isolated men had an elevated risk of dying from an accident (relative risk = 3.54) compared to men who were not socially isolated. Socially isolated men have also been found to be more likely to smoke (Berkman et al.). Being social isolated they are not engaging with their community and are often sitting at home with no real connection to other people and what is happening around them (Berkman et al.).

Being elderly (> 65yrs) was shown to be a risk factor as they comprised 40.6% of this fire death population. This was consistent with previous findings of Gulaid et al. (1988) and Brennan (1999). The elderly (>65yrs) make up only 12.6% of the Victorian population (ABS, 2001). This indicates that people aged over 65 years are at a much higher risk of dying compared to their proportion in the general population. Normal

ageing in itself makes the elderly more susceptible to dying in a fire. The elderly are likely to have a reduced sense of smell, slower responses, increased forgetfulness (that can be related to them forgetting to put a cigarette out or leaving combustibles too close to a heater) and their physical and mental responses tend to be slower preventing successful evacuation from occurring (Gulaid et al.).

The majority of this fire death population (54.5%) were demonstrated to have a mental illness. It has been well documented that the mentally ill are more likely to die an unnatural death (Eastwood, Stiasny, Meier, & Woogh, 1982; Gau & Cheng, 2004; Hiroeh, Appleby, Mortensen, & Dunn, 2001) and dying in a residential fire is just an extension of the risks this section of the population face (see Study 2).

Unlike Runyan et al. (1992) and Marshall et al. (1998) findings that 52% and 41% respectively of fire victims were alone at the time of the fire, this study established that 80.2% of the victims were alone at the time of the fire. This result may tie in with the finding that the overwhelming majority of accident fire victims (82.2%) were not in any form of paid employment. This finding is more than double the Victorian figure of 39% of the adult population being unemployed or not currently in the labour force (ABS, 2001). This group of people included the unemployed, retired, pensioners and home makers and the possibility of social isolation is a real possibility for these people.

Brennan and Thomas (2001) have suggested that as high as 80% or more of fatal fires involved the victim being intimate with the ignition, and the results of this study (71.3%) supported this claim. This intimacy with the fire has implications on whether smoke alarms would have helped in these scenarios. Unless the victim was asleep or

unconscious they would have been instantly aware of the fire situation and a smoke detector would not have changed the outcome.

The majority of fatal residential fires (59.8%) in this sample occurred between the hours of 8pm and 8am. It appears that since Brennan (1999) conducted her Victorian Coroner research and found that 81% of fatal residential fires occurred during the hours of 8pm and 8am, that there has been a substantial reduction in deaths occurring at night.

Winter fire fatalities in Queensland from 1991-2000 made up 55% of the accident fire fatalities investigated by the Department of Emergency Services (2003). Winter (41.6%) was also found to be overrepresented in Victorian fatal fires in this study. This not an unexpected finding as people tend to be inside more during the colder months using heaters, electrical appliances that might be faulty or too close to combustibles and this may result in a fire. During summer if people are drinking and smoking they are more likely to be outside and are less likely to cause a fire if they drop a lit cigarette. However, in winter the weather tends to restrict these activities to inside the house. Houses are closed up more during winter resulting in poor ventilation and this leads to the victim being overcome more easily by smoke.

Working smoke alarms were only present in 15.8% of the fires reviewed and this was similar to Runyan et al. (1992) findings of 18%. Considering that in 1992 smoke alarms were not as prevalent as they are now it was expected that this study's findings should have had a higher number of working smoke alarms. This indicated that for this fire death population the fire safety messages of having and maintaining a working smoke alarm have either been ignored or were not received. However, compared to Brennan's Victorian Coroner study in 1999 these findings do represent a substantial

increase in the number of working smoke alarms, as she reported only 5% of fire deaths that occurred from 1990-1995 had a working smoke alarm.

These results showed that in 15.8% of these fatalities a working smoke alarm was present and people still died. It is not discernible through the Coroner reports at what stage of the fire these smoke alarms operated and it is possible that by the time they did operate it may have already been too late for the victims due to smoke inhalation, clothes igniting or safe egress being no longer possible. Many of the victims who had a working smoke alarm were under the influence of alcohol and/or drugs and it has been shown that people who are under the influence of alcohol may fail to wake up to the current types of smoke alarms (Ball & Bruck, 2004).

The finding that 55.4% of this fire death population had a BAC over 0.05mg/100ml was higher than the levels found in previous Coronial studies of 32% (Brennan, 1999) and 39% (Mierely & Baker, 1983). It is also interesting to note that the alcohol intoxicated victims in this current study all had a BAC greater than 0.05mg/100ml. This finding indicated that this particular population were not just having a couple of drinks but rather they are drinking to the point where they are deemed to be legally intoxicated. Drinking is not uncommon in Australia with over 80% of the population having consumed alcohol at some point in the last 12 months. However, of this figure only 19% drank in a way that was considered to be risky or harmful (Australian Institute of Health & Welfare, 2005).

More people were observed acting normally (65.7%) before the fire than those deemed to be acting abnormally (34.3%). As many of these fire victims were alone at the time of the fire it is not possible to know how 25% of this fire death population were

behaving prior to the fire. Considering the high number in this fire death population that had alcohol and/or drugs in their system (75.3%), acting abnormally could very well be related to alcohol and/or drug usage. An example of a fire death victim acting abnormally involved a male aged in his early 20's who refused to leave a fire that started in his lounge room. He was intoxicated at the time and his room mate described him as dancing and singing around the fire. When the room mate tried to get him to leave the young man ran back further into the house and subsequently died from smoke inhalation.

Alcohol is well known to inhibit precautionary behaviour that under normal circumstances would minimise the likelihood of fire ignition and death. A person under the influence of alcohol and/or drugs may fail to consider or respond to potential consequences of a smoke detector alarming or other fire cues such as smoke. Consequences of drinking alcohol and/or drug use can lead to careless acts such as failing to put out a cigarette properly, while alcohol associated with physical impairments could lead to falling over and/or passing out whilst holding a lit cigarette.

As in previous studies, cigarette smoking materials were implicated in the majority of residential fires (Barillo & Goode, 1996; Brennan, 1999; Fahy & Molis, 2004; Mierley & Baker, 1983; Taylor et al., 2001). Cigarette smokers represented 59.4% of this fire death population yet cigarette smokers make up only 20% of the Victorian population (Durkin, Germain, Letcher, & Lipscomb, 2005). Males in Victoria are more likely to smoke (23%) compared to females (17%) (Letcher, Bobevski, Black, Lipscomb, & Durkin, 2004). In this fire death population it was confirmed that males were 1.6 times more likely to have been cigarette smokers compared to the female victims.

5.3 Justification for further study into the mentally ill

Due to the finding that the majority of this database were determined to be mentally ill and the lack of published relevant research into this area it was felt that a further study was required. This further study will rectify this gap in the literature. As the mentally ill represent one of the most vulnerable groups in society it was important to further investigate risk factors that might be placing the mentally ill at a higher risk of dying in a fire. This information can then be used to design public prevention strategies aimed at this group of the population.

6.0 MENTAL HEALTH STATUS DATABASE: INTRODUCTION

6.1 Mental illness

It was identified in the initial study that the mentally ill represented the majority (54.5%) of the Victorian accidental fire death population from 1998 to 2005. However, there has been no known research into the occurrence of accidental fire deaths in people who had a mental illness. People with a mental illness are quoted as being vulnerable (Marshall et al., 1998) due to cognitive impairment but there has been no known research into what makes this group of people vulnerable and potentially at risk of dying in a fire.

It is difficult to define what constitutes a mental illness as it is subject to interpretation. This has come about as there are legal, medical and laymen definitions. Even the Diagnostic and Statistical Manual of Mental Disorders-IV-TR (DSM-IV-TR) (2005) recognises the difficulties in defining mental illness. No definition has been able to adequately determine precise boundaries for the concept of mental illness. For the purpose of this study mental illness was defined as a condition that seriously impairs, either temporarily or permanently, the mental functioning of a person both in thoughts and/or behaviour (Beumont & Carney, 2004). This condition may result in an inability to cope with life's ordinary demands and routines.

It is necessary to understand that there are different definitions as this has an impact on the research that is being conducted. If different definitions and standards are

being used it is possible that this impacts on the results that are subsequently found. This will have an effect on the relationship of these results to other studies and whether the findings agree or not.

It is also important to understand this current definition as it goes to the heart of what puts the mentally ill group of people at risk of dying in a fire. It is difficult for this group of people to cope with what the rest of the population manage day in and day out (Beumont & Carney, 2001). Those behavioural mechanisms that keep people safe are possibly not available to mentally ill people.

6.2 Mental illness and accidental death

Studies have shown that there is a high risk of accidents and accidental death in people with mental disorders and that those with psychiatric disorders are overrepresented in the fatal accident statistics (Bayard-Burfield, Sundquist, & Johansson, 1998; Gau & Cheng, 2004; Hiroeh et al., 2001; Holding & Barraclough, 1975, 1977). The most prevalent conditions for increased risk of accidental death appear to be depression, alcoholism and drug abuse Furthermore the risk of accidental death is found to be much higher again when there are a number of comorbid conditions present (Gau & Cheng; McDonald & Davey, 1996).

Findings by Hiroeh et al. (2001) identified that there is a high risk of unnatural death in all mental disorders and specifically in people who are alcoholics and/or drug users. Gau and Cheng's (2004) also found risk of accidental death was significant for substance abuse disorders (largely alcoholism). Specifically, the research has shown that

this risk for unnatural death was greatest for co-morbidity when presented with a substance use disorder and another mental disorder (Bayard-Burfield et al., 1998; Hiroeh et al.).

Eastwood et al. (1982) have shown that people who had a mental illness had from a two fold to a 50 fold risk of dying an early death. When compared to the general population they found mentally ill people were at greater risk of dying in an accident and/or by a violent death. Those with affective disorders and alcohol/drug addictions were found to be at highest risk of unnatural death (Eastwood et al).

A review of risk factors in Norwegian former peacekeepers ascertained that alcohol related accidental deaths resembled suicides with respect to the known risk factors for suicide (Thoresen & Mehlum, 2004). Importantly, these two groups had in common mental health problems, unemployment and that the accidental group was characterised by self-destructiveness or a reduced interest in their own safety.

In a study of 110 London Coroner reports into accidental deaths, Holding and Barraclough (1997) identified that 60% of those who died were classified as mentally ill before their death. Depression, alcoholism or drug abuse was identified in three-quarters of the accidental death victims. Holding and Barraclough (1975) utilising London Coroner reports of undetermined deaths identified that a high proportion of these deaths were preceded by a serious mental illness. Within this group 55% were determined to be legally intoxicated at death. In a subgroup that died from accidental poisoning it was found that 65% of these fatalities had mixed alcohol with psychotropic drugs. Holding and Barraclough concluded in their 1975 study that a mental disorder was directly

implicated in many of these deaths. Having a mental illness often led to risk taking behaviour, especially in the taking of medication and consumption of alcohol.

6.3 Mental illness and non-fatal accidents

There has been little known research into whether there is an increased risk of the mentally ill suffering more non-fatal accidents than the mentally healthy population. McDonald and Davey (1996) reviewed the research into mental illness and the risk of having an accident including being burnt or involved in a traffic accident. McDonald and Davey defined an accidental injury as "an unintended or unforseen proximal outcome of an individual's behaviour which leads to a physical injury to that individual of sufficient severity to warrant medical attention" (p. 106). McDonald and Davey considered this definition for non-fatal accidents suitable as it implied lack of intent and that the injuries were unintentional and this distinguished these cases from suicide and self-harm. It also made the distinction that accidental injury occurred as a result of the person's actions rather than the actions of another.

McDonald and Davey (1996) established that unlike an increased risk across all psychiatric disorders in accidental death there was only an increased risk of accidental injury in personality disorders and alcoholism. A significant risk was not found for those suffering from anxiety and depressive disorders. The characteristics of an antisocial disorder and alcoholism may make a person more vulnerable to experiencing an accident than when these conditions were not present. This could be associated with maladaptive

ways of coping with the effects of stress by using emotion-focused coping that results in a lack of awareness of their surroundings (McDonald & Davey).

The causes of traffic accidents have been extensively researched in the general population. The effects of alcohol, drug use and personality characteristics have been investigated, particularly in reference to a person's ability to perform tasks involving attention and motor control and these factors have been found to impact on a person's driving ability (Beirness, 1993; Leigh, Tong, & Campbell, 1977). According to Armstrong and Whitlock (1980) there has been no relationship found between mental illness and road traffic accidents when alcohol is not a factor.

McDonald and Davey (1980) proposed that there is a link between psychopathology and accidental injuries. The prevalence of psychiatric disorders was found to be higher in those who had experienced accidental injuries when compared to the general population. Surprisingly they found that anxiety and depression were not seen in inflated numbers in accidental injury. This finding may have been related to the authors' inclusion criteria of only a diagnosed DSM-IV illness. This may have led to underestimating the effects as possible cases of undiagnosed anxiety and depression were not taken into account.

6.4 Mental illness and alcohol/drug use

There is a significant relationship between mental illness and alcohol use (Virgo, Bennett, Higgins, Bennet, & Thomas, 2001; Westreich, 2005). According to the DSM-

IV-TR (2005) the diagnosis of alcohol dependence or abuse is no different than any other mental illness and as such alcohol/drug dependency is recognised as a mental illness.

Westreich (2005) determined that greater than 20% of people who had a mental disorder also suffered from alcohol abuse or dependency, and that this alcohol abuse can cause or exacerbate a wide variety of psychiatric syndromes. Furthermore, those with a diagnosed alcohol dependency (53%) also had a co-occurring diagnosed mental disorder (Westreich). Virgo et al. (2001) have also found a high prevalence of co-morbidity for alcohol and/or cannabis abuse with a mental disorder. Use of mind altering substances was found in 20% of the seriously mental ill adults investigated and one-third had experienced problematic substance use in their lifetimes (Virgo et al.).

People with comorbid diagnoses tend to have more extensive and severe problems than those who do not. This group of people, due to the nature of their conditions, tend to pose more risks to themselves and others and they are also likely to display higher levels of aggressive behaviour (Bradizza & Stasiewicz, 2003; Sher, Oquendo, Galfalvy, Grunebaum, Burke, Zalsman, & Mann, 2005; Virgo et al., 2001).

Approximately 24% of people in the United Kingdom with a severe mental illness diagnosis used alcohol/or drugs at a problematic level in the preceding 12 months (Graham, Maslin, Copello, Birchwood, Mueser, McGovern, & Georgiou, 2001; Virgo et al., 2001). It is worth noting in these studies that only 50% of these patients recognised or accepted they had a comorbid alcohol substance disorder (Virgo et al.).

6.5 Mental illness and cigarette smoking

The mentally ill are also more likely to be cigarette smokers. Approximately 21% of the Australian population smoke tobacco (Lasser, Boyd, Woodhandler, Himmelstein, McCormick, & Bor, 2000). People suffering from a mental illness, however, are two to three times more likely to smoke cigarettes, compared to the general population (Lasser et al.; Lucksted, McGuire, Postrado, Kreyenbuhl, & Dixon, 2004). An Australian study conducted by Kavanagh (2000) found that patients with a mental illness demonstrated drastically elevated cigarette smoking rates of 60% compared to the 2000 general population figure of 21%.

6.6 Mental illness in Australia

It has been reported that 20% of Australians will at some time in their life be diagnosed with a mental disorder. In Victoria this figure is slightly lower at 17.3% with a similar finding for rate of mental illness in both men and women (ABS, 1998). A further 40% are estimated as being undiagnosed for a mental illness at some point in their lives (Department of Health & Ageing, 1995). It can be inferred that as many as 60% of the Australian population could be impaired with a mental illness at some point in their life. Thus, studying if and why the mentally ill group may be particularly at risk of dying in a fire has important community, social and nationwide implications.

6.7 Aims

The aim was to determine whether the mentally ill group of victims (ranking 1 & 2) were more likely to be cigarette smokers and to have consumed alcohol and/or drugs prior to the fire ignition compared to the non-mentally ill group of victims. These variables were derived from the existing literature on known mental illness behaviours.

Variables investigated in the VU Adult Accidental Fire Fatality Database were used to determine if the MI had different risk factors for dying in a fire compared to the NMI. The variables included age of victim, sex of victim, physical illness, behaviour prior to the fire, history of careless smoking, cigarette as an ignition factor, cigarette smoking prior to the fire ignition, employment status, smoke alarms, time of fire (day/night), intimate with the fire, sleeping at time of fire ignition and alone at the time of the fire.

6.8 Hypotheses

It was hypothesised that the MI group would have significantly different risk factors than the NMI group. It was hypothesised that the MI group would be more likely to be cigarette smokers and to have consumed alcohol and/or drugs prior to the fire compared to the NMI group of people.

Further comparisons between the MI and the NMI were made on a number of risk factors including age of victim, sex of victim, physical illness, behaviour prior to the fire, history of careless smoking, cigarette as an ignition factor, cigarette smoking prior to the

fire ignition, employment status, smoke alarms, time of fire (day/night), intimate with the fire, sleeping at time of fire ignition and alone at the time of the fire. As these factors had not previously been mentioned in the relevant literature no directional hypotheses were formulated.

7.0 MENTAL HEALTH STATUS DATABASE: METHOD

7.1 Database sample

From the VU Adult Accidental Fire Fatality Database (N=101) two groups were created. Each group contained a specific subgroup of victims representing different populations within the context of a fire death population. There was a control group of those deemed not to have a mental illness (NMI) and those who were determined to have a mental illness (MI) based on the qualitative evidence (see 3.4.1 for details on the methodology of classification). These two distinct groups were created to allow a comparison to be performed to highlight risk factors that were significant for the MI. Table 7.1 summarises the observed percentages of the sex and age of the MI and NMI groups.

Table 7.1. *Summary of observed percentages of the sex and average age (SD) of the MI and the NMI groups (N=101).*

	MI	NMI
Males		
Observed percentage	58.3%	41.7%
Average age (SD)	49.2 (14.5)	57.2 (24.1)
Female		
Observed percentage	44.8%	55.2%
Average age (SD)	64.0 (14.6)	70.3 (16.8)

The MI were overrepresented in this fire death population. It can be seen from Table 7.1 there were more males who died in a fire with a mental illness than without. Female fire death victims were slightly less likely to have a mental illness. MI males and females were on average younger than their NMI counterparts at time of death. MI males were also younger on average compared to the female MI and NMI victims.

7.2 Procedure

The procedure for this study included the same procedures discussed in the previous VU Adult Accidental Fire Fatality Database study. In a number of cases where the information was not available for a particular variable, these cases were excluded from the chi-square and relative risk ratio analyses. Excluded cases are indicated in Table 8.2.

7.3 Data analysis

Variables were included on the basis of having been identified in the literature as an established risk factor or perceived as a potential risk factor. Coding of the identified variables for the current study was the same as described for the VU Adult Accidental Fire Fatality Database with all variables converted into dichotomous variables (see 3.4.1 for details on the methodology of classification). Frequencies were recorded for these identified variables and all statistical assumptions were checked. Appendix E contains the SPSS printouts for the univariate statistics and

shows that no assumptions were violated. Chi-Square Test of Independence and relative risk ratios (RRR) were then calculated. Statistics were run using SPSS for Windows version 14.0 adopting an alpha of .05 for significance.

8.0 MENTAL HEALTH STATUS DATABASE: RESULTS

8.1 Descriptive statistics

Table 8.1 presents the findings for the observed percentages for those victims with a diagnosed mental illness, possible mental illness and no mental illness evident in the qualitative data.

Table 8.1. *Observed percentages of diagnosed, possible mental illness and no evidence for mental illness.*

	Observed percentage
Diagnosed mental illness	30.7
Possible mental illness	24.8
No mental illness evident	44.6

As can be seen from table 8.1 those victims with a diagnosed or possible mental illness constituted the majority of this fire death population.

Table 8.2 presents each of the hypothesised variables for the MI and the NMI groups. Variables were listed from highest to lowest frequency in the MI group.

Table 8.2. *Variable observed percentages for MI and NMI groups of victims.*

Variable	% in MI	% in NMI
Smoke alarm not working/not present	89.1	88.3
Alone at time of fire ignition	87.3	71.7
Not in paid employment	83.6	80.4
Asleep at time of fire ignition[14]	79.1	51.3
Cigarette smoker	78.2	37.0
Cigarette as fire ignition factor	72.7	32.6
Blood alcohol content (>0.01g/100ml)[15]	71.2	35.0
Intimate with fire ignition	70.9	71.7
Cigarette smoking prior fire ignition	70.9	30.4
Drugs in system[16]	60.4	23.1
Acting abnormally before fire ignition[17]	60.0	16.7
Night-time fire (8pm-8am)[18]	52.8	43.2
Physically ill	43.6	47.8
History of careless smoking	38.2	6.5
Alcohol and drugs in system[19]	37.7	5.0
Age: > 65 years	25.5	58.7

It can be seen in Table 8.2 that the majority of the MI group were aged less than 65 years old at the time of death with this finding reversed in the NMI group. An independent samples t-test with alpha at .05 found that the MI (M=52.7) were significantly younger than the NMI (M=61.7) at the time of death ($t(99)=-2.3$, $p=.03$).

The majority of the MI were acting abnormally before the fire, they were more likely to be cigarette smokers, to have consumed alcohol and/or drugs prior to the fire compared to the NMI fire fatality victims. The majority of the MI were more likely to be asleep at the time of the fire ignition, to have a cigarette as an ignition factor, to be

[14] 18 cases were excluded when it could not be determined if they were asleep/awake at the time of the fire
[15] 8 cases were excluded as BAC levels were not obtained or not available
[16] 25 cases were excluded as there was no information available on their behaviour prior to the fire
[17] 4 cases were excluded as Toxicology reports were not obtained or not available
[18] 4 cases were excluded as the time of fire was unknown
[19] 8 cases were excluded as Toxicology reports were not obtained or not available

smoking prior to the fire ignition, and have a history of careless smoking compared to the NMI fire victims.

RRR were run on the 10 variables that were found to have a significant Chi-Square association. The results for the 16 Chi-Square analyses as well as the 10 RRR performed on those variables that had a significant Chi-Square result are summarised in Table 8.3. Results are listed in order of highest to lowest RRR.

Table 8.3. *Chi-Square Test of Independence and RRR for the MI group and the NMI group.*

Variable	χ^2	*P*	RRR	95% CI
Alcohol and drugs in the system	15.07	.01	7.89	1.96-31.81
History of careless smoking	13.86	.01	5.86	1.86-18.39
Acting abnormally before fire ignition	14.89	.01	3.60	1.66-7.80
Only drugs detected in system	15.49	.01	2.83	1.52-5.27
Cigarette smoking prior to the fire ignition	16.45	.01	2.33	1.46-3.72
Cigarette as the fire ignition factor	16.26	.01	2.23	1.43-3.48
Blood alcohol content (>0.01g/100ml)	12.68	.01	2.08	1.32-3.30
Cigarette smoker	17.65	.01	2.12	1.42-3.16
Age of victim (under 65)	11.48	.01	1.81	1.24-2.63
Asleep at time of fire ignition	7.02	.01	1.54	1.10-2.17
Alone at time of fire ignition	3.81	.08		
Smoke alarm not working/not present	2.20	.18		
Sex (male)	1.52	.27		
Night time fire (8pm-8am)	1.12	.57		
Physical illness	0.18	.69		
Not in paid employment	0.18	.80		

As shown in Table 8.3, a Chi-Square Test of Independence indicated that there was a significant association between a person's mental health and 10 of the variables of interest. When RRR were conducted, three variables in particular indicated a much higher risk of occurrence in the MI group of fire death victims compared to the NMI group of fire death victims. The MI group were much more likely to have combined alcohol and

drugs prior to the fire than the NMI group. It is also worth noting that the MI group were more likely to have had a history of careless smoking and were more prone to have been acting abnormally prior to fire ignition compared to the NMI group of victims. The MI were also more likely to have had drugs in their system, to have been smoking a cigarette prior to the fire ignition, have a cigarette as an ignition factor, to have drunk alcohol prior to the fire, be cigarette smokers, aged under 65 years and be asleep at time of fire ignition compared to the NMI group of victims.

9.0 MENTAL HEALTH STATUS DATABASE: DISCUSSION

9.1 Hypotheses outcomes

It was hypothesised that the MI group were more likely to have consumed alcohol and/or drugs prior to fire ignition and to be cigarette smokers compared to the NMI. This hypothesis was supported.

It was further hypothesised that the MI would have significantly different risk factors than the NMI. This hypothesis was partially supported. Significant risk factors for the MI compared to the NMI were found to be: cigarette smoking prior to fire ignition, cigarette as the ignition factor, history of careless smoking, acting abnormally prior to fire ignition, asleep at time of fire ignition, and aged less than 65 years of age.

9.2 MI risk factors

As identified in the previous VU Adult Accidental Fire Fatality study, the MI made up 54.5% of this fire death population. It was found that 30.7% of this fire death population had a confirmed mental illness diagnosis including diagnoses of depression, alcohol related disorders and anxiety disorders. This was a higher finding than the current estimate of 17.3% of the Victorian population suffering from a diagnosed mental illness (ABS, 1998). The finding that 24.8% of this fire death population had an undiagnosed

mental illness is a concern as it is a reflection of the problem in the community of people going undiagnosed and untreated.

A number of risk factors were found to have a significant association for the MI when compared to the NMI. This was not surprising considering the findings from previous studies into the mentally ill and their increased likelihood to be cigarette smokers (Lasser et al., 2000; Lucksted et al., 2004), at risk of accidental death (Bayard-Burfield et al., 1998; Gau & Cheng, 2004; Hiroeh et al., 2001; Holding & Barraclough, 1975, 1977), and to abuse alcohol and drugs (Westreich, 2005).

The MI were demonstrated to have a number of risk factors that were more likely to put them at risk of dying in a residential fire when compared to the NMI. In support of findings from previous studies (Brennan, 1999; Marshall et al., 1998; Runyan et al., 1992) it was found that the MI compared to the NMI had a 2.83 times increased chance of having drugs in their system and were 2.08 times more likely to have consumed alcohol prior to their death.

When the MI used alcohol and drugs together their risk of dying in a residential fire increased substantially to 7.89 times more likely to occur compared to the NMI. This finding is related to the fact that their combining alcohol and drug medication together could lead to a situation where they became drowsy and disorientated whilst smoking a cigarette. Many of this fire death population, in particularly the MI group, had benzodiazepines, selective serotonin reuptake inhibitors (SSRI) and sedatives/hypnotics in their systems. Benzodiazepines are a class of tranquilizers/sleeping pills that are prescribed for anxiety disorders, panic disorders, and sleeping problems (Comerford, 2003). Combining alcohol and benzodiazepines leads to an increased Central Nervous

System (CNS) depression and drinking alcohol whilst taking these drugs is not recommended (Comerford). SSRI are a class of antidepressant and were found in 18% of this fire death population. SSRIs and alcohol use also leads to CNS depression and drinking alcohol is discouraged whilst using this medication (Comerford). Depression of the CNS leads to drowsiness, dizziness, lethargy, daytime sedation and confusion. These are all factors that can result in a fire occurring especially if the person is a cigarette smoker. They are more likely to fall asleep whilst smoking or become confused as to whether they have put it out or not.

A MI victim was 3.6 times more likely to have been acting abnormally before the fire compared with the NMI. From the Coronial reports it was hard to determine at times whether a person who was reported as acting abnormally were doing so because of their mental illness, alcohol or substance use or even some other factor that was unknown. This abnormal behaviour within the MI group could be explained by alcohol and/or drug use that has known effects on a person's behaviour as previously discussed. As the MI were more likely to be on prescription medication for their psychiatric disorders it makes sense that combining this with alcohol would lead to abnormal and risky behaviour.

The MI group were 2.12 times more likely to be cigarette smokers and 2.33 times more likely to have been smoking prior to the fire compared to the NMI group. Even though the MI group were only 2.12 times more likely to be cigarette smokers they were 5.86 times more likely to have a history of careless smoking compared to the NMI. A history of careless smoking has implications in hazard recognition and consequent behavioural change and this appears to have been impaired in this group of people.

The MI were found to be significantly younger at the time of their death compared to the NMI fire death victims. In particular the MI group were 1.92 times more likely than the NMI group to be aged less than 65 years of age. This age discrepancy appears to be related to the type of behaviours a person exhibited rather than age related factors that the MI were more likely to undertake compared to the NMI fire death victims. These behaviours included mixing alcohol with drugs, being cigarette smokers, cigarette smoking prior to the fire, acting abnormally and being asleep at the time of the fire ignition. This is consistent with Eastwood et al. (1982) finding that the mentally ill had a tendency to die younger from an unnatural death compared to those without a mental illness.

9.3 MI and NMI similarities

The MI and NMI groups had a lot of risk characteristics in common that were determined not be significant for either group. This is supported in the findings from the VU Adult Accidental Fire Fatality Database. Both groups tended to be intimate with the fire, were alone at the time of the fire, and in paid employment. Males were overrepresented in both groups, neither group were found to be different for having a working smoke alarm, and being alone at the time of the fire was also not significantly different between the two groups. Physical illness was also not found to be a risk factor for either group. These similarities themselves provide valuable information on these two groups of victims and as a result help build up a picture of those most at risk of dying in a residential fire.

It is worth noting these similarities between the MI and NMI groups. The overall database represents a population different to a population representative of Victoria, Australia. A number of risk factors including being male, not being in paid employment, cigarette smoking, and alcohol use were found to be in much higher numbers in this fatal fire group compared to their occurrence in the Victorian population (ABS, 2001). As has been discussed these findings have major implications for the mental health community and those responsible for getting the fire safety message across.

10.0 GENERAL DISCUSSION

Findings from the VU Adult Accidental Fire Fatality Database have supported previous research findings. The first study has added to the body of knowledge, especially in terms of recognising the risks of dying in a residential fire for males and the mentally ill. The second study has identified risk factors that put the mentally ill at a higher risk of dying in a fire compared to the non-mentally ill. To date there are no known programs aimed at person and behaviour risk factors and as shown in this current research these are the factors most likely to put people at risk of dying in a residential fire. The value of the current findings is that they reinforce that this situation needs to be addressed.

10.1 Limitations

A limitation of this study involved the types of information that were obtained and how it was presented. The Coroner reports were limited in the information they contained. As these reports were compiled by different people, information was readily obtainable in some, obscured in others, or missing completely. This may have had some effect on the results. For example, instances where toxicology reports were not run or available accounted for 8.9% of all cases in this fire death population. This prevented an accurate number to be determined on all victims who had consumed alcohol and/or drugs.

10.2 Future Directions

The current findings would aid those responsible for the delivery of the fire safety message and the mental health community to further investigate the way they can work together to develop prevention and education programs aimed at reducing the risk of dying in a fire for those identified at greatest risk.

Unfortunately as Coroners have been focused on establishing the cause of a death and the events leading up to the death there is often little focus on the survivors of these fatal fires. Having this information would enable a comparison to be conducted on what characteristics may differentiate survivors from victims. Knowing more about the survivors and what made them different to the fire victims may provide valuable data. This data can then be used to design prevention and education programs for those in the population who have been identified as most at risk. Specifically plans need to be implemented addressing the issues of fire safety to males, the mentally ill, cigarette smokers, alcohol and/or drug uses, those not in paid employment, people living alone and the elderly.

The creation of a National Coroner's Database would generate a much larger database and this would allow greater validity to be achieved for these findings. Certainly, more research is required in the area of mental illness and the risk of dying in a fire with a particular focus on examining risk factors in combination.

With the introduction of self-extinguishing cigarettes to many states of America research is needed to be conducted into the actual efficacy and preventative nature of these cigarettes in fires and whether smokers are actually adapting to and using these

types of cigarettes. Studies (e.g., Barillo & Goode, 1996; Brennan, 1999), including this current one, have shown lit cigarettes are responsible for the majority of fatal residential fires that have occurred. Therefore, anything that can potentially reduce the danger of a lit cigarette resulting in a fire has to merit significant interest. If these self-extinguishing cigarettes are effective, and more research is needed to determine this, then Australia needs to seriously consider following the U.S example of introducing them and legislating their use here.

As interesting as the concept of self extinguishing cigarettes is, it still only addresses the action rather than the social and behavioural aspects that lead certain people to develop a history of careless smoking. One way to address the social and behavioural aspect of careless smoking is to develop a Hotline where relatives or friends of people who have had incidences of small fires caused by a cigarette can report the event. This would enable the fire brigade to either contact these people themselves or involve social workers to visit them to try and educate them in the dangers of this behaviour. The fire department would then be able to target individually those most at risk of dying in a fire due to a carelessly discarded cigarette and potentially prevent these people from becoming a fire death statistic. This Hotline does not necessarily have to be confined to just being a reporting system of those with a history of careless smoking. It could also be used by any person who identifies someone they know as being at risk of dying in a fire. This is where the value of knowing the risk factors for dying in a fire becomes evident as these risk factors can be identified to the public through the promotion of the Hotline.

When at least 55% of residential fire fatalities occurred as a result of one type of ignition factor it is evident that this is an area that should be concentrated on both from an

education and prevention point of view. There have been no known fire prevention campaigns targeted at cigarette smokers and the implications of smoking and residential fires. Past education programs have instead concentrated on environmental fire factors such as ‘change your clock, change your smoke battery’ a campaign used at the end of day light saving or have an evacuation plan that is practiced by your family.

10.3 Conclusion

This study on adult accidental fire fatalities highlights that many of these victims represent the most vulnerable people in our society including the mentally ill, the unemployed, pensioners, retirees etc. It is possible that some of these fatalities may have been avoided by the presence of a working smoke alarm especially for those people who were unimpaired by alcohol and/or substance use. Unfortunately though, working smoke alarms are only a partial solution and the real issues involve the social, environmental and behavioural characteristics of people at risk.

It needs to be recognised that current education and prevention programs are aimed at the general public to raise their awareness of potential hazards around the home and the need for a working smoke detector. This has been shown by the fact that 84.2% of this fire death population did not have a working smoke alarm. A smoking alarm may have been present but it had been disabled in some way for example the battery had been removed or not replaced. This provides evidence that for this fire death population the fire safety message has not been received, understood or even considered relevant for a

number of reasons including mental illness, substance use or being aged over 65 years (e.g., the elderly may have difficulty changing the smoke alarm battery).

The fact that the MI constituted a large proportion of this fire death population has important implications not only to those responsible for getting the fire safety message across but also to the mental health community and the part they play in identifying and treating the MI. It has been well documented that the MI are more likely to die an unnatural death (Eastwood et al., 1982; Gau & Cheng, 2004; Hiroeh et al., 2001) and dying in a residential fire is just an extension of the risks this portion of the population face. The MI have a number of risk factors shown to increase the likelihood of a fire fatality occurring. They are less likely to have the same coping and life skills the rest of the population utilise every day (Beumont & Carney, 2004). As a result of their mental illness their actions and behaviours during the fire may not take a rational and life saving approach.

As such there needs to be a stronger focus on issues of detection and treatment of mental illness and alcohol/substance abuse disorders rather than simply on fire safety issues. Rather the fire safety message needs to be more specific and directed towards those parts of the population identified as being most at risk of dying in a residential fire. For there to be a change in a person's behavioural patterns the person first needs to recognise that they are putting themselves at risk. Victims of this fire death population who have had a history of careless smoking demonstrate that they have not recognised that they are putting themselves at risk. The fact that that was no disastrous consequence to their actions enabled these people to believe that they were okay and hence the behaviour continued.

These results clearly indicate that many of these fatal residential fires occurred as a result of the victim's own actions and behaviours. This is not a victim blaming statement rather it acknowledges that for the majority of victims the fire has resulted not because of an unpreventable act but rather due to an act that could only have occurred as a result of the victim's own actions. For example, when a person is intoxicated they are less likely to put a cigarette out properly, or due to combining alcohol with drugs there is a much higher likelihood of a person falling asleep whilst smoking. Being intoxicated or mixing alcohol with drugs impairs a person's cognitive functioning that can lead to irrational decisions being made during a fire or preventing them from undertaking a safe and timely evacuation.

It is necessary, though, to point out that not all people are equally susceptible to dying in a fire and there are different risk factors that come into play. Similar to previous studies, the current study has also demonstrated that a fire will occur due to a number of risk factors working in combination rather than in isolation. These risk factors include environmental risk factors such as the lack of a working smoke alarm, night-time fire, and winter. These had an impact firstly, on whether a fire occurred and secondly, whether it developed into a fatal fire. There are also person risk factors that include not in paid employment, alone at time of fire ignition, being male, mental illness, being asleep at time of fire ignition and physical illness which had an impact on a fire starting and the potential for a fatality occurring. Behavioural factors also contribute to the outcome of a fire and include smoking cigarettes, alcohol and/or drug use, and acting abnormally.

The MI combined alcohol and prescription medication even though the medication had warnings about mixing with alcohol. This finding has implications for the

medical profession prescribing the different types of medication. This result might indicate that the victims may not have been aware of the dangers of combining the medication with alcohol or if they were they did not realise the consequences of combining the two, becoming drowsy as a result whilst smoking a cigarette. The mixing of alcohol and drugs was by far the biggest finding of this study in the MI group and it demonstrates that future studies need to go beyond single risk factors and concentrate on identifying risk factors in combination. Risk factors do not necessarily occur in isolation. It is more likely that a number of risk factors interact with each other to create a fatal fire event. This would allow a clearer picture to develop on why people die in residential fires.

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Table A.1. Summary of the fire incident, witnesses, escapees and victim major variables

Fire incident	Witnesses	Escapees	Victim
Type of property and occupancy	Gender	Whether involved in the fire start	Demographics – sex, age, occupation
How alerted to fire	Location before and during the fire	Location at ignition, during fire and after	Involved in fire start
Total people in property at time of fire	Action taken during the fire	Activities during the fire	Behaviour observed before the fire
Area of fire origin		Injured and if so type of injury	Location, activity and condition - before, during and after the fire
Fire cause		Legal consequences after the fire	Physical condition before, during and after the fire
Ignition factors, equipment involved, types of materials ignited, form of heat ignition			Contributing factors
Method of extinguishment			Pre-existing condition – physical, mental illness, disability, other conditions
Fire detectors present			Fire motive
			How escaped and conditions preventing escape
			Alcohol/drugs detected in system
			Coroner's finding – fire and death

Table C.1. Mental illness ranking

Case number	1. Definite diagnosis	2. Possible diagnosis	3. Unsure/suicide/ murder	4. No indication of MI
104601			Suicide	
135800				Social drinker, but not excessive
147300	Relapsing unipolar depression – discharged from hospital 11 days before death			
191200		GP diagnosed her as possibly in early stages of dementia		
198900				Nothing found to indicate any MI
202700		Taking temazepam, no GP reports found though, wife says he had a mental breakdown 18yrs prvsly and admitted to psych ward		
236000	GP report and under psych service care – depression, anxiety, dysthymic disorder, obsessive			

	personality			
245600				Diazepam was noted in his blood system but no indication in the coroner report of any prior MI
269400		Reported by niece as having suffered depression over the years and having a drinking prob for last 37yrs -no other family statements taken		
272400	Diagnosed with histrionic personality problems and benzodiazepam addiction by BHCG psych services			
268600				No evidence of prior or current MI
286300	Heroin drug user on community based order - long time user with convictions			
290000	GP- suffering depression			

	secondary to social isolation and having breast cancer			
303300			Child	
327300			Child	
373400		Heavy marijuana use		
753/754/755/756-03			3 murders, 1 suicide	
267/03		Described by friends and acquaintances as an alcoholic		
231/02			Suicide – note left	
869/01 625/01			Murder and suicide	
2825/03			Suicide	
3054/04			Suicide	
3217/3218-02			Double murder	
4021/02			Suicide	
4208/04			Suicide	
483/98			Child	
1910/98		Sister reports heavy drinking history (1-2 bottles spirit/night)		
2385/98		Family report history of heavy drinking		
2443/99				No MI – regular but not heavy drinker
3067/98				No MI
717/04			Suicide	
1131/03			Suicide	
1571/04			Suicide	
2139/03			Suicide	
2172/04			Suicide	

238302			Suicide	
22900			Child	
27900				No MI
41600	Hospital: dementia and anxiety disorder			
105300		Family confirm history of alcoholism		
106000				No MI – arson
1085				No evidence of MI
1103/1104/1105-00			Children	
112004	History given by family, GP, salvation army			
112200	History: depression, alcoholism by GP and family			
119803	History: mental illness, chronic alcoholism – GP, family			
135603	History: MI and alcoholism by GP, family			
136201				No evidence of MI
147603			Suicide	
161001				No evidence of MI
161101			Child	
172603		History of binge drinking and drug use given by family		
194101				No

				evidence of MI
196099	History: chronic alcoholic – numerous hospital admissions			
212801		History of heavy drinking given by brother/ friends		
216103	Diagnosed schizophrenic			
225701		History of heavy drinker – family		
243302				No evidence of MI
2434/2435-02			Children	
254302	Definite medical diagnosis of drug & alcohol abuse			
271001			Possible suicide	
278199			Child	
284502	Definite diagnosis: depression, anxiety, psychotic			
284903				No evidence of MI
285501		History of serious drinking problem given by friends		
293401			Unsure whether MI at time, also unclear whether	

			suicide	
293602			Child	
306202			Deliberately lit fire and wouldn't leave	
333599	Definite diagnosis: schizophrenia, alcoholic			
334099				No evidence of MI
336002				No evidence of MI
361802	Definite diagnosis: hospitalisation for alcohol/drug abuse			
362602			Probable suicide	
381103			Suicide after killing her mother	
393002		History of alcohol abuse given by family		
410003				No evidence of MI
17898			Possible suicide – cant rule out	
34398				No evidence of MI
150798			Child	
151698			Child	
192598		History of alcohol abuse given by family		
28103		History of alcohol problems attending AA		

		meeting		
290103		History of alcohol problems given by family/friend		
349003				No evidence of MI
95904				No evidence of MI
216604	Definite diagnosis by GP: depression			
230004				No evidence of MI
233104			Suicide	
240104				No evidence of MI
251404	Definite diagnosis: depression/ anxiety			
285704	Definite diagnosis: depression			
337704		History given as heavy drinker, anxiety		
337604				No evidence of MI
350504				No evidence of MI
356404				No evidence of MI
359104				No evidence of MI

13698			Possible suicide	
40998			Possible suicide	
93698			Suicide	
208098			Suicide	
227698				No evidence of MI
302098		History of alcoholism given by family/friend		
16705	Definite diagnosis: depression, alcoholism			
937/938/939-05			Children	
116605	Definite diagnosis: alcoholism, anxiety, depression			
135199				No evidence of MI
199605		History of alcoholism given by family/friend		
224398			Suicide	
409804			Suicide	
456304				No evidence of MI
420804			Suicide	
2774/98				No evidence of MI
235/236-99			Children	
110799				No evidence of MI
1321/99		History of drug abuse		
1508/99				No evidence of MI

1509/99				No evidence of MI
1510/99			Child	
1514/99				No evidence of MI
1821/99				No evidence of MI
2550/99			Suicide	
49701			Murdered	
385402				No evidence of MI
389202		Family history: depressed before fire		
391602		History of depression, alcohol abuse		
394702				No evidence of MI
105403			Suicide	
401504		History of alcohol abuse		
2499			Possibly died before fire	
3459	Definite diagnosis by GP			