Strategies in Increasing Smoke Alarm Compliance

Sponsoring Agency: Metropolitan Fire Brigade

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1 Abstract

This project, delivered to the Metropolitan Fire Brigade, Melbourne, Australia, developed strategies to improve compliance with legislation requiring household smoke alarms. Research, interviews, and analysis of fire statistics identified several at-risk groups. Current community education programming was compared to similar programs worldwide. Enforcing legislation was found to be effective in raising compliance. The team identified productive partnerships to reach groups at risk, identified internal organizational barriers, and framed guidelines for the design of educational programs.

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7 Executive Summary

Smoke alarms have been proven effective in reducing fatalities in household fires by providing early detection and warning to a building's occupants. The goal of this project was to assist the Metropolitan Fire Brigade in creating strategies to increase the number of homes in Melbourne, Australia, with working smoke alarms.

This goal was met with a series of recommendations developed from research into behavioural response to risks similar to house fires, analysis of data from house fires in Melbourne, and interviews with professional staff of the MFB. Those recommendations include:

- Enforce smoke alarm legislation among rental properties.
- Educate hard-to-reach groups by forming partnerships with professional organizations.
- Continue targeting groups identified as at risk for having no working smoke alarm.
- Schedule community events with backup presenters.
- Update programming routinely with fire fighter input.
- Keep more detailed statistics to identify at risk groups and track program effectiveness.
- Pre-evaluate any potential community educational programming using guidelines developed by this team.

Data from the Australasian Incident Reporting System (AIRS) was used to identify renters as a group at risk of not having a working smoke alarm. From 2001-2005, 36.5% of all fires occurred in rental homes. Of those homes, 31.3% did not have a working smoke alarm. Since only 25% of Melbourne residences are rental properties, renters face above average risk of not having a working smoke alarm. Furthermore, data from the AIRS was used to determine the ten worst Melbourne postal codes in terms of failure to have smoke alarms installed in houses.

Examining both bicycle helmet and seatbelt use found that enforcement of legislation was very successful in increasing compliance. The MFB itself had a serious problem with false alarms caused by system maintenance in the late 1980's, resulting in legislation to allow billing for false alarms. Through enforcement, the MFB recorded a 50% drop in false alarms over a 15 year time span. Rental properties can be classified as commercial properties, and local councils (who carry the burden of enforcement) could educate renters and landlords about their responsibilities, and enforce the ordinance. Education coupled with enforcement could increase compliance among this high risk group.

Forming partnerships will also help to educate accepted high risk groups. Members of the Real Estate Institute of Victoria (REIV) could ensure that there is a working smoke alarm in place before renting or selling a property, and explain the responsibility of maintenance to new tenants. Such a partnership would target renters and homeowners, both identified as at risk groups. Another effective partnership could be through insurance companies. While no discount in premium is possible as smoke alarms are required by law, there is the possibility of a reduced claim payout if no working smoke alarm is found following a fire.

A third partnership opportunity is with medical professionals, as the health and safety advice of this group is often valued. Doctors and nurses could educate their patients about the importance of home fire safety, and posters, brochures, and other materials could be placed in offices. This method would be especially effective in reaching the elderly, an accepted at risk group who visit doctors often.

The MFB targets various accepted at risk groups with specific programming. To maintain the current level of compliance, this educational programming should be maintained to make information available to Melbourne's diverse population.

Public education events could be scheduled with backup presenters or across several stations. In the case of an emergency alarm the non-responding unit would be

able to cover the event, and the community's respect for the MFB would remain high. To address the monotony of repeatedly presenting the same programming to the same target groups, programming could be updated regularly and re-evaluated for effectiveness. Fire fighter feedback should be encouraged, and their unique insight into program presentation techniques should be incorporated into these updates. This will also give a sense of ownership over these programs, and encourage fire fighter buy-in to the message they are presenting.

More detailed statistics could be kept following incidents of fire. A supplement to the AIRS data was created, with questions to further identify at risk groups such as particular cultures, age, and socio-economic standing. Questions to discern if the household had received any of the MFB's community education were also added.

Pre-evaluation was determined to be the most effective method of forecasting potential program effectiveness for the MFB. Guidelines that the MFB could use to pre-evaluate the effectiveness of any new or proposed programming were developed. By adhering to these guidelines, the MFB can ensure that resources are allocated only to effective community education programs, as well as compare program effectiveness objectively without regard to the message promoted.

These recommendations are feasible and attainable, and offer the best return on investment for the MFB. They are also easily implemented with little to no disruption to current operating procedures. Through these recommendations, the MFB has the potential to see an increase in smoke alarm compliance.

To create these recommendations, the following project methodology was used:

- Identified the groups of people that are at risk for not having a working smoke alarm.
- Reviewed and analysed community education programs in use by the MFB and other similar organizations.
- Identified areas for improvement within the MFB.

Studies of worldwide fire data identified several demographic groups as being at risk for low smoke alarm usage. In Melbourne, interviews conducted with members MFB staff employed in the development, delivery, and management of community education found that these accepted at risk groups were corroborated and targeted by MFB community education programming.

It was also found that the MFB relies heavily on anecdotal information, and has very little concrete data backing up these assumptions of at risk groups. Therefore, AIRS statistics kept by the MFB were used as a means of identifying these groups. Comparing the owner's address with the actual address of the fire, identified which homes had been rented, and more importantly, which homes had operational smoke alarms at the time of the fire. As no data was available to concretely identify other at risk groups, it was concluded that the only way to increase compliance was to target the general population of Melbourne.

Staff interviews also helped to examine the community education programs currently in use by the MFB, as well as programs in use by similar fire organizations around the world. Public safety campaigns relating to seatbelts and bike helmets were also researched to compare the effects of legislation on compliance and different delivery methods. These results were the basis for several partnership recommendations. Reviewing MFB literature yielded further information on community education programs, and fire services throughout the world were also contacted and asked to contribute.

Guidelines to pre-evaluate effectiveness of programming were collected from staff interviews, and corroborated by background research. These results were catalogued into a uniform format, ensuring that future employees of the MFB will be able to research and compare any proposed programming, and to correct any problems before presenting it.

By referencing information gathered throughout the project, internal barriers to compliance were identified. The internal barriers identified were:

- Attitudes and motivations of fire fighters
- Priorities of upper/middle management and in fire stations
- Tension between administration and fire fighters
- Communication throughout the chain of command
- Not enough detailed statistical data for a baseline of compliance or identifying at risk groups

The aforementioned recommendations were created in response to data gathered from the Australasian Incident Reporting System, fire safety (and general safety) organizations from around the world, and interviews with MFB staff. Included within this report are detailed write ups of the project's methodology, results, conclusions, and most importantly, recommendations.

8 Introduction

Fires are of particular concern in metropolitan areas where the majority of structures are privately owned and the loss of human life and personal property has a great impact on the population. Due to the close proximity of the buildings in an urban area, fire has an increased chance of quickly spreading out of control. In recent years many new fire-related safety devices have become popular, including fire alarms and smoke alarms. Smoke alarms have been proven effective in reducing the number of fatalities due to household fires, an important fact since 90-95% of fire fatalities are caused not by the heat of the fire, but rather from smoke inhalation. With the early detection and warning that these devices provide, the occupants of a building have more time to evacuate and call for help.

Ideally, every home in Melbourne would have a working smoke alarm installed. Studies show that smoke alarms are effective, but many choose not to use them or fail to keep them operational. Despite statistics on how they can save lives, studies done in Melbourne and other cities suggest that there is a significant number of people that do not have operational smoke alarms in their homes.

The Australian Bureau of Statistics (ABS) conducted phone surveys of the city of Melbourne, and 96% of the respondents reported that they had a working smoke alarm in their home. “These findings, however, are contradicted by the data collected by the MFB when they respond to fires. MFB experience indicates that 30% of residences (homes and apartments) have no smoke alarms at all, and 4% of homes have smoke alarms that are non-functional.” (Barnett, 2006). Australian laws require any building built prior to 1997 to have a battery powered smoke alarm installed, and any building built after 1997 must have smoke alarms hard wired into the main power source, with a battery backup. A violation of this regulation carries a $500 AUD fine (Victoria Building Commission *et al.* 2003). The existence of such regulation would lead one to believe that most people would be motivated to install and maintain smoke alarms. Despite the fact that studies seem to show that smoke alarms provide the early warning that can save lives in the event of a

fire, barriers to the adoption and use of safety devices exist. Particular socio-economic and demographic groups are at higher risk for non-compliance with such safety devices, and it is the education of these groups that is the concern of the MFB. The key issue to be addressed through the project is developing strategies to increase smoke alarm compliance among target demographics such as the elderly, the young, and people with English as their second language.

The goal of this project is to assist the MFB in developing strategies to reach the groups of people who have a low level of smoke alarm compliance in their homes. To accomplish this end result, the project identified the groups of people and barriers or reasons for their non-compliance, researched the current risk communication programs in use by the MFB and those used by other organizations, compared the MFB's programs to different programs used elsewhere, determined barriers and possible areas for improvement, and then used the information gathered to make suggestions to improve compliance. The general approach to gathering a better understanding of strategies to reach the targeted demographic groups was interviews of organizations that provide risk communication programming to the targeted demographics. This is an appropriate approach, given that there is a chance that other organizations might have tried different strategies that the MFB has yet to attempt. Through the research completed, the MFB stands the chance to employ new strategies that could increase smoke alarm compliance in the general population.

This report begins with a significant amount of literature review on identified at risk groups elsewhere in the world, and risk communication strategies used elsewhere. The methodology describes the steps completed to finish the research onsite at the MFB, and the findings of on site research are found in the data and analysis section. Conclusions and recommendations addressing them are explained in the final section.

9 Literature Review

Smoke alarms are an important fire protection measure that can be used in both commercial and residential properties to alert inhabitants of the presence of fire in their surroundings. Considering the fact that 90 to 95% of all fatalities in fires are not caused by heat but rather smoke, smoke alarms play a vital role in making people aware of potential danger (Metropolitan Fire and Emergency Services Board, 2003). In an ideal world, all buildings in Melbourne, Australia would have working smoke alarms installed in required locations, but unfortunately this isn't the case. The Australian Bureau of Statistics, Australia's national statistical service, conducted telephone surveys of a random sampling of the population of the city. The findings of their survey showed that 96% of respondents claimed that they had a working smoke alarm installed in their home. Based on statistics gathered by the MFB upon inspecting homes responded to for fire distress (2000-2004), there is some discrepancy in the number of actual homes with working smoke alarms versus the previous telephone survey. In 30% of the fires responded to by fire fighters, there were no smoke alarms present in the structures in question. Of the remaining 66% of structures that had alarms present, 4% of those devices were not operational due to varying causes (Barnett, 2006).

Throughout this literature review, information concerning smoke alarms was examined to gain a better understanding of potential barriers to compliance with regard to the population. Of primary concern were the various types of smoke detection devices, the uses of each type, how and where they should be installed, and the regulation pertaining to the building code of Melbourne. Next, a review of the role risk perception plays in the decisions that a person makes was also investigated. In order to have a better understanding of the target demographics of this project, the results of surveys that focus on the demographics of smoke alarm compliance will be reviewed along with the techniques that promote statistically valid samplings. Of interest to the project was whether or not the same demographic groups were at risk for having low smoke alarm compliance regardless of their city or country of residence. Basic guidelines regarding

the evaluation of community education programming were investigated to obtain an understanding of the necessary steps in determining program effectiveness.

9.1 Smoke Alarms

9.1.1 Types of Smoke Alarms

A smoke alarm is a device designed to detect the early signs of a fire and emit an audible or visual warning, usually in the form of a very loud siren. Smoke alarms are compulsory and must be installed in residential buildings on or near the ceiling of every storey (Victoria Building Commission *et al*. 2003). Ranging from $10 to $50 (AUD), smoke alarms can be purchased in many home appliance and hardware stores as well as directly from a manufacturer and either come hard wired into the structure or are generally easy to install.

There are two types of smoke alarms, each using a different method of smoke detection and each able to detect a different type of fire. The first type of alarm uses photoelectric technology to detect large smoke particles. Many slow burning fires, such as those that occur when cooking (burning a piece of toast, for example) or by a lit cigarette dropped on a couch, produce relatively large particles of smoke (on the order of 0.3 microns and larger.) A photoelectric smoke alarm consists of a light source facing a receptor device, with an empty space between the two. When smoke enters the space, the beam of light emitted by the source (usually a light-emitting diode) is broken up and blocked by smoke particles. The photo-sensitive diode registers a change in the amount of light being received from the LED and triggers the audible alarm (Kidde, Australia).

The second type of alarm uses a process called ionization to detect particles of smoke that are invisible to the human eye (as small as 0.1 micron.) Particles this small are generally produced by fast-burning flare-ups, such as a fire caused by an electrical short circuit. An ionization smoke alarm works by using a radioactive source (most commonly Americium 241) to ionize the air between two electrically charged plates (a positive and a negative.) Air particles become ionized, with positively-charged ions attaching to the negative plate and negatively-charged ions attaching to the positive plate.

When smoke particles enter the ionized airspace, ionized particles collide with smoke particles and attach themselves. As more and more smoke particles enter the area, the overall voltage of the plate's increases. A monitoring device in the smoke alarm compares the voltage of the ionized section with that of a completely separate reference chamber, and when an imbalance is measured, the alarm is set off (Kidde, Australia).

Each of the two types of smoke alarms are each designed to detect a certain type of fire, so it is important to remember that location is important during installation. Since photoelectric alarms are more proficient at detecting the particles produced by a slow burning fire, they should be placed in areas where this type of fire is likely to occur, such as the kitchen. An ionization alarm is more sensitive and should be kept away from these areas, as other small particles such as steam or paint fumes may set off the alarm (Kidde, Australia).

9.1.2 Installing/Maintenance of Smoke Alarms

There are two methods of installing smoke alarms: hardwired and battery. For many newer houses, Australian building code dictates that smoke alarms must be hardwired into a house's main power supply, with a 9 volt battery backup. This means the alarms are physically wired into the house's wiring, a task that should be done only by a licensed electrician. A benefit to hardwired smoke alarms is that when one alarm is set off by smoke, the rest of the devices that are wired into the network will be set off as well, a lifesaving feature if it is difficult to hear the kitchen alarm from an upstairs bedroom or a distant, secluded area of the house. Also, a hard-wired alarm does not require routine battery changes, and the back-up battery will ensure that the alarm will work even if the building looses power.

The simpler alternative to a hardwired smoke alarm is a battery-powered device, which only requires a 9-volt battery to operate. This type of alarm can easily be mounted by any able-bodied person. One of the most important limitations in using battery-powered smoke alarms, however, is the need to change the battery at least once a year. When the battery's charge gets low enough, the alarm will begin to beep once every 20

seconds or so, prompting the owner to replace the drained battery with a fresh one. It is also important to note that hardwired alarms, while hooked into the electrical system of the building, also require a battery that can serve as an auxiliary power supply should the power fail during a blackout or similar circumstance. Conversely, battery-powered alarms can be hardwired into a home to provide the complete-network coverage of normally-hardwired smoke alarms.

When installing a smoke alarm in a home, there are two important considerations: (1) a sufficient number of alarms to ensure coverage of the entire home; and, (2) proper placement of alarms to maximize their effectiveness. Fire protection agencies in many countries recommend at the very least one smoke alarm on each floor of a home. Ideally, smoke alarms should also be installed in each bedroom and in the hallways outside the bedrooms, as well as in common areas such as living rooms and kitchens, and at the tops and bottoms of stairwells (BRK Electronics, 2001).

It is just as important to know where *not* to put smoke alarms as it is to know where to put them. On ceilings, alarms should be installed as close to the centre of the room as possible, to avoid the dead-air pockets that form close to the walls. Alarms on walls should be between four and twelve inches from the ceiling, and alarms on sloped or peaked ceilings should be three feet away (horizontally) from the top of the peak (BRK Electronics, 2001).

Due to their sensitive electronics, smoke alarms should not be installed near any source of steam or dampness, such as a shower or dishwasher. Also, any air stream that may channel particles produced by cooking should be avoided, as it will cause the alarm to go off when there is no threat of fire. Areas with extreme temperatures (below 4ºC and above 38ºC) should be avoided as well, since this may dull the sensors, making the smoke alarm less effective. In addition to dust and dirt, insects may also clog the sensors of the alarm, and therefore it is best to avoid areas that contain insects. Finally, it is important to remember that, while dead-air pockets should be avoided, excessively drafty spots (such as air vents or windows) are poor locations for alarms as well, since moving

air may prevent smoke particles from reaching the sensors inside the device (BRK Electronics, 2001).

A smoke alarm is only effective when properly maintained. Although the maintenance required to keep a smoke alarm is minimal, opting to not follow such procedures could cause the device to work improperly. It is important to never paint over a smoke alarm and to clean it monthly with a vacuum equipped with a brush attachment to loosen and remove any dust and debris that has built up. Also, the batteries in smoke alarms should be tested at least once a month. Smoke alarms are equipped with a "Test" button that tests all the components of the device to determine if it is still operating at a sufficient level of sensitivity. Batteries in hardwired units should also be tested at least once a month.

9.1.3 Regulations Concerning Smoke Alarms

Various regulations govern the type and placement of smoke alarms, depending on the nature and use of a structure. The *Building Code of Australia 1996* distinguishes among five types of structures (Victoria Building Commission et al, 2003):

- Class 1a: Detached houses, row houses, town houses, terrace houses or villa units
- Class 1b: Some boarding houses, guest houses or hostels
- Class 2: Buildings containing sole-occupancy units (e.g. apartments, blocks of flats)
- Class 3: Backpacker accommodation, residential parts of hotels or motels, residential parts of schools, accommodation for the aged, disabled or children
- Class 4: Dwellings in non-residential buildings (e.g. houses attached to shops).

Each of the classes of structures are required to have smoke alarms; the only differentiation between classes is the locations in which smoke alarms must be installed. Per Australian law, the property owner is responsible for properly installing and maintaining smoke alarms. Failure to do so can result in fines up to $500 (AUD) (Victoria Building Commission *et al.* 2003.).

It is the duty of the local government to enforce this regulation; however there are no documented cases of enforcement. In addition, many local governments are not aware of the responsibility (Victoria Building Commission *et al*. 2003.).

9.2 Risk Perception

Though it maybe the law for all Melbourne property owners to have working smoke alarms in their homes, many houses do not (Barnett, 2006). To help understand why some individuals avoid the use of such fire prevention measures, it is of interest to consider factors that could influence their decisions whether or not to be compliant. One way in which psychologists have examined this behaviour is the study of individual's risk perception of different situations.

A large part of how people make decisions is based on a common psychological research topic known as risk perception. Risk perception is an individual's opinion of the situation that he finds himself in. It is the evaluation of potential hazards that exist in the environment around him, and whether or not he should allow himself to be in such an environment. Environmental factors that could cause bodily harm could cause a person to deem the environment they are in to be risky.

9.2.1 Basic Concepts in Risk Perception

The topics in the decision making processes that cause human beings to think the way they do can be boiled down into two general categories. These categories consist of probability and consequences. In any decision that someone makes these two categories come into mind, and a person asks himself a variety of questions such as: What are the consequences of my actions? What is the chance that these consequences could happen to me? Depending on the situation that he finds himself in, one of these two categories could be

the dominant factor. This is attributed to the thought process on a person to person basis.

A large part of the reasoning that goes into making the decision is the size of the group that a person may find himself in. It can generally be said that if a person is a member of a large group, he will feel more at risk than if he were a member of a smaller group. Using smoke alarms as an example, a person that lives in a larger high-rise apartment building with many other tenants would generally feel more at risk, and a greater need to have a smoke alarm than a person who lived alone in his own home (Grisanzio, 1996). Unlike most animals in the wild, in some situations people do not always feel safety in numbers. This can be attributed to a lack of trust that people often have in those around them. One is more likely to feel less risky living alone or in small groups since he feels that he has a greater knowledge of everything that is going on in the household. Everything that goes on in and around the home can be attributed to something that he has done, or someone that he trusts has done, and he does not have to worry or perceive a situation as risky because of the potential mistakes that others could make (Grisanzio, 1996).

To help humans make decisions, there is instinctive rubric that all decisions are graded against to assess the risk of a situation. Subconsciously humans form a decision matrix in our head and rate theses nine items. The overall judgment that humans come to is then based on the risk rating that we determine a situation will have. Fischoff, Slovic, Lichtenstein, Read and Combs (2000.) determined the following nine items to be a decision making rubric. See Table 1.

Table 1: Rating Scales

Volunteering of risk: Do people get into these risky situations voluntarily? If for a single item some of the risks are voluntary undertaken and some are not, mark an appropriate spot towards the centre of the scale (1 = voluntary; 7 = involuntary)

Immediacy of effect: to what extent is the risk of death immediate – or is death likely to occur at some later time (1 = immediate; 7= delayed)

Knowledge of risk: to what extent are the risks known precisely by the persons who are exposed to those risks (1 = known precisely; 7= not known precisely).

Knowledge of risk: to what extent are the risks known to science (1 = known precisely; 7 = not known precisely)

Control over risk: if you are exposed to the risk of each activity or technology, to what extent can you, by personal skill or diligence, avoid death while engaging in the activity (1 = uncontrollable; 7 = controllable)

Newness: are the risks new, novel ones or old, familiar ones (1 = new; 7 = old)

Chronic – catastrophic: is this a risk that kills people one at a time (chronic) or a risk that kills large numbers of people at once (1 = chronic; 7 = catastrophic)

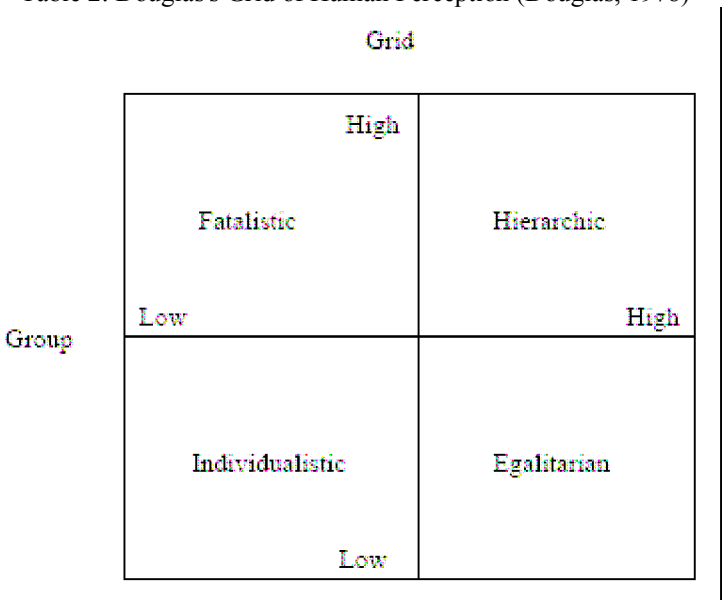
Common - dread: is this a risk that people have learned to live with and can think about reasonably calmly, or is it one that people have great dread for – on the level of gut reaction (1 = common; 7 = dread).

Severity of consequences: when the risk from the activity is realized in the form of a mishap or illness, how likely is it that the consequence will be fatal (1 = certain not to be fatal; 7 = certain to be fatal).

9.2.2 Four Mindsets of Human Perception

A significant contributing factor in what is perceived to make people behave and think in different manners is cultural differences. The idea of cultural theory revolves around the way that people look at the world. What is commonly referred to as "culture" is simply one's outlook on the world around them. Studies show that a person's perception of the world can be placed on the following diagram, see Table 2 and that people fall into the categories of fatalistic, individualistic, egalitarian, and hierarchical (Douglas, 1978).

Table 2: Douglas's Grid of Human Perception (Douglas, 1978)



All members of this grid have a self-preserving outlook on life, but because of their different views of the world around them, they have varying perceptions of what they consider to be a risky environment.

The Hierarchical psychological demographic is comprised of individuals that resist change and prefer things to be structured, with each person to having their place in society. This group of people is not comprised of free thinkers and would prefer to have experts on matters justify the decisions that they make. The Hierarchical demographic is law abiding, dislikes chaos, uprising, and believes that there is little need for change as nature is a self preserving body with in reason. If these bounds are violated bad things could happen and that's why it's important to keep on a straight unwavering course.

The Egalitarian psychological demographic is comprised of those that prefer all people to be treated equally in all aspects of life. They do not trust the government and fear that so called experts will abuse their authority on matters to create inequality amongst people. Egalitarians promote action that would increase equality amongst people in society. Higher taxes for the rich are an example of this. They see nature to be fragile and susceptible to change as a result of our actions. Egalitarians look out for future generations and avoid risks that could impact the state of nature or quality of life.

The Fatalistic psychological demographic is comprised of people that have a somewhat jaded outlook on life. The basic idea behind fatalism is, 'If I can't stop it from happening to me, then I don't want to know about it.' There are traces anti-establishment and anti-societal feelings in their beliefs: for example, a person should generally keep to themselves, because friends will only use you for their own benefit. Fatalists believe society will continue regardless of whether they try to change it or not, for this reason, they choose not to vote or apply themselves to their jobs. Aiding others and cooperation are considered pointless and will only end negatively for the fatalist. Fatalism seems almost paranoid in its beliefs, at least with regards to society and the government. This cynical view of the world around oneself contrasts sharply with the idea that what will happen is random and therefore there is no way (and no point in trying) to avoid any of it.

The Individualistic psychological demographic consists of those who hold a Darwinist outlook on life. They believe that society should allow those who strive to succeed to reap the benefits of their effort, and those that fail or make no attempt to succeed should be left to suffer the consequences. Individualists support a capitalistic government and believe the primary goal behind work is to make money and prosper. They believe strongly in the economy and feel it should be allowed to expand, regardless of who it leaves behind, since the idea of equality is one of the problems preventing a country from prospering.

The following descriptions found in

Table 3 below provide a means of profiling the potential target demographics of smoke alarm compliance.

Table 3: The cultural measure (Dake 1990).

Hierarchy (15 items)

I think there should be more discipline in the youth of today

I would support the introduction of compulsory National Service

I am stricter than most people about what is right and wrong

We should have stronger armed forces than we do now

The police should have the right to listen to private phone calls when investigating crime

Those in power often withhold information about things which are harmful to us

One of the problems with people is that they challenge authority too often

It is important to preserve our customs and heritage

I think it is important to carry on family traditions

In my household, family members have their own places at the dinner table

I always sort out clothes into separate categories before washing

I value regular routines highly

I think being on time is important

My time-tabling of meals is haphazard

I like to plan carefully so that financial risks are not taken

Individualism (9 items)

In a fair system people with more ability should earn more

A free society can only exist by giving companies the opportunity to prosper

If a person has the get-up-and-go to acquire wealth, that person should have the right to enjoy it

It is just as well that life tends to sort out those who try harder from those who don't

Continued economic growth is the answer to improved quality of life

This country would be better off if we didn't worry so much about how equal people are

Making money is the main reason for hard work
I don't join clubs of any kind
I tend to be sceptical of health food fads

Egalitarianism (11 items)
If people in this country were treated more equally we would have fewer problems
The government should make sure everyone has a good standard of living
Those who get ahead should be taxed more to support the less fortunate
I would support a tax change that made people with large incomes pay more
The world could be a more peaceful place if its wealth were divided more equally among nations
Social security tends to stop people from trying harder to get on
Racial discrimination is a very serious problem in our society
What this country needs is a "fairness revolution" to make the distribution of goods more equal
Most of the meals I eat are vegetarian
Health requirements are very important in my choice of foods
I prefer simple and unprocessed foods

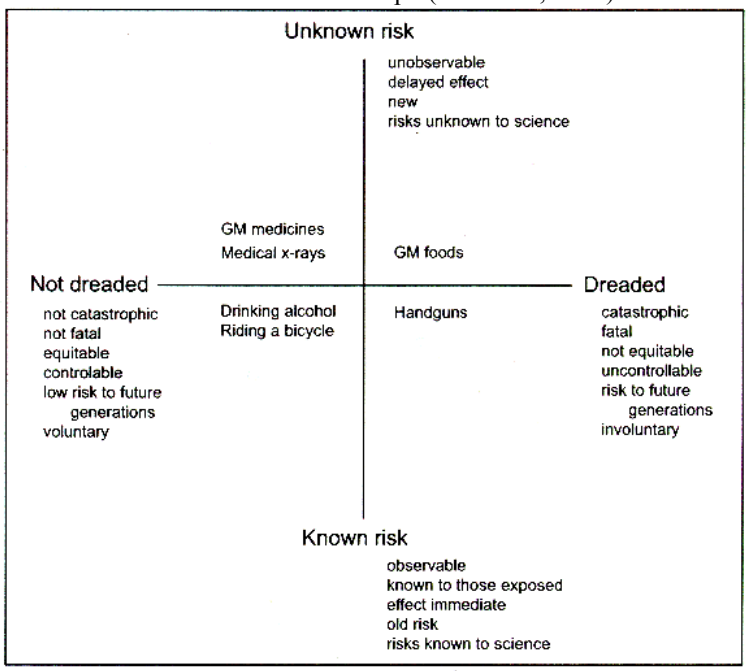
Fatalism (11 items)
There is no use in doing things for other people – you only get it in the neck in the long run
Cooperating with others rarely works
The future is too uncertain for a person to make serious plans
I have often been treated unfairly
A person is better off if he or she doesn't trust anyone
I don't worry about politics because I can't influence things very much
Most people make friends only because friends are useful to them
I feel that life is like lottery
Even if you work hard you never know if that will help you do better

It seems to me that, whoever you vote for, things go on pretty much the same
I have few financial investments

9.2.3 Risk as it Pertains to Frequency, Dread, and Accidents in the Home

Residential fires are risks that are common or understood, and therefore low in terms of dread. Thus, they are located in the lower left hand corner of the Risk Factor Graph, shown in **Table 4**. They are here along with other common risks such as falls in the home, car accidents, and electric shock. The notion of frequency and dread ties into the fatalistic outlook on the world, where people believe that certain things are meant to happen and there is not much to be done to avoid them. People have trouble becoming terribly concerned with fire prevention and detection measures, as everyone feels it won't happen to them, and if it does there isn't much that could have been done to prevent it. From this it is possible to understand why it is so difficult to convince the entire population to comply with smoke alarm regulations.

Table 4: Risk Factor Graph (DeNoma , 2001)



It is important to understand the psychological profiles of the target demographics when planning approach strategies. Also, when evaluating previous strategies, this information is equally important because it allows for a more comprehensive insight into the psychological processes behind the compliant and the non-compliant.

9.3 Action/ promotion programs

According to a report from the Federal Emergency Management Agency's U.S. Fire Administration (USFA), "In 2000, 379,500 residential structure fires resulted in 3,445 fatalities, 17,400 injuries, and $5.7 billion in property loss. The majority of fires (and losses) occurred in one- and two-family dwellings" (USFA, 2004). The USFA states that the "three leading causes of residential fires were cooking, heating, and incendiary/suspicious (arson) fires." (USFA, 2004). "Kitchens were the area of the home where the highest percentage of fires started" (USFA, 2004).

According to the National Centre for Health Statistics, "Fires and burns are the fourth leading cause of unintentional injury death in the United States, and residential fires account for 80% of these deaths (NCHS, 1994)." Also, the NCHS found, "the rate

of residential fire deaths has declined by nearly 40% over the past two decades…(NCHS, 1994)" These statistics come from a reliable source in the United States and show that an actual problem exists.

"In 1991 three different communities in the states of Minnesota, North Carolina and Oklahoma embarked on a public outreach and awareness program" (Shults et al. 1998.). Selected groups were given a battery operated smoke alarm and instructions on how to use it. Three years later, in 1994, surveyors went back to the communities to check the status of the smoke alarms that had been distributed previously. According to Shults et. al, the survey found that 88% of the households in the study still had a smoke alarm and that 64% of these households had at least one working (1998).

An important issue to mention at this point is that the values presented are very similar to the ones in project description. A fair assumption is that is due to similar cases where information/alarms are distributed to individuals, and after a period of time the targeted population looses track of the alarms maintenance in a similar manner.

The data presented above shows that the action programs were somewhat helpful in the long term, but that maintenance of alarms is a major issue to be overcome. "Twenty-six percent of the households found to have non-working alarms reported that they forgot to replace the batteries when they wore out, and 21% reported having removed the battery because of the irritating sound it made (many smoke alarms emit a beeping noise when the batteries are dying)" (Shults, 1998).

The Shults study also showed that "25% of the houses studied in North Carolina, Minnesota, and Oklahoma did not have a smoke alarm either in an entire story or in a sleeping area" (Shults, 1998). As already mentioned, the smoke alarms were provided completely free of charge, so the subjects could have requested one for each room if desired. The subjects involved did not understand that living and sleeping quarters would be safer if they were equipped with fire safety accessories.

Two major conclusions can be drawn from this study. First, if additional funding were provided, the risk of having smoke alarms that only last the lifespan of the battery due to the lack of maintenance could be significantly decreased. The second is that "…visiting homes can be an effective method for distributing and evaluating the status of smoke alarms in high-risk households. If conventional battery-operated alarms continue to be distributed to high-risk households, more effective methods are needed for maintaining them" (Shults, 1998).

9.4 Human Behaviours in Relation to Smoke Alarms

In this section, the decision making process and risk perception of people with regard to smoke alarms will be examined. Previous surveys will be examined with regard to preventing these clusters from suffering household fire-related fatalities. According to the National Centre for Injury Prevention and Control, residential fire fatalities in the United States "…are highest among adults aged 60 years and older, children younger than 5 years old, people with low socioeconomic status, and those living in substandard housing or mobile homes" (NCIS,1995). To highlight the relationship between perceived risk and experience, George Rogers explained "…the social processes that construct and maintain risk in the public eye are at least as important as, if not more than, the physical and psychological dimensions of risk"(Rogers, 1997.).

The following example examines a study regarding nuclear plants and people's perceptions of danger in relation to proximity of risk. This study also shows how these two different communities react to a false alarm of a possible nuclear leak. This research also highlights how actual risk factors are reacted to in real life situations.

To better introduce this subject, several key concepts will be explained. The first concept is the theoretical perspectives of how people learn. According to George Rogers, "human perception rests on a foundation of experiences," (Rogers, 1997) which means that the dynamics of the learning process do not only lie on one possible method of learning, but rather on several different components that make up the whole. The two main branches that can be derived from this learning basis are learning theory and

prospect theory. Leaning theory can be described as "…environmental stimuli that drive, reinforce and play a central role in accounting for acquisition and maintenance of observable responses" (B. Lott and A. Lott, 1985). Since the definition is based upon stimuli, it is valid to state that a single rare and non-shocking stimulus will be less prone to cause a lasting effect in a person's mind than a constantly repeated message. The practical meaning of this definition can be identified with an example regarding smoke alarm use (B. Lott and A. Lott, 1985).

If a person randomly hears that some of his/her neighbours have smoke alarms, it is not a given that the individual will follow the crowd and get a smoke alarm; mainly because it was a single random stimulus that caused a faded impression. The real way to get that person to buy a smoke alarm, according to the learning theory, will be if reinforced stimuli are delivered in order to craft a lasting impression. This can be a valid approach in our case since the population in Melbourne might know about the dangers of fire, but not enough to be aware that a smoke alarm is a helpful factor in their safety.

The second approach on how people learn is more biased towards probability; it is called Prospect Theory. This theory states that people "…are influenced more by the weighted subjective probability than the objective probability would warrant" (R.P Abelson, 1985). This means that the mere fact that an event is possible has more credibility than the probability of the same to happen. The objectivity of this method is highly doubtful since most of the time the individual will not have enough information to make a conscious analysis of risk perception.

A clear example of prospect theory regarding smoke alarms will be if a person living half a block away from the fire station does not have a smoke alarm. The reason behind this argument could be that when the individual analysed the possibility of a fire in his home, a person took the fact that the fire station is half a block away (therefore the help will be immediate) into account more than the statistical probability of a random house fires that was unable to be reached on time. This type "perceives risk in a lower manner since the available data shows low level of accuracy" (R.P Abelson, 1985). This

specific approach can be really insightful, since the MFB has more that 35 different fire stations all around the city and many individuals might follow this philosophy.

By referring to the prior definitions of different reactions to risk perception in an environment, we can describe the experiment taken in two different communities in the United States. Both of the communities observed in this study were subjected to contingency plans in case of an alarm notification of a leak in a nearby nuclear plant. The neighbourhoods studied had one main difference between them- their relative distance to the nuclear power plant. The results showed that the people with more knowledge about the gravity of the possible situation executed the contingency plan in an orderly fashioned manner and more efficiently than those who didn't have as much of an awareness of what is going on.

From the introduction it is obvious that both groups are at different distances from the nuclear plant, but that determines how well informed they are. The neighbourhood near the facility always had, according to the study, information bulletins from the company keeping the community more informed about their situation with regards to the power plant. Since they were closer and inside of what George Rogers defines as the "impact zone", they were used to hearing about the facility, which kept their concerns in a lower level. With the neighbourhood outside the impact area the story is a bit different, these individuals were not used to hear about the nuclear plant, and, according to George Rogers, " these groups tends to fit in the description of … *every time I hear about the place it is negative"(Rogers, 1997).*

The main goal of this experiment was to see how people changed their risk perception after the study period. From a sampling of ten people, five from each site, "…about 3 in 10 did not change their risk estimates" (Rogers, 1997). Curiously enough, those three people that did not change their risk perception were from the neighbourhood inside the impact zone. The explanation that the author George Rogers gives to this incidence is that "for relative low-probability events (like the one of having a leak in the

nuclear plant) the non-occurrence information simply swamps the occurrence data, making any adjustments nearly unobservable" (Rogers, 1997).

Even though the neighbourhood closer to the plant reacted quickly while performing the evacuation plan, there were also people that didn't have the necessary radioactive readers in their houses to measure any un-notified hazard. The subjects justified this by saying that the bulletins were so informative about the security of the plant that they did not think that an emergency evacuation would ever be necessary. This research can help us understand why in Melbourne some people do not use fire alarms.

9.5 Community education programs

9.5.1 Current Evaluations of Effectiveness

The current measure of smoke alarm usage is a survey completed in 1998 by the Australian Bureau of Statistics. This survey was entitled "Safety in the Home," and covered a wide range of topics from pool fences to helmet wearing while horseback riding to seatbelt and smoke alarm usage. The results of this survey quoted that 96% of all homes in Victoria had a working smoke alarm.

9.6 Fire Statistics in Other Cities

The New Zealand Council for Educational Research (NZCER) compared data from studies done in the United States, the United Kingdom, and Australia with the goal of finding patterns in the victims of fire fatalities. The data is presented below, grouped by country.

9.6.1 British fire data

- Demographics
    1. Age
        - Between the ages of 31 and 65 the majority of fatalities were male, resulting in males in general having twice the fire death rate per million as a women. (Goddard, 1996).
        - The highest death rate per million occurred in the 80 plus age group (46/1.000.000). The second highest rate was for those aged 65-79 (17/1.000.000) (Goddard, 1996).

    These numbers are quite alarming since the 80+ group has a fire fatality rate of 2.7 times more than the next highest group. Goddard also points out that the third highest rate of fire fatalities was among those aged 1-4 with (13/1.000.000) (Goddard, 1996). The group with the lowest death rate was that of children aged from 5-16, or school aged children.

2. Location of fire
    - According to the NZCER, "The bedroom was the most common room of origin of fire, closely followed by the living room, and the living room was the most common location of the fatality, closely followed by the bedroom" (NZCER, 2000).

- Smoke Alarm Use
    1. "32% of the households that experienced fatal fires had smoke alarms", from the non-functional alarms, "64% were found to have no batteries, and 17% of them were not working due to a dead or faulty battery" (Goddard, 1996). This is very similar to the information from the AIRS data.

9.6.2 United States fire data

- General Demographics

  According to the USFA, "Fire deaths were 35% higher in rural areas as compared with non-rural areas" (USFA, 1998). This data correlates to the statistics that were previously shown from the NZCER stating that rural areas are more susceptible to catch on fire than urban areas. In the United States, "children ages 1-4 were 2.3 times more likely to die in a fire than the general population" (Hall, 1998).

The data for the elderly was very similar to that found in Great Britain, "those over 65 were at twice the risk of fire death than the general population; the risk increased with increasing age to 3 times the risk at 75, and four times the risk at 85" (Hall, 1998). Hall states also that "preschoolers that died in fires were recorded as *too young* to act while 3 out of every 10 elderly victims of fire were recorded as *too old to act*" (1998).

- Smoke Alarm Use

  From the data that the Fire Service collects after an incident in the US, we can infer that "only 19.2% of fire deaths occurred in homes known to have an

operational smoke alarm" (FEMA, 1997). Another alarming number that Hall brings forth is that "across all ages, 20 percent of fire deaths were caused by people who were smoking or falling asleep with a still lit cigarette" (Hall, 1998).

9.6.3 Australian fire data

- General Demographics

  The groups particularly at risk were:

  "Elderly over the age of 65, particularly from fires caused by heaters and smoking materials. Figures from 1989-1996 show that people aged over 75 had 3 to 4 more times the dead rate from fire than the national average" (Thompson,1997).

  "Children under the age of 5 – in situation where parents miscalculate the development of a fire and think they can complete several evacuations of their home when they cannot, so that the child is not rescued" (NZCER, 2000)

  "Adults affected by alcohol; "21% of fatal victims over the age of 18 have been affected by alcohol, usually in fires involving smoking or heaters and falling asleep" (NZCER, 2000).

- Time of fire

  Fatal fires where most common between midnight and 8am and during winter. (NZCER, 2000)

- Causes of fires

  "The most common causes of fire fatalities are discarded smoking materials, either if a person falls asleep or if a child plays with the discarded materials" (NZCER, 2000).

For this particular study in Australia, "the presence or absence of smoke alarms is rarely recorded; however, where it is recorded, almost no fatal cases had a smoke alarm present" (NZCER, 2000).

Vulnerable groups

Children:

- "Approximately 66% of fires causing child injury or fatality occurred in homes where there was no operable smoke alarm" (NZCER, 2000).
- "Preschoolers have a higher fire risk than the general population" (NZCER, 2000).
- "A disproportionate number of fires that kill pre-school children are caused by children playing with fire. Child fire play is usually motivated by curiosity" (NZCER, 2000).
- The key factor in protection pre-school children from the data presented above is constant supervision; many parents do not realize that even leaving a young child alone for a couple of minutes can be extremely dangerous.

Elderly:

- According to FEMA, "the elderly face a two-fold fire risk: they are exposed to greater risks of fire, and they are often less capable of escaping a fire due to physical limitation (FEMA, 1997).
- Gamache states that elders who are self-housed should be the main target of educational programs since the ones in care institutions will most likely have someone that can take care of them (Gamache, 1997).
- Elders are often less capable of escaping a fire due to physical or mental impairments (NZCER, 2000).

Lower Socio-economic Groups:

- FEMA argues that "poorer neighbourhoods tend to have more vacant housing which also attracts homeless, who are more likely to start fires for heat" (FEMA, 1997).
- "There is less likely to be an operational smoke alarm in lower income households. While there are no direct U.S. data showing this link, circumstantial data points to the likelihood that lower income households are less likely to have smoke alarms" (National Fire Protection Association,1996)

- In Britain there is further evidence showing a correlation between being poor and not having a smoke alarm. “Families without a car are also unlikely to have a smoke alarm, suggesting a link between poverty and owning a smoke alarm” (FPA,1996)
- A survey conducted in a hospital in the UK states that “the most common reason cited for not having a smoke alarm was cost. This finding applied to 85% of those surveyed who did not own a smoke alarm” (McCabe, 1990).
- Low socio-economic status is linked to lower education levels. This increases fire risk as “educational programs may be easily grasped, and low literacy levels inhabit the reading of instruction manuals and warning labels” (NZCER, 2000).
- Some have suggested a racial link to having or not having a smoke alarm, however, “the evidence on the relationship between race and fire risks is unclear. It appears that any link between the two can be accounted for by socio-economic factors” (NZCER, 2000).

9.7 Groups to be found at high risk for not having a working smoke alarm

A study conducted in a low-income area of the United States with a history of fire-related incidents suggests that telephone surveys may have an effect on the number of households that claim to have at least one working smoke alarm. Approximately 71% of the households surveyed by telephone reported having a working smoke alarm, however when those same households were surveyed using a door-to-door method, only 66% claimed to have a working smoke alarm. The survey went one step further, actually testing the alarms, and it was determined that only 49% of the targeted households had a working alarm. (Douglas, *et al*. 1999.)

A 3-year program was recently conducted in five states (Arkansas, Maine, Maryland, Massachusetts, and North Carolina) with the goal of improving smoke alarm compliance in high-risk households. More specifically, the study focused on improving the installation and maintenance rates of alarms through two experimental methods. The

first method involved local fire fighters (or similarly trained personnel) physically installing smoke alarms in targeted households, while the second involved handing out vouchers for free smoke alarms, redeemable at locations within walking distance of almost all targeted homes (Harvey, *et al*. 2004.).

An important part of this project is its definition of "high-risk" households. Factors considered when determining whether a household fell under the category of "high-risk" included "a high prevalence of residential fire deaths, a low prevalence of functional residential smoke alarms, a composition of primarily low-income residents, and/or a high proportion of rented residential units." (Harvey, *et al*. 2004.) In addition to the above elements, only households with a child under the age of 5 or an adult over the age of 65 were considered for this program, based off of the trend that these two age groups are at the most risk during a fire.

Further research suggests a common theme in determining high-risk households in relation to lack of operational smoke alarms. The Get-Alarmed Campaign, conducted in two counties in Georgia (one urban and one rural) in 1998, selected approximately 450 households that were judged to be high-risk and installed smoke alarms in them. The Campaign's definition of "high-risk" individuals took into consideration their age (under 5 and over 64 years of age), their socioeconomic status (poor), and their race (ethnic minorities) (Thompson, *et al.* 2004).

The studies allow firm consideration of households with low income or rented residences as at risk of a lack of operational smoke alarms. In addition, households with young children and senior citizens can be classified as high-risk in terms of fire-related injuries and fatalities, and should, therefore, be examined for smoke alarm compliance as well.

Groups at risk

The following information comes from the study "Improving fire safety knowledge and practice of vulnerable groups", performed by the NZCER. One of the

focuses of the study was to compare demographic data of fire fatalities of the United States, the UK, and Australia, and determine which groups are more prone to have a fatal fire. According to the NZCER the most vulnerable groups are: children under the age of five, older people, and lower socio-economic groups/ rural groups.

Children under the age of five

The NZCER considers this group as a vulnerable group since "child fire play is usually motivated by curiosity, with the setting of actual fires and accidents rather than the intent" (NZCER, 2000). Thus, it can be stated that as a kid grows up, "...actual fires decrease as a child's fire competence increases" (NZCER, 2000). The key factor in protecting pre-school children is constant supervision. "Many parents do not fully realize that leaving a young child alone, even for a few minutes, can be highly dangerous" (NZCER, 2000).

Older people

It is well known that older people are less active and capable of fast physical reactions in case of an emergency; this is one of the reasons why the NZCER considers the elder a vulnerable group. The exact reason of the NZCER is that "Older people are often less capable of escaping from a fire due to a physical or mental impairments" (NZCER, 2000)...

Low Socio-economic groups

The reason why low socio-economic status leads to a higher fire risk can be related to income, educational background, housing quality, and to the number of people living in each household (NZCER, 2000).. There are two different levels at which we can define this group as vulnerable, the first is at a household level and the second one is at an individual level. At a household level "houses are less likely to be well maintained, have fewer fire safety devises, have more occupants, and possibly adult occupants provide less child supervision" (NZCER, 2000). In the individual level we are faced with less education regarding fire risk, and risky behaviours such as smoking, which has been found to be a trigger for a great portion of the household fires.

The rural population can be partly applied to low socio-economic groups since "lower incomes, unsafe heating, lack of smoke alarms and geographical distance from the fire service" (NZCER, 2000) can be attributed to the major definition of this specific cluster.

9.8 Programs for specific target groups

There are different ways in which we can present an educational program, depending on which vulnerable group you want to target. The way children learn is not the same as the way elders learn. Therefore, these types of factors have to be applied in order to have a successful educational program. This important aspect of the education process needs to be considered to generate the desired comprehension of the program material.

Children

One of the suggested methods for this group is to apply "learning theory" to the programs. It is important to first realize though, that learning theory is very age-specific, and therefore its approach needs to match with the targeted age.

"The Preschoolers will not understand cause and effect reasoning and are more likely to remember an image than its accompanying message" (NZCER, 2000). For that reason, fire safety education for this age group must be carefully designed to avoid any negative results. As an example, a preschooler is more likely to remember the image of a smoke alarm than rather the message, Change Your Clock, Change Your Smoke Alarm Battery (CYCCYSAB).

An additional way to educate children is by behavioural teaching. In the case of this project, behavioural teaching would include imagery relating to the actions that they would need to take should they find themselves in a fire, as well as how to prevent fires from starting. This, "is much more effective at improving children's ability to perform the behaviours in question than the verbal or visual teaching alone" (NZCER, 2000).

Giving the low levels of skill retention over time, even for the most effective programs, "…it is clear that repetition, both within programs and of programs over time, is crucial" (NZCER, 2000). Should children retain the information that they've learned, parents can be treated as a secondary target of these campaigns since most of the kids will go home and talk about what they learned.

Another way to reach children older than 5 years is by a study "designed to assess the effectiveness of pediatricians' counselling and facilitation of obtaining smoke alarms" (Miller, 1982). A brief pamphlet and a one-minute standardized message delivered to families in a suburban Pittsburgh pediatric practice resulted in 26/55 parents who did not have smoke alarms purchasing one. One reason that suggests why this program was effective is that mothers usually consider doctors as authorities, and listen closely to their advice.

The Elderly

One of the main problems that programs targeted toward the elders undergo is that "…many older people respond negatively to an emphasis on their high risk status; having spent years looking after themselves and others, they do no wish to be told their abilities to do so is declining" (NZCER, 2000). This problem can have severe repercussions; mainly because of the fact that these "offended" elders will not listen ever again to any educational program, thus defeating the purpose of the campaign.

According to the NZCER, "this can be circumvented by appealing to a wish to create a safe environment for partners, friends, grandchildren or pets (NZCER, 2000). Alternatively, we would also suggest to present fire safety as a general health and safety measure that *everybody* needs to take in account; not only the elderly. The purpose of these alternatives to approach the problem is to generate real concerns into the vulnerable group that will further modify their prior points of view and aid a better fire safe community.

An interesting aspect to point out is that also according to the NZCER, "older people are unlikely to respond to media campaigns. They are better reached through community groups, social events, or personalized appeals by people they respect, such as medical practitioners" (NZCER, 2000). This references Miller's article in the pediatrics journal discussing using physicians an important community outreach source and how physician can also be used to better educate the elderly. It might be a valuable tool to suggest this particular action when talking about improving compliance since it is verified to work.

It has furthermore been noticed that building "…a dependable relationship among a certain community of elders has a positive effect on overall safety, as it counteracts the tendency of some older people to respond to a general fear for their safety by isolation themselves" (NZCER, 2000). Interaction is the key in educating this group. Give them confidence and also to inform the audience about the danger that *everybody* has with fire. Something to keep in mind is the fact that elders have physical limitations and that programs should be focused towards their caretakers as well (NZCER, 2000).

Lower socio-economic groups

According to the NZCER, "lower socio-economic groups appear not so much hard-to-reach as hard-to-influence" (NZCER, 2000). "The key factor in influencing lower socio-economic groups to adopt fire safe practices is to involve the community to be targeted in the design and implementation of fire safety programs" (NZCER, 2000). What this means is that since these communities fall into a separate demographic group, their specific educational programs need to have a narrower approach and be more specific. For example, targeting the elderly of this group is more difficult than targeting the elderly in general. Ways to make this type of education more effective include making the interaction programs language specific.

Appointing precise tasks to members of the community that is trying to be targeted and performing smoke alarms give-aways are also a means of targeting these specific groups. "A main aspect for many programs for lower socio-economic groups has been smoke alarm give-aways. If a give-away scheme is carefully targeted and involves

the community in its administrations and implementation, it can result in significant reductions in fire fatalities" (NZCER, 2000). Evidence of these mentioned give-aways has been talked about previously in the background research. As an example, due to the program performed in Oklahoma, Minnesota and North Carolina, a compliance with smoke alarm regulation were raised up to 69% in 4 years by means of smoke alarm give-aways and education on how to operate them.

According to the New Zealand study, "…the three most vulnerable groups based on relative fire risk are, children under the age of five, adults aged 65 and over (even more so, adults aged 75 and over), and people on low incomes in urban and rural settings"(NZCER, 2000).

9.9 How to evaluate program effectiveness

A community educational program, as the name states, is a program that provides education to a group of people about a specific risk or subject. There are several different methods to evaluating the effectiveness of a program or campaign, and many factors must be addressed.

The Federal Emergency Management Agency (FEMA), uses an evaluation process who's primary goal"…is to show that a public education campaign on fire prevention is successful in reaching and motivating its target audience to practice fire prevention." (FEMA, 1999). This means that reducing the number of deaths, injuries and economical losses because of fires is a priority.

FEMA suggests that "The best way to measure the effectiveness of a prevention program is to show the degree to which the program reduced fires, deaths, injuries and/or dollar loss" (FEMA, 1999). Evidence supporting a decrease in these figures is highly regarded, however sometimes fluctuations in the data can be attributed to other factors rather that the program. But, if it can be shown that "1) a majority of the community was reached with the message, that 2) a tested sample of people showed a sharp increase in knowledge of what to do in a fire, and that 3) a significant portion of the community now exhibit the proper behaviour" (FEMA, 1999), then a stronger argument can be presented in favour of the action program.

In some other cases, no perceivable change of behaviour can be recorded, and therefore no change in the statistics can support the effectiveness of the implemented educational program. If this is the case, the question of "what" did the program change should be raised. It is also important to remember that sometimes the change in risk perception is not immediate

FEMA advises to look upon the following guidelines to understand why the program was not as effective as thought (FEMA, 1999):

1) First, it is imperative to reach a substantial part of the public or target group with the safety message.
2) Second, the information presented must be clear enough for the audience to understand what actions to take or behaviours to change.
3) Third, the lesson must be persuasive enough to make people act by changing fire safety practices.

As an example, the message gained by the public from an educational program could have been to not overload electrical sockets and be safe in the kitchen. The effects of this information might not be immediate, yet if over time no change is made on the statistics of the targeted measures, then "…it may mean that the fire prevention actions targeted in the program were not the most important ones" (FEMA, 1999).

Another measure that FEMA recommends for a more accurate knowledge of program effectiveness is to "conduct a survey to a random sample before the public education campaign starts, and repeating the survey after the campaign is completed to a different random sample" (FEMA, 1999). This way it can be assured that something useful was learned or that the particular action program reinforces some prior knowledge.

Some common sense comparisons can be performed to prove the validity of an action program. For example, if the educational program that is implemented differs from others that were used in different communities; it will be a wise decision to compare them and get more data that supports the findings (FEMA, 1999). FEMA suggests that "It is also is possible to compare similar neighbourhoods within a community. One way

would be to start a pilot program in schools in one area, and then see if the program made any difference relative to the areas of the community that did not have the program" (FEMA, 1999). The relevance of these comparisons is that they can provide a wider view of the issue than the one offered by the data. In our particular case we could compare data from Melbourne to other cities and find similarities in the findings.

The following Table **5**5 provided by FEMA (FEMA, 1999) highlights the main points previously discussed. This reference is used by FEMA, however it relies heavily on gathering data and statistics about the percent of the population reached. There is no guarantee that this information is always available.

Table 5: Ways to Measure Public Education Programs

WAYS TO MEASURE PUBLIC EDUCATION PROGRAMS	
Aspect Measured	Examples of Evaluation Measures
Program Outreach	Percentage of population (or a subgroup) receiving public education materials. Percentage of seniors receiving safety lecture. Percentage of school children with x hours of safety instruction per year.
Awareness, Knowledge	Percent of population knowing how to extinguish a grease tire. Percentage of public that can use extinguishers. Percentage of public aware of need to crawl low in smoke. Test scores before and after education.
Behavior, Environment	Percentage of households with working smoke detector. Percentage of households with fire sprinklers. Percentage of chimneys cleaned at least annually.
End Results	Number of deaths, injuries, dollar loss or fires per capita. Anecdotes detailing saves linked to programs.

Another way to assess community action plans is by evaluating them in terms of three different perspectives: merit, worth, and significance (Framework for Program Evaluation in Public Health, 1999). This model is often used when evaluating public service or information programs, because it incorporates several very important parameters of a project. Merit refers to the quality of the project, worth to cost effectiveness, and significance to the programming having the desired effect on the

audience. Each of these criteria is important on their own, but it is very easy to satisfy only some and exclude others where convenient. For example, a program might have high merits and have an impact on many, but the costs might prove to be prohibitive for a public project.

For a uniform analysis of a program, the following questions should be asked at the beginning of the project and re-addressed throughout the execution:

- What will be evaluated? (That is, what is the program and in what context does it exist?)
- What aspects of the program will be considered when judging program performance?
- What standards (i.e., type or level of performance) must be reached for the program to be considered successful?
- What evidence will be used to indicate how the program has performed?
- What conclusions regarding program performance are justified by comparing the available evidence to the selected standards?
- How will the lessons learned from the inquiry be used to improve public health effectiveness?

Having a standardized model to analyse any project is important to having uniform data.

9.10 Guidelines for Creation of Effective Programming

Face to face contact and personal interaction where possible

Many studies have been performed to analyse the effectiveness of face-to-face communication of educational material. In the following quote, Jeannette McDonald draws comparisons between face-to-face nursing education versus online education. “Currently there are general guidelines that hold true for all educational endeavours, we “teach to the test” whether the test is to assess student achievement or to evaluate our

educational programs" (McDonald, 2002). McDonald also gives reasons why face-to-face education is still a reliable, effective and efficient delivery method:

1. Discussions are conducted on multiple levels and at multiple speeds depending on the audiences' response to the delivered information.
2. Face-to-face communication allows easy implementation and assessment of tasks that are designed to strengthen penetration of delivered content.
3. Face-to-face communication evokes a better response since verbal communication exists.

In consideration of MacDonald's reasons why face-to-face communication is important in education, it is possible to draw comparison between her statements and why they have been found to be successful in fire protection education. In reference to reason number one, face-to-face communication helps people absorb the information that is being taught to them at a speed they are comfortable learning at. Fire fighters presenting fire protection information are able to read the audience's comprehension of material and adjust the pace of the lesson to their learning ability. In response to the second point, face-to-face fire protection education also incorporates group activity in the form of hands-on demonstrations of firefighting equipment for home and professional use. Different communities have different questions or issues in relation to fire safety, and face-to-face communication allows for responses to specific questions that other means would not be able to answer. Given immediate feedback to questions, participants are more likely to absorb the ideas and experiences that they encounter, remembering them long term so they can be implemented in their daily lives. This last feature of fire protection communication is MacDonald's final reason for the use of face-to-face education.

Information should be addressed to the target audience

The government of Nicaragua currently has a Poverty Reduction Program (PRP) that addresses the concerns and needs of the poor in order to achieve an economic standard posed by the IMF (International Monetary Fund). Governmental resources have

been targeted to irrelevant needs such as strengthening programs to improve lifestyle in highly urban areas, or on construction of quality roads with tolls in places where people could not afford to own cars. Although better roads could lead to infrastructure and higher standards of living, improvements such as these fail to directly benefit the poor. It states in a Nicaraguan government report that as much as "47% of the funds ($372 million) do not provide direct benefits that address the specified risks faced by the poor" (Gillespie *et al.* 2001.). These improvements completely mis-addressed the needs of the target group.

The importance of listening to the needs of the community before spending resources to make an attempt to reach them is an important guideline to consider. Addressing outreach appropriately to the target audience is necessary to have the largest impact on the needs of the community. Using techniques, such as those described here, has been proven effective in community outreach.

Information should be delivered by a person respected by the target audience

Here in Australia, a program funded by the government was created in order to teach children about the misuse of drugs. The purpose of the study presented was to determine and evaluate a specific set of guidelines that could be used as a cornerstone whenever a drug education program takes place.

One of the main focuses of this program was to ask the students "who should teach young people about drugs?" (Orme, 1999), and student answers were recorded as shown in Figure 1.

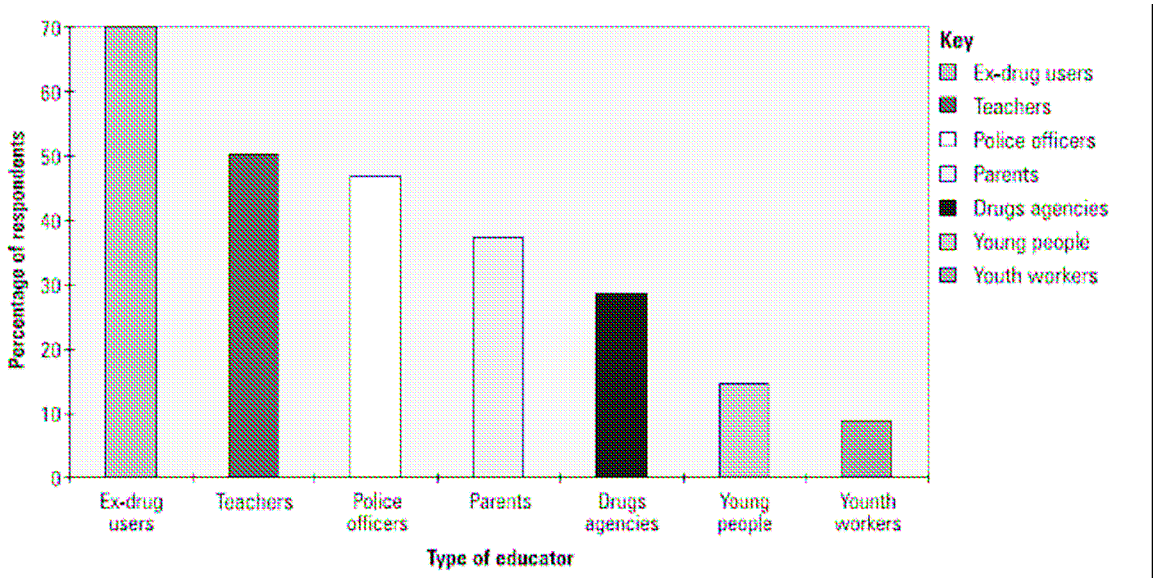


Figure 1: Effectiveness of Different Educators in Drug Resistance Education

As it can be seen from the data presented, the top four percentages of groups of people that children were most likely to listen to and respect were those they trusted to be knowledgeable about the subject. An ex user who has since reformed could therefore send a very positive message to young people about the effects of drugs. Teachers, Police Officers, and parents are all adults that students trust have their best interest in mind, and therefore will respect and absorb the information they present.

Although doctors are not present in the chart, it could be assumed that their opinions on health and safety issues would be valued.

Information should be reinforced multiple times

The main goal of the Bangladesh Family Planning Program (FPP) for the last 30 years has been to effectively increase participation in issues that affect the entire community. The objective of the program's most recent campaign was to increase the contraceptive prevalence rate to prevent further population increase (Islam, 2001).

To address the issue of a population rapidly expanding dis-proportionally to the available government services, the government of Bangladesh created a set of priorities

that require attention in order to overcome the upcoming crisis. One of these guidelines suggests pursuing an "improvement of education which will result in improvement in other sectors, including the Family Planning Programs" (Islam, 2001). While some of the other suggestions are very general and vague, "some of the suggestions are distinctly specific and need to be constantly reminded to the people so that the process of community participation intensifies" (Islam, 2001).

The approach adopted by the Bangladesh government involves creating "various separate associations in the community, each involving their elected chairman and local elite to exchange views of the performance level of the family planning programs in the areas under consideration" (Islam, 2001). It is important to keep in mind the objective of the FPP, which is to constantly reinforce the communities' knowledge and make sure they are headed in the right direction in terms of improving their standards of living.

Ownership should be shared by different groups

The FPP in Bangladesh also makes recommendations about maintaining a high level of performance in terms of community programs. The first of these recommendations involves preserving partnerships developed between groups so ownership of an educational program continues to be shared by more than one organization. One of the important characteristics of the FPP is the active participation of the members of Non-Governmental Organizations (NGOs), such as the Bangladesh Rural Advancement Committee (BRAC) in its activities. An NGO representative attends the meeting of the development family planning committee to provide advice as well as an evaluation of their economic situation. This direct interaction between the project's management and workers allowed for better communication and provides a better sense of the project's progress and the level of involvement needed from the parent organizations (Islam, 2001).

On the topic of partnerships, Ataharul Islam notes that "collaboration between government and NGO workers makes it easier for the FPP to carry out its work…" (Islam, 2001). The point raised by Islam is to create partnerships and divide up ownership of the

program in order to facilitate delivery, which can be critical to the positive development of an educational program.

A study conducted by the Department for Education and Employment (DEE) involved children's suggestions for improvement of the programs to which they were exposed. A common thread became apparent in their answers:

> "…start drug education at a younger age; have more knowledgeable people in to do drug education lessons; insist on middle school education and don't drop the guard; avoid just putting across a "say no" message, and use a more balanced approach…"(Orme, 1999).

Not only does data from government agencies support the belief that information should be consistent among programs, but the people that have been educated by these programs suggest that the message should stay consistent throughout a child's academic career.

The DEE has also published a set of guidelines to follow when educating schoolchildren about drug use. The DEE suggests that educators "incorporate drug education into a wider Personal, Social, and Health Education (PSHE) program that begins at primary school and is continued in secondary school and beyond" (DEE, 1995). Not only do the subjects of an education program state that it is prudent to keep information consistent among programs, but a government association such as the DEE states this as well.

Orme's study also emphasizes the value of "involving to best effect all those with an interest in delivering effective drug education via multi-agency approaches"(Orme, 1999). The idea behind multi-agency approaches is to delegate work to other entities and share the ownership of the program in order to effectively reach more people and improve the actual delivery of the program. By creating partnerships and sharing ownership of an educational program, the implementation of better strategies and better planning with more resources becomes increasingly more feasible.

10 Methodology

The goal of this project was to assist the Metropolitan Fire Brigade in creating strategies to increase the level of smoke alarm compliance in the city of Melbourne. The result of this project is a list of recommendations to improve the reach and effectiveness of current MFB community education, and thereby increase compliance. These recommendations address the identification of at risk groups, as well as current internal MFB procedures

To reach this goal, the following objectives were used:

- Identify the groups of people that are at risk for not having a working smoke alarm.
- Review and analyse community education programs in use by the MFB and other similar organizations.
- Identify areas for improvement within the MFB.

To collect the information needed to fulfil each of these objectives, the following methods of information gathering were used:

- Researched risk literature and worldwide studies to identify at risk groups elsewhere.
- Interviews with MFB staff involved in the development, delivery, and management of community education programs, as well as staff members who identify at risk groups.
- Analysis of Australasian Incident Reporting System (AIRS) data to identify risk groups and geographic areas of failure.
- Researched current MFB programming in terms of scope, target group, and objectives.
- Contacted other similar organizations worldwide to compare their methods with those of the MFB.

Table 6: Project Gantt Chart

TASK	WEEK							
	prep	1	2	3	4	5	6	7
Research at risk groups worldwide								
Conduct interviews with MFB Staff								
Identified internal barriers to compliance								
Cataloguing MFB programming								
Researching other programming								
AIRS data analysis								
Determine new delivery techniques								
Finalize report								

10.1 Identify groups of people that are at risk for not having a working smoke alarm

Completion of this task involved research on studies relating to smoke alarm compliance, review of the results of these studies, interviews with MFB staff, as well as examination of AIRS data provided by the MFB. Common trends of demographic groups at risk, regardless of the city or country that they're residents of, were a major product of researching previous smoke alarm compliance studies.

Before arriving, background research was done to identify groups at risk to not have a working smoke alarm worldwide. Data was used from New Zealand, Great Britain, and the United States.

Interviews with MFB staff members identified at risk groups currently targeted by the MFB, as well as current procedures to finding at risk groups. Analysis of AIRS fire data was also done using groupings in Excel. This allowed for the identification of renters and homeowners as high risk groups, as well as the postal codes with the highest concentration of non-compliance.

Having identified the non-compliant demographic groups, the reasons and/or barriers preventing these groups from complying with regulation were identified by researching prior studies that have investigated these issues. The groups examined were:

- The elderly
- Foreign Cultures/Languages
- Low socio economic standing
- Renters/landlords

10.2 Review programs in use by the MFB and other similar organizations.

To understand where the MFB could potentially improve programming to the community, it was first necessary to understand the current means of risk communication that the MFB uses. In this stage of the project, research into the specific content of risk communication programs as well as means of distribution was examined. Aside from simply reviewing MFB programming literature to note the means in which they convey their message to the target audience, interviews with MFB employees were quite valuable. Through employee interviews it was possible to gain insight into strategies and approaches that the MFB has attempted to use in the past and were determined to be unsuccessful. Knowledge of such attempts helped to focus the comparison the project tries to draw between evaluated programming of other organizations with that the MFB currently offers.

To understand what the MFB has done and is doing currently to increase smoke alarm compliance, we spoke to the project liaison, Dr. Sharon Pepperdine, who works in

the community education branch of the MFB. She then recommended other people that could be interviewed to gain insight and opinions on MFB smoke alarm programming past and present. Possible people of interest were professional acquaintances in the same line of work, the developers of community education, as well as the community education presenters. As these interviews were completed early on, the information gained from this series of interviews was used to lead the project throughout the following weeks.

The people that were actually interviewed were selected in order to provide views and insights from several different parts of the MFB. The people interviewed were Peter Loenen, Terry Hunter, Con Patralis, Ian Danahay, and Patricia Nicholson.

Peter Loenen is the MLO (Multicultural Liaison Officer) for the Southern Zone. In each of the 4 zones the MFB covers, there is an MLO who is in charge of Multi-Cultural outreach. Mr. Loenen provided valuable information about his work with the many multicultural communities. While there are three other MLO's in the three different zones, the job description and responsibilities are uniform, and therefore only one was necessary. Since the MLO works directly with already identified at risk groups, it was important to hear exactly what information was included.

Terry Hunter is currently the Assistant Chief of the Southern Zone however he was instrumental in creating many of the current programs used in Community Education in the mid-nineties. He had many interesting and unique ideas to contribute, as he had examined our problem from the different standpoints of both Community Educator and Administrator/Chief. He had also been involved with the programming from its inception, so he could comment on the evolution and effectiveness of programming.

Con Patralis works in Equity and Diversity, as a CALD (Culturally and Linguistically Diverse) Project Manager. He supervises and oversees the four MLO's, as well as creates some of the programming used with these target groups. Mr. Patralis works with a wide range of cultures, from the new and emerging communities to those

who immigrated to Australia many years ago. He also was able to speak about both the CALD groups and the elderly.

Ian Danahay is a former Commander/Manger of Community Education for the MFB, a position currently held by Frank Stockton. This interview was also set up by Dr. Pepperdine. He managed the department during the time period that many community education programs were installed and first used. He also had a different view in that he had the most concrete idea of how compliant different groups are.

Patricia Nicholson works in Community Education, and was able to give an overview of how groups are deemed to be at risk and the setup of Community Education from an administrative standpoint including managing those who educate, and keeping programs updated and interesting.

Interviews were attended by all members of the project team, and took 45 minutes to an hour to complete. Topics regarding demographics that interviewees felt need education, and the education of said demographic groups in relation to smoke alarms were covered. Specific questions relating to the educational programming that the MFB has offered were also asked of the interviewee. The following are samples of the questions that were asked.

- What demographic groups do you consider most at risk for complying with smoke alarm regulation?
- What programming past/present has been offered to increase smoke alarm compliance of at risk groups?
    - How long has this programming been in existence?
    - Can you provide an outline of what is covered in these programs, and how it is presented?
- Have studies been performed on these educational programs to determine whether they are effective?

- Were they determined to be effective?
    - How well are people retaining information short term?
    - How well are people retaining information long term?
    - Does the programming contain information that the MFB believes to be of the quality needed to educate people of low compliance?
    - Does the programming used produce the results that the MFB expects?
    - Is the programming considered to be cost-effective given the results that the MFB is obtaining?
- Do you think that there is anything that could be changed within current MFB programs/distribution of programming material to better target its audience?
- What types of programming material do low compliance groups respond to the best?

Initially, there was concern that employees might be afraid of stepping on other employee's toes by making particular comments about the programming that is offered by the MFB, leading to false responses that would not help the end goal of the project. This was avoided by conducting interviews in private and keeping responses confidential. After completion of the interviews, results were summarized and compared later on with evaluations done of risk communication programs of other organizations.

From these interviews, the project gained a more comprehensive understanding of the MFB's current programming. This includes the program content, as well how it is presented to different groups. It was also important to record how it is decided that certain groups need the information.

By examining the risk communication programs used by organizations in New Zealand and the United States, it was possible to compare the actions of the MFB to those that have been tried elsewhere. If programs were found that targeted the previously mentioned demographics, and different from those already in place, it might be of interest for the MFB to try reaching people in a similar manner. Likewise, if programs were

found to be unsuccessful in reaching target audiences, the MFB would benefit by discontinuing or not beginning similar programs.

To catalogue the vast amount of information about each program into an easily accessible format, a chart method was developed. This method covered all of the basic information about each program, including who ran it, who paid for it, who it was targeted towards, who created it, and the basic messages and delivery that made the program unique. To evaluate the effectiveness of the current programming, a set of guidelines was developed based on the interviews and background research. The MFB will be able to easily reference all this information in the future, as well as catalogue any future programs in this way.

10.2.1 Other organizations

The specific organizations that contact was attempted contact with were the National Fire Protection Association (NFPA) in the United States, New Zealand Fire Service, and the London Fire Brigade. Several people at the MFB tried to make contact with all three of these locations, however only New Zealand replied with information. Therefore, they are the only program referenced.

10.3 Identify areas for improvement within the MFB.

During the interviews and program reviews, several re-occurring internal barriers were recorded. An identified barrier was posed to a person employed in a different role, and two sources were required to validate a barrier. Making a recommendation was handled in a similar manner. Once the barriers and all related issues were outlined, it became a matter of identifying a solution to each specific problem.

11 Data & Analysis

11.1 Data

11.1.1 Interviews

Interviews were conducted with seven members of the MFB who hold very different jobs throughout the organization. Several were administrators or managers within Community Education, several worked with programs aimed at identified at risk groups, and several were more involved with fire fighting.

Names and positions are withheld in this report. This is to protect the confidentiality of those who volunteered information. The interviewees either came to the Community Education department, or were met at their branch of the MFB. Questions were to each person's specific area of expertise and their opinions on other areas of the problem. From these interviews, several key recurring themes were found. Barriers and at risk groups were identified through these interviews.

11.1.2 Internal Barriers

Employees from both the administrative side and the on duty fire fighter side believe that a major internal barrier lies with the fire fighters of each individual station who are responsible for program delivery. Many are said to believe that their job is "to put wet on red", that is, to fight fires rather than educate about them. This leads to several different issues.

Since fighting fires is the priority in the stations, if a fire and a scheduled community education event coincide, the latter is disregarded. This leads to some disdain for the fire service within the community. This attitude is often passed on to new fire fighters by veterans, or the veterans who are doing the same thing day in and day out lose motivation. When this happens, they are in danger of losing the attention of the community. In addition, frequent industrial or work bans can slow or halt any progress made on any of these issues.

Another issue is the chain of command as it stands now. Fire fighters work under the Chief, and those who work in Community Education report to the Director of Community Safety. While both the Chief and the Director are on the same level, "they have very different priorities with little opportunity for interaction". Those in administrative positions are also not held in high regard by the fire fighters on duty, and seen as less credible and respected. "Firees", as they refer to themselves, feel as though those in administrative positions look down on them, and do not trust them to carry out simple tasks.

Some feel that the 96% of compliance quoted in the ABS survey is either accurate or very close, while others are very harshly cynical. They feel as though many "hang their hat on that number, and use it to justify not doing anything," and feel that there is still a large percentage of the population without a working smoke alarm.

Another issue is that there is very little numerical information about incident demographics. This is backed up by the fact that the AIRS (Australasian Incident Reporting System) reports that are used to track fires collect very little demographic information, and the reporting format is not consistent with itself. At risk groups are determined mostly by assumption rather than concrete evidence and acting globally after a tragic local event. While speaking about a program aimed at the Vietnamese, one interviewee was asked why it was deemed necessary. The interviewee replied "Well, there was a fire several years ago, and the house was full of Vietnamese families".

11.1.3 At Risk Groups

From viewing the AIRS data in the previous section, renters and homeowners were identified as groups more likely to not have a working smoke alarm. Possible reasons for non compliance among these groups are ignorance of their responsibilities in smoke alarm installation/maintenance or inability to perceive the risk of house fires.

Currently, the MFB targets several other at risk groups with programs specifically aimed at increasing compliance. Each of these groups has it's own set of challenges to creating effective programming.

Multi-cultural groups often have difficulty with language and culture differences. For example, Vietnamese immigrants were arriving in Australia to find signs all over airports and public places saying "no smoking". When they were told about smoke *detectors*, many of them "thought that they were being monitored in their own homes, and punished or deported if the *detectors* saw them smoking". Therefore, many of them actually unplugged the batteries, leaving the devices useless. Some of the traditions or customs of certain ethnic groups have made them more prone to having a house fire. Sudanese people cook on the floors of their homes with open flames in their native country; however in a small enclosed home this can quickly escalate into a serious fire hazard. Many different CALD groups are refugees, and have issues with trusting uniformed officers.

Therefore, programs aimed at the CALD community often include the use of a translator or multi-lingual presentation materials. The MFB also tries to create bonds with these communities to foster a sense of trust and comraderie. A more complete write up of these programs can be seen in Appendix B.

Among the elderly, the educator often has the challenge of overcoming many years of ingrained "bad habits." There is also a common belief of "I've lived this many years without a smoke alarm, why do I need one now?" These attitudes also tie in with the risk perception data presented in the literature review. The elderly must also be treated with respect when addressed, or the message is completely lost.

11.1.4 Alarm Maintenance Enforcement

During the 1980s, as alarms systems became more common in commercial buildings, the number of false alarms began to increase as well. Many of these false

alarms were due to poor maintenance and operation of fire systems. Every year, the Metropolitan Fire Brigade responded to over 20,000 false alarm calls, finally peaking at 28,000 in 1989. This number represented 68% of the calls responded to by the MFB (Metropolitan Fire Brigade, 2005), prompting the State Government to enact legislation that allowed the MFB to begin levying charges against the owners of buildings if it was determined that a false alarm was caused by something that could have been prevented, such as poor system maintenance.

This action had immediate results, as the number of false alarms dropped by almost 20% between the fiscal years of 1989/90 and 1990/91. False alarms have continued to decline in the past 15 years, with only 43% of all calls being false alarms in 2002/03. During the 2004/05 fiscal year, the MFB responded to 13,602 false alarms, a difference of 13,280 – almost 50% – from the 26,882 false alarms during the 1989/90 fiscal year, when the legislation was first introduced.

In conclusion, the situation concerning false alarms in commercially-owned buildings within the city of Melbourne shows promise in terms of enacting legislation to solve a problem of compliance. Once the MFB began charging for false alarms, building owners were quick to bring their systems up to code and to keep them maintained. Such a dramatic increase in compliance levels in a private sector such as commercial property suggests that a similar tactic may work for rental properties. Landlords could be just as quick to respond if the MFB began charging them for any false alarms occurring in their buildings.

11.2 Analysis

11.2.1 Fire Data

11.2.1.1 ABS Survey

Earlier in the project, a survey performed by the Australian Bureau of Statistics. Upon further examination, there appears to be several questionable issues. The only

available resource was the actual report of the survey, and the brief technical notes section. Several possible errors or discrepancies within the survey include:

- The extrapolation process and sample used
- The calculated error
- Manner of reporting
- Age of the survey

The first issue is the extrapolation process. Only 1000 subjects were questioned, and then this data was extrapolated to represent not only the 3.6 million residents of Melbourne, but all of Victoria as well. While it is entirely possible that this is an accurate sampling of the population, there is no information as to how the sample was stratified. For example, this sample could have been done based on socio-economic distribution, occupation, age or any other number of demographic factors. Therefore, it is very hard to incorporate these results into the project in a technical sense.

This survey was last conducted in 1998 - close to 10 years ago. Since then, the demographics of the area have assuredly changed. There has been no other formal recording of smoke alarm usage since then, so there is no way to monitor how it has changed over the span. Also, the survey is so old that those who created and executed it (and therefore would be able to provide information about the previous issues) are no longer reachable.

11.2.1.2 AIRS Data Analysis

To find concrete evidence of an at risk group, AIRS data was analysed with respect to the non-compliance of landlords and renters, as well as, the percentage of renter/owner occupied fires that the MFB responds to. To perform this analysis, AIRS fire data from 2001-2005 was first arranged into the two different types of property ownership in Melbourne: rented and occupant owned properties. To accomplish this, data was first sorted comparing the property owner's suburb versus the suburb of the fire incident. Any instances where the two suburbs were different were considered to be

rental properties. A second pass through the data analysed the street name of the owner address and that of the incident of fire. Again, all comparisons resulting in a difference were considered to be rental properties. These two filtering operations yielded lists of owner occupied and rental properties with incidents of fire in Melbourne.

An initial finding of separating rental properties from those that are occupant owned was the percentage of renter/owner occupied properties that had fires. Through interviews it was stated that "approximately 25% of all housing in Melbourne are rental", but upon this investigation, it was found that the number of fires amongst these groups was not proportionally represented. Approximately 36.5% of all fires that the MFB responded to, during the 2001-2005 period, were to rental housing. This is a significant finding as it appears that those that live in rental housing are more likely to have fires.

It was also possible to draw comparison between incidents where there was "Fire within Range of Alarm" and "No Alarm Present", and in the case of those that did have alarms, whether it "Failed to Operate" or "Operated". This comparison was performed for both owner-occupied and rented properties. Through this comparison, the project hoped to determine any differences in the levels of compliance in relation to having alarms installed and maintained for both owner-occupied and rented properties. It was found that 31.3% of rental properties and 28.6% of owner occupied properties failed to have smoke alarms installed. It was also found that 15.9% of rental properties and 16.9% of owner occupied properties did not have a working smoke alarm as a result of improper maintenance.

The result of this inquiry showed that there is no real difference in the level of compliance between owner occupied and rental properties when comparing maintenance and having the alarm installed. Although neither group stands out as being at higher risk of failure to comply with smoke alarm regulation, it is apparent that there is still a significant problem with compliance in the community at large.

11.2.1.3 Where the Problem Lies

The AIRS fire data was then further manipulated to yield the postal codes with the highest occurrence of both having fires as well as not having a smoke alarm among renters. To perform this analysis, instances where occupants failed to comply with regulation and their respective postal codes were summed. To normalize the data, the total number of instances of no alarm or alarm that failed to operate were divided by the number of incidents in a given post code. Doing so quantified the likelihood that a rented home from a given post code would fail to comply with regulation. The probabilities for each post code are exhibited in the graph below. See Figure 2.

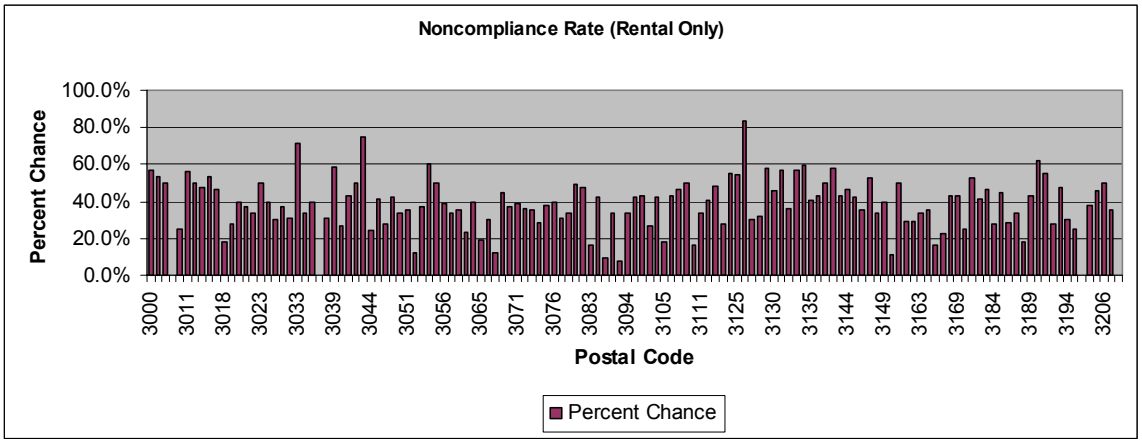


Figure 2: Non-compliance Rate (Rental Only)

In the figure above, it is apparent that there is a random pattern to the non-compliance rate found in each postal code. Postal codes are shown in ascending order in the preceding figure. Generally speaking, postal codes with sequential numbers are in close proximity to one another. Through this comparison it is possible to determine any forms of geographic correlation. While postal codes do not exhibit a particular pattern of non-compliance, some are clearly at a higher risk than others. Table 7 shows the top ten worst postal codes to comply with smoke alarm regulation.

Table 7: Top Ten Worst Postal Codes for Failure to have a Smoke Alarm

	Postal Code	Non-compliance Rate
1	3126	83.30%
2	3043	75.00%
3	3033	71.40%
4	3190	62.50%
5	3054	60.00%
6	3134	59.30%
7	3039	58.30%
8	3129	57.90%
9	3141	57.50%
10	3133	57.10%
-	3131	57.10%

The rates of non-compliance shown in the table above show that there is a significant problem among certain postal codes in Melbourne. A complete listing of all postal codes and their corresponding non-compliance rates can be found in Appendix D. From this information it would be wise to attempt pilot programs among landlords and renters in any of these ten postal codes.

11.2.2 Programming Information

For easy reference and comparison, the information from all analysed programming has been entered into table format, and can be seen in Appendix B. Some of the information that is contained in the programming tables includes programming target audience, delivery methods, staff hours, duration of programming, materials used, and objectives. Arranging this information this way allows for programming delivery techniques to easily be compared amongst programming. Current MFB Programs, MFB Programs not currently in use, Smoke Alarm/Fire Education Programs from the NZFS (New Zealand Fire Service), Smoke Alarm/Fire Education Programs from the United States, as well as a successful program where enforcement of legislation increase compliance.

Analysis of Programming

Due to the nature of public education, it is very difficult to assign a quantitative value to its effectiveness. In the literature, it was found that there are two means in which you can quantitatively measure the effectiveness of community education. These two means involved post-evaluation in terms of use of resources the other with regard to penetration of programming into the community. However, the implementation of such evaluation techniques poses quite the problem given the large number of variables that affect the outcome of programming. Within a group of people it is very difficult to actually discern the reasons for each person's behaviour, and even more difficult to attach that behaviour to a program or promotion. Another issue that a post-evaluation raise is the large cost involved in collecting a valuable amount of data. The only other ways to measure how well a program worked is through pre-evaluation of programming. Pre-evaluation techniques may involve tracking how many people participated in the programs, and how well those who administer feel they retained the information. Pre-evaluation techniques are used to forecast the potential effectiveness of a community education program.

Through interviews with MFB staff, it was found that the basis for the success of their current programming is only gauged solely by anecdotal evidence. There is no quantitative analysis performed on these programs; only on compliance as a whole. If a program is designed to target a certain sect of the population, often times those who work in the programs will have a feel for how well those who were educated responded to it.

Through the interviews conducted and the programming information collected, it became clear that the only feasible and achievable way to actually evaluate how well a program works is by evaluating how well it is designed to work, and identifying any possible flaws that could arise throughout the operating time of the program. Therefore, universal guidelines, for the pre-evaluation of programming effectiveness, were developed as an effective way to measure the strengths and point out the weaknesses of any public education program. These guidelines were the product of organizing the key information points of each program in the charts in, Appendix B, and then grouping the

strong and weak points of a program. How well employees of the MFB felt the programs were received was also taken into account. Once the set guidelines was complete, background research was used to corroborate their validity. The guidelines are shown below:

1. Face-to-face contact and personal interaction where possible
2. Information is consistent among all programs
3. Information is tailored to the target audience
4. Information is delivered by a person respected by the target audience
5. Ownership is shared by multiple parties
6. Message is reinforced by multiple exposures

Another important point about the Gold Star Guidelines for pre-evaluating programming effectiveness, is that it is a method the MFB can use in the future along with the program information grids to design an effective program. In a manner similar to that presented in the next section, program design from two completely different sources promoting two completely different messages can be compared for potential successfulness in program delivery.

11.2.2.1 Implemented Guidelines

Following is an examination of the effectiveness of each program already presented, according to the rubric. The number along the top row of the chart corresponds to the number of the guideline referenced, with the program titles listed in the far left and total score on the far right column. *See* Table 8

Table 8: Gold Star Evaluation of MFB Programming

Australian programs	1	2	3	4	5	6	Total
Early Fire Safe	★	★	★	★		★	5
Fire Ed for Preps	★	★	★	★		★	5
Fire Ed Grade 6	★	★	★	★			4

FLAMES for English Language Schools and Centres (ELS/ELC)	★	★	★	★	★	★	6
Retire Ed	★	★	★	★			4
FLAMES for Adult Migrants	★	★	★	★			4
Operation Home Safe			★				1
Isolated Elderly	★	★	★	★			4
New Zealand programs							
The CLASP programme (Community Liaison Ambassadors Safety Project)	★	★	★				3
Home Safe Home	★	★	★	★			4
C'mon Seniors get Fire Wise - Confident Living	★	★	★	★			4
Marae (cultural buildings)	★	★	★	★			4
Similar Programming							
Florida Bicycle Helmet Education	★	★	★	★			4
Ticketing Incentives	N/A						N/A
"Click it or ticket" Campaign		★	★	★			3
Freddy Finger Campaign	★	N/A	★	★	★	N/A	4

These guidelines for pre-evaluation of potential program success will be available for MFB use long after the end of the project. It will also allow them to objectively examine any new or already in use programming, so as to avoid promoting anything that has obvious flaws from the start, or to modify programming to make it more worthwhile. This in turn will help the essential goal of the project: to make recommendations to

increase smoke alarm compliance in the city of Melbourne. To see a more detailed description of all programming mentioned see Appendix B.

While the chart above shows the Gold Star ratings in a very easy-to view format, a more complete write up of each program's evaluation can be seen below.

Early Fire Safe

- **Face-to-face contact and personal interaction where possible**- The educators speak and interact directly with students.
- **Information is consistent among all programs-** Children are instructed by fire fighters, and then relay the message to their parents. However, there potential for the message to be altered in transit from fire fighter to parent.
- **Information is tailored to the target audience** – Educators are trained in presenting effectively to young children.
- **Information is delivered by a person respected by the target audience-** Fire fighters are usually respected by young children.
- **Ownership is shared by multiple parties**- No.
- **Message is reinforced by multiple exposures-** Yes. There are 5 sessions in total, 2 hours each.

Fire Ed for Preps

- **Face-to-face contact and personal interaction where possible-**Yes, teachers prepare and educate their students, and a trained fire fighter makes two visits to the classroom.
- **Information is consistent among all programs-** Yes, teachers and fire fighters use the same kits.
- **Information is tailored to the target audience -**This program is targeted to 5-7 year old children.
- **Information is delivered by a person respected by the target audience-** The teacher reinforces children's respect for the fire fighter and the fire fighter demonstrates operation of firefighting equipment.

- **Ownership is shared by multiple parties-** No
- **Message is reinforced by multiple exposures-** Yes, after the initial session the fire fighters come back to the school to reinforce knowledge.

Fire Ed Grade 6

- **Face-to-face contact and personal interaction where possible-** Classroom teachers present a course incorporating grammar and fire safety and fire fighters visit the classroom to reinforce concepts the children have learned.
- **Information is consistent among all programs**- Yes, this information is similar to that of previous programs.
- **Information is tailored to the target audience** – these children have already been presented with previous fire education, they receive a more in-depth set of information. This information includes how fires start and how to identify potential hazards.
- **Information is delivered by a person respected by the target audience**- Both the classroom teacher and the fire fighter present the information.
- **Ownership is shared by multiple parties**- No, only Community Education.
- **Message is reinforced by multiple exposures-** No. There is only one session with the fire fighters in class. The teachers have the option to continue teaching about fire safety messages or move on.

FLAMES for English Language Schools and Centres (ELS/ELC)

- **Face-to-face contact and personal interaction where possible-** Trained fire fighters and/or educators present the information through an information session and a video at English Language Schools.
- **Information is consistent among all programs**- Yes, information is consistent. Fire fighters are identified as emergency respondents, and basic home fire safety is taught.
- **Information is tailored to the target audience** – Translators are used to reach people who speak different languages. Lessons are conducted in English and incorporated into the lesson plans already in place.

- **Information is delivered by a person respected by the target audience**- This program attempts to reinforce that fire fighters should be trusted and respected.
- **Ownership is shared by multiple parties**- Yes, several MFB employees are responsible for coordinating this program.
- **Message is reinforced by multiple exposures-** Yes, after the initial session the fire fighters come back to the school to reinforce knowledge.

Retire Ed.

- **Face-to-face contact and personal interaction where possible-** Fire fighter/educators meet with local community groups to present programming.
- **Information is consistent among all programs**- Yes, information is presented on basic home fire safety.
- **Information is tailored to the target audience – Yes,** only information that is practical and pertinent is presented. The video used is in three languages, and translators are used to reach different ethnicities.
- **Information is delivered by a person respected by the target audience**- The community leaders work with the fire fighters/educators to reach this group.
- **Ownership is shared by multiple parties**- No.
- **Message is reinforced by multiple exposures-** No. Fire fighters deliver the message only upon request of the local community.

Flames for Adult Migrants

- **Face-to-face contact and personal interaction where possible-** Fire fighter/educators present the information in the FLAMES program to students who did not attend elementary school in Australia.
- **Information is consistent among all programs**- This is the same information presented in the other FLAMES program.
- **Information is tailored to the target audience** –Incorporated into English lessons, translators are used, and an adult-specific lesson plan is used.

- **Information is delivered by a person respected by the target audience**- The classroom teachers and the fire fighters present the information to the class separately.
- **Ownership is shared by multiple parties**- No.
- **Message is reinforced by multiple exposures-** No. This program is offered in one session delivered by the fire fighters.

Operation: Home Safe

- **Face-to-face contact and personal interaction where possible-** No, the only means of promotion used was a letterbox drop of flyers in one suburb of Melbourne as a pilot study. Should a recipient of the flyer choose to accept the MFB's offer, home visits would have been performed on a person–to-person level. Since the initial information was only presented through flyers, this program had little response.
- **Information is consistent among all programs**- While information was presented on basic home fire safety, there was some misconception that participating in this program would require costly repairs. Homeowners through this program had home safety inspections performed and believed that they would be required to perform the repairs that were made by the inspections. Failure to maintain consistent message helped prevent the successfulness of this program.
- **Information is tailored to the target audience** – Yes, the program was presented to homeowners with regard to safety issues specifically in their home.
- **Information is delivered by a person respected by the target audience**- No, the information was only promoted through flyers, and caused people to question the credibility of those that performed home inspections.
- **Ownership is shared by multiple parties**- No.
- **Message is reinforced by multiple exposures-** No. The fire fighters come once into the house and asses the residence with respect to fire safety issues.

Isolated Elderly

- **Face-to-face contact and personal interaction where possible-** Care takers of the elderly are trained to educate the elderly or their families on the importance of fire safety.
- **Information is consistent among all programs**- The information presented to care takers is consistent. However, there is potential for error in transit between care takers, the elderly, and family.
- **Information is tailored to the target audience** – The information presented covers basic home/fire safety issues that are of interest to the elderly, but the focus is on teaching that information to the care takers as well as teaching them strategies to pass it to those who are at risk.
- **Information is delivered by a person respected by the target audience**- Yes, since either the care takers or the families are the ones directly in contact with the target audience.
- **Ownership is shared by multiple parties**- While there are several links to reaching the at risk group, it is monitored solely by Community Education.
- **Message is reinforced by multiple exposures-** No. The fire fighters come once into the house and asses the residence with respect to fire safety issues.
- **Message is reinforced by multiple exposures-** No. The fire fighters come once into the house and asses the residence with respect to fire safety issues.

Programming in Other Organizations

New Zealand Programs (New Zealand Fire Service, 2005)

CLASP Program

- **Face-to-face contact and personal interaction where possible-** Yes, trained representatives of the NZFS visit individual homes to install smoke alarms, give fire safety advice, and distribute home escape plan kits.
- **Information is consistent among all programs**- All representatives have the same training, and give the same advice and home safety materials.

- **Information is tailored to the target audience** – Information is presented to the homeowners for them to pass along to the other residents.
- **Information is delivered by a person respected by the target audience**- While the representatives are trained by the NZFS, the public is still reluctant to allow them into their homes.
- **Ownership is shared by multiple parties**- No.
- **Message is reinforced by multiple exposures-** No, the ambassadors pass through a house only once.

Home Safe Home

- **Face-to-face contact and personal interaction where possible**- Trained educators present information to the care takers of the disabled and the elderly for them to then educate the at risk groups.
- **Information is consistent among all programs**- While the information is consistent among the caretakers that are trained, there is the possibility for the message to be distorted when passed from the caretaker to the patient.
- **Information is tailored to the target audience** – Similar to the Australian program, the information is targeted towards the care takers, but the information is aimed at the elderly and/or disabled.
- **Information is delivered by a person respected by the target audience**- The information is delivered via trained fire fighter/educator to the care giver, and then passed to the target audience via care taker or family member.
- **Ownership is shared by multiple parties**- no.
- **Message is reinforced by multiple exposures-** Yes. The fire safety education is taken in a set of sessions.

C'mon Seniors get Fire Wise- Confident Living

- **Face-to-face contact and personal interaction where possible-** Information is delivered directly to the elderly at recreational group
- **Information is consistent among all programs**- Yes, basic fire/home safety is presented through a standardized video and educational materials.

- **Information is tailored to the target audience** – Video and flip chart are designed for the elderly.
- **Information is delivered by a person respected by the target audience**- Yes, fire fighters present the educational material
- **Ownership is shared by multiple parties**- no.
- **Message is reinforced by multiple exposures-** No. Message is only delivered to the recreational groups upon request.

Marae

- **Face-to-face contact and personal interaction where possible-** Information is presented directly to Maori Communities as identified by community leaders.
- **Information is consistent among all programs**- Specialized fire risk management information is presented.
- **Information is tailored to the target audience** – Marae buildings are more susceptible to devastating fires, so the information centres on risk prevention and management. Also, a translator is used to reach the large portion of this group that does not speak English.
- **Information is delivered by a person respected by the target audience**- Fire fighter/educators present the information, with the assistance of an interpreter who may or may not be chosen by the community.
- **Ownership is shared by multiple parties**- no.
- **Message is reinforced by multiple exposures-** No. Information is delivered only upon request of the community with a single session.

United States

"Freddy Finger" Campaign

- **Face-to-face contact and personal interaction where possible –** The Austin Fire Department has relied almost completely on Face-to-face contact, including a public campaign roll-out celebration and door-to-door canvassing of the Austin area.

- **Information is consistent among all programs –** There is only one program using one message.
- **Information is tailored to the target audience –** Information is delivered to everyone – homeowners, children, etc. and is in some way catered to appeal to and be effective in reaching all of them.
- **Information is delivered by a person respected by the target audience** Information is delivered by Austin fire fighters to the general public.
- **Ownership is shared by multiple parties** – Yes, the partnership with local media has proven to be invaluable in enhancing the importance of smoke alarm maintenance.
- **Message is reinforced by multiple exposures- Yes, exposure includes public events, billboards, posters, and commercials.**

Florida Bicycle Helmet Education (non-fire related)

- **Face-to-face contact and personal interaction where possible –** Information is delivered directly to schoolchildren by nurses during school visits.
- **Information is consistent among all programs –** Yes, a video about helmet safety is presented.
- **Information is tailored to the target audience –** Nurses use examples of kids aged 7-14 not wearing helmets and being seriously injured in bicycle accidents.
- **Information is delivered by a person respected by the target audience** – Information is delivered by nurses from the Broward General Medical Centre.
- **Ownership is shared by multiple parties** – No.
- **Message is reinforced by multiple exposures-** No, nurses visited schools only once.

Enforcement Programs (non-fire related):

Ticketing Incentives

This program targets the police officers that ticket civilian drivers for lack of seatbelt use, making it unlike other campaigns in the sense that it does not involve any sort of public education programming, and therefore cannot be held to the same rubric as the other campaigns presented here.

"Click it or ticket" Campaign

- **Face-to-face contact and personal interaction where possible –** Other than being issued a ticket, very little – the majority of information is delivered through the media.
- **Information is consistent among all programs –** Delivered through the media and word-of-mouth, information is very basic and therefore easy to keep consistent.
- **Information is tailored to the target audience –** The target audience is anyone that drives a car and is obviously catered to them.
- **Information is delivered by a person respected by the target audience** – Information is generally delivered by police officers, whether in person or through media.
- **Ownership is shared by multiple parties** – No.
- **Message is reinforced by multiple exposures-** Yes. Police officers were constantly reminded of the incentives they could get if they kept ticketing.

12 Conclusions & Recommendations

12.1 Conclusion

Barriers to compliance are the different reasons why the percentage of compliance is lower than desired by the MFB. Barriers can be divided into two main areas: external barriers, meaning issues among the population of Melbourne, and internal barriers, meaning issues within the MFB.

External barriers are the easiest to identify, and often easily addressed once recognized. Interviews with different employees of the MFB have suggested the following common barriers:

- Language/Culture
- Ignorance of the benefits of smoke alarms
- Ignorance of responsibilities/maintenance
- Inability to perceive risk
- Ingrained bad habits

All of these are issues that the MFB has already addressed through community education programming. Descriptions of these programs can be found in **Appendix B**. Renters and homeowners were the only at risk groups in Melbourne to be backed up by concrete data.

Internal barriers can be more difficult to recognize, and therefore more challenging to address. Sensitivity of certain matters and political barriers often block the possibility of change within an organization. Internal barriers can be further broken down into several internal issues have been identified as barriers within the MFB.

Identified internal barriers are:

- Allocation of resources
- Chain of command
- Rotation of fire fighters
- Motivation of fire fighters
- Priorities in administration and in fire stations

The AIRS statistics collected by the MFB do not include several pieces of demographic information that would allow a more concrete assessment of at risk groups to be made. This leads the project to conclude that at this point there is no way to make concrete identifications of at risk groups, outside of the groups identified in the literature review. Instead, a major conclusion is that the only way to increase compliance in Melbourne is to increase general compliance.

Currently, the MFB has no uniform method of evaluating program effectiveness. This could mean that resources are being allocated to ineffective community education programming. The two different means of post evaluation referenced in the literature review are not appropriate for the public education campaigns of the MFB because they rate a program in terms of resources used and penetration into the community. This data was explained to be costly to collect a useful amount. Therefore pre-evaluation was concluded to be a much more cost effective means of evaluation, because it allows potential effectiveness of a program to be forecasted before resources such as time and funding are poured into it.

Within the MFB, fire fighters report to the Director of Operations. Those who work in Community Education report to the Director of Community Safety. While these two positions are on the same level within the organization, they represent very different interests. Currently, priorities are established at the executive level. However, among the senior and middle management levels, these priorities are often debated when assigning resources.

Between one and five times annually, fire fighters are rotated between any of the MFB's 48 stations. This prevents the fire fighters from establishing roots in a community, and most importantly, assessing the educational needs of a community.

Fire fighters delivering community education programs are often asked to present the same programs repeatedly to engage the audience. While these programs are carefully

crafted to appeal to their desired audience, their message can easily be lost in transit from a fire fighter who has become bored with presenting the same material and does not show enthusiasm while delivering the programs. Fire fighters can only present a meaningful and engaging program if they themselves are engaged and motivated.

Both fire fighters and those working in Community Education have admitted that community education strategies are often something that tends to take a backseat to the other important core duties of a fire fighter, such as responding to emergency calls and training. In most cases, community education is not seen as a priority. According to several interviewees, if a public education event is planned, but those scheduled to present are called to an alarm, the appointment is often cancelled generally without a new informational session being scheduled.

12.2 Recommendations

The following recommendations centre on addressing the aforementioned conclusions and the project goal of "assisting the MFB in developing strategies to reach the groups of people who have a low level of smoke alarm compliance in their homes."

- **Enforce legislation in rental properties**

Research into seatbelt and bicycle helmet legislation, shown in the literature review, suggests that enforcement of pre-existing legislation with a fine attached is a very effective means to increasing compliance.

The MFB has also had success with enforcing legislation. As referenced in the data section, Legislation was passed allowing the MFB to charge commercial properties for false alarms relating to disrepair in 1989, and by 1990 false alarm calls had decreased by 20%. Since then, false alarm calls have decreased by close to 50%.

Rental properties were shown to be at a high risk for non compliance through the AIRS data analysis. Rental properties can also be classified as commercial properties, as

the landlord is earning a profit. Therefore, it is recommended that the MFB promotes awareness of responsibilities to both landlords and renters, and encourages local councils to enforce the ordinance in rental properties.

A pilot test of this recommendation could be effectively conducted in any one of the postal codes identified in Table 7, "Top Ten Worst Postal Codes for Failure to have a Smoke Alarm." This would not only target test the effectiveness of the recommendation, but also target a particularly at risk area.

- **Create partnerships with professional organizations**
    a. *Partnerships with Real Estate Organizations*

As shown through AIRS data analysis, both rental and owner occupied properties were found to be at risk for not having a working smoke alarm. A possible partnership to target both of these groups is the REIV (Real Estate Institute of Victoria), an industry association representing Victorian real estate agents. The mission statement of the over 3600 member of the organization is "to lead the industry and promote the delivery of professional services by our members to the public and to ensure the integrity, credibility and ethical standards of the real estate industry." (REIV, 2006)

The REIV, along with many independent Victorian real estate agents, has created a website (www.realestateview.com.au) that lists the majority of for-sale properties in Victoria. Features of this site include the ability to locate properties in terms of proximity to schools, shopping centres, transportation, and a number of other facilities. Information on each property can be quickly and easily accessed, therefore it would be simple to include information concerning the smoke alarm situation in a property.

Members of this group could require a working smoke alarm to be installed before renting or selling any properties. In addition, agents could provide information to both owners and renters informing them of their responsibilities (Owners must install the alarm, renters must maintain it.)

b. Partnerships with Insurance Companies

Through research, this project found that many effective campaigns to change human behaviour to safe practices in life have utilized monetary setbacks to discourage failure to comply with regulation. As of now, insurance companies in Victoria cannot offer insurance discounts for those that have smoke alarms, as they are required by law. However, there is the possibility of a reduced claim payout if no evidence of a working smoke alarm is found following a fire.

This would act as a win-win situation for both parts of the partnership. The insurance companies would benefit from reduced settlement payout, and therefore increased profits. The MFB would be able to increase smoke alarm compliance. A benefit of this opportunity is that it does not specifically target any one group for smoke alarm education, rather the very general identified at risk group of homeowners.

c. Partnerships with Medical Professional organizations

Educating the public through medical professionals proved very effective in the bicycle helmet campaign referenced in the literature review, therefore partnerships with health organizations have the potential to increase smoke alarm compliance. The health and safety advice of medical professionals is often highly regarded.

Fire statistics from around the world shown in the literature review cited the elderly as particularly at risk for not having a smoke alarm. This group also frequents doctor's offices for checkups, and views medical professionals as authority figures.

A possible organization is The AMA, the peak health advocacy organization that represents over 27,000 medical practitioners across Australia. One of the objectives of this organization is "to advance the public health through improved communication between doctors and the community". (AMA, 2006) The AMA already has partnerships with other organizations, including state and federal governments, medical schools, the National Heart Foundation, and the Cancer Council of Australia. As the AMA is comprised of such a large amount of professionals, it would be very easy to send a

consistent message to a large quantity of people. Brochures and posters could be placed in the offices of participating members, and professionals could speak directly to their patients about fires safety in the home.

- **Continue to tailor programming to specific at risk groups**

Currently, the community education department of the MFB devotes a large amount of time to tailor each program to the designated audience. By continuing to make information accessible to Melbourne's diverse population, the MFB will maintain their level of service.

- **Review and update presentation materials as necessary, and encourage fire fighter input in community education programs and resources.**

To combat feelings of repetitiveness among the fire fighters that could be transferred to the public, presentation materials and programming should be reviewed and updated with their input as needed. The basic fire safety information presented will not change, just the method of delivery. The community will benefit from the increased interested and fire fighter buy in to the message.

Fire fighters are one of the key links in educating the community. Other communication tools are regular campaigns involving the various media, internet information/resources, and the Community Education Department. They also have a unique insight into which techniques work best, and which could be improved. Their valuable input would help to fine tune programs.

- **Avoid cancellations of community education events**

Obviously, responding to emergencies is the main responsibility of a fire fighter. However, that does not mean it is necessary to forget all other obligations when the alarm sounds. Public education events should be scheduled with several back up stations or units on call. If the primary scheduled station members are suddenly called to an emergency, the fire fighters of another station could take over the responsibility. Clearly, if the emergency was large enough to require multiple stations, the emergency is

definitely the priority. However, shared scheduling when possible or applicable would help to avoid any public resentment due to a "no show."

- **The middle and upper management staffs of the Director of Community Safety and the Director of Operations should meet to compare progress and priorities.**

These two equally important positions have the power to accomplish many of the recommendations set forth in this report. While it is important that these two positions share the same priorities, the people working under them and dealing more directly with the fire fighters must also share them. Therefore, the Director of Community Safety and the Director of Operations should have regular meetings with their middle and upper management to monitor their progress and help develop new strategies in this area. By reinforcing the importance of community education to the mangers, they will be in a position to pass these attitudes along to the fire fighters.

- **Update Statistics**

Due to the possible flaws of the ABS survey outlined in the analysis section, it is recommended that this survey no longer be accepted as a benchmark of compliance. One possible method to ensure more accurate reporting is to have respondents actually test their smoke alarm over the phone, so that the person administering the survey had proof of the reporter's accuracy.

While the AIRS data is up to date and goes into more demographic detail, it only allowed for the at risk group conclusions of renters and homeowners. More detailed statistics would provide a more accurate count of the number of working alarms in the community, as well as identify potential at risk groups. Therefore, it is recommended that the MFB incorporate the supplement seen in Appendix C into its current AIRS procedures.

This supplement includes questions to further identify the ethnicity, age, socio-economic status of the buildings occupants, as well as questions to determine if the

occupants had ever received any MFB community educational programming. This recommendation would help to identify future at risk groups to target, as well as track program effectiveness and reach. If resources are limited, this information would assist the MFB to prioritize its resources. This recommendation also helps to avoid the potential issues with a citywide survey.

- **Evaluate any proposed programming using the methods developed during the project.**

A large part of this project was analysing the current programming that the MFB uses, as well as programming data from several other compliance challenges. To compare and evaluate this massive amount of information, a two step format was created. The first step involved categorizing all the information from each individual program into an easily referenced format. This grid format compares all information about a program, including objectives, target audience, delivery methods, and duration of program. This information can be seen in Appendix B.

As stated in the conclusions section, pre-evaluation was found to be the most effective means for the MFB to measure potential effectiveness of a program. A set of six guidelines was created from interviews and the literature review to compare common traits of effective programs, and incorporate those traits into their own educational programs.

It is recommended that the MFB use this two step plan in evaluating any proposed programming. It allows for easy reference to all the important characteristics of a program, as well as for comparison without regard to the actual message. Employees of the MFB will be able to reference this method in the future, and evaluate any community education program exactly how it would have been evaluated during the project, and present improved programming to the general public while sparing any resources being allocated to less than effective programming.

13 Appendix A

History of the Metropolitan Fire Brigade

The origins of the Melbourne Fire Brigade (MFB) date back to the year 1845 when it was called the Melbourne Fire Prevention Society. With time and the growth of the city the number of fire prevention groups increased dramatically. Unlike the fire prevention services of present day Melbourne, these services were privately funded by insurance groups and businesses to protect their investments. Each residence or business carried a plaque, or coat of arms, to identify the fire company responsible for fighting a fire at that building. Strong rivalries formed among companies, and, in the event of a fire, all companies would rush to the scene to see who was responsible for putting out the fire. Those companies that were not responsible for fighting a particular fire would get in the way of anyone that was.

In 1899, there were several catastrophic fires. Six fire fighters lost their lives, and much property was destroyed. In December of 1890 the Fire Brigades Act was passed, and the rival groups were joined together as the Melbourne Fire Brigade. The 56 volunteer Brigades throughout the area were dissolved, and all fire fighters had the option to join the MFB. The motto of the newly formed organization was *Audax et Promptus,* which translates to "audacious and prompt," or "bold and ready."

Between the Northern, Southern, Eastern and Western Districts, the MFB now has 47 fire stations and specialty departments to handle the needs of the community. The MFB's territory extends to the city limits of Melbourne; Communities that lie outside the city limits are serviced by the Country Fire Authority (CFA). The MFB oversees over 1600 career fire fighters who are responsible for quickly and efficiently responding to all fire emergencies. These fire fighters work at all levels of the organizational structure of the MFB from management to the men and women fighting fires on the frontlines. In addition to fighting fires, the Brigade also is capable of Urban, High Angle, and Road Accident Rescue and Emergency Medical Response First Response. The Brigade must also respond to water emergencies, industrial and hazardous material accidents, chemical,

biological and radiological emergencies, as well as supporting any other combat or State agency in an emergency or major event.

The organizational structure of the fire brigade can be seen in Figure 3. The current President, Julie Elliot, oversees a Chief Executive and eight directors who manage development in Corporate Strategy, Operations, Finance and Administration, Human Resources, Community Safety, Corporate Relations, Technical Services and Corporate Governance. The Directors are then responsible for carrying out the Mission Statement of "Protecting Our Community."

Figure 3: MFB Organizational Chart

Over the past several years, the MFB has made a huge push towards education as a means to prevent and reduce fires. By working with several other government and corporate agencies, the MFB identifies groups at a high fire risk, and then targets educational programs towards them. Recently, they have started programs for school-aged children, the elderly, and those who do not speak English as a native language. In addition, they offer home and office services aimed at making buildings and the people in

them much safer. They will visit the homes of the elderly or disabled to install smoke alarms, assess buildings for any fire risks, and make presentations to classrooms to teach young children the importance of fire safety. The organization also endorses many home, recreation, and hazardous materials safety guidelines.

The MFB is a non-profit, government regulated organization. The Brigade is largely funded by statutory contributions to the fire levy. Before the start of each quarter, 12.5% of the cost is paid by the State Government of Victoria and 12.5% is collected from the local municipalities that fall entirely or partially within the Metropolitan Fire District. The remaining 75% is paid by statutory contributions from Insurance Companies, Insurance Brokers, and Insurance Owners.

A current issue for the MFB is the discrepancy between the actual number of operable smoke alarms in homes and the number reported by occupants. MFB statistics indicate that although 96% of people report that they have functioning smoke alarms, the MFB has found that functioning alarms are present in only 64% of the houses to which they respond. The goal of the project is to identify which groups are most likely to be out of compliance, and then to help create educational outreach programs and strategies that will increase the levels of compliance.

As previously mentioned, the MFB has a large scale education program already in place to target those who are believed to be vulnerable or at high risk, such as the elderly and children who have been identified to have pyromaniac tendencies. In creating their current programming, the MFB has worked closely with various groups, including school aged children and the elderly, in their efforts to reach out to particular groups. The Brigade has used its extensive library of data and research materials and has worked with different statistical bureaus to identify those groups and individuals that are most at risk.

14 Appendix B

FLAMES for English Language Schools and Centres (ELS/ELC)	
Target Group	Newly arrived secondary students and their families
Program Objectives	· Fire fighters role as emergency responders. · Home fire safety information · Testing smoke alarms/maintenance/changing barriers · Emergency procedures information · 000 emergency phone number
Offered to	Students that have not attended primary school in Australia
Offered by	MFB
Managed by	Community Education - Chris Hare (Leading fire fighter)/ Pat Nicholson (Public education officer)
Program Process and Materials	· Lesson based and blended into curriculum of schools attended by fire fighters · 3 Language fire safety video · Complete lesson plan teaching English (reading and writing) with fire safety messages
Duration of Programming	· 4 Years
MFB Man hours for Programming	· 10 schools (~7 hours per school) 70 hours
Audience Size	· 14 - 30 Students
Indicators of Effectiveness	· Prior and Post intervention survey · Teacher Feedback · Fire fighter feedback

Retire Ed	
Target Group	Seniors 50+ year old
Program Objectives	· Smoke alarms - placement, testing and maintenance · Fire safety in relation to home security · Accessing emergency services - Dialing 000 · Common fire hazards around the home and bad habits
Offered to	Local senior citizens community groups
Offered by	MFB (Presented only by retired officers)
Managed by	Community Education - Mathese Kavanagh (Public Education Officer)
Program Process and Materials	· Lesson based and blended into curriculum of schools attended by fire fighters · 3 Language fire safety video · Complete lesson plan teaching English (reading and writing) with fire safety messages
Duration of Programming	· 13 Years
MFB Man hours for Programming	· 2 Years~ 200-300 people per year (1 hour sessions) + 300 hours per year
Audience Size	· 12 - 200 People
Indicators of Effectiveness	· No survey at all

FLAMES for Adult Migrants	
Target Group	Newly arrived secondary students and their families
Program Objectives	· Fire fighters role as emergency responders. · Home fire safety information · Testing smoke alarms/maintenance/changing barriers · Emergency procedures information · 000 emergency phone number
Offered to	Students that have not attended primary school in Australia
Offered by	MFB
Managed by	Community Education - Pat Nicholson (Public Education Officer)
Program Process and Materials	· Lesson based and blended into curriculum of schools attended by fire fighters · 3 Language fire safety video · Complete lesson plan teaching English (reading and writing) with fire safety messages
Duration of Programming	N/A
MFB Man hours for Programming	N/A
Audience Size	N/A
Indicators of Effectiveness	N/A

Operation Home Safe	
Target Group	General community
Program Objectives	· The need for a home escape plan · Fire safety and hazards in the home · Slip and trip hazards · Smoke alarm information · Deadlocks and security · Burns and scalds
Offered to	General community
Offered by	MFB
Managed by	Community Education -
Program Process and Materials	· Free home safety inspection · Home safety brochure, thermometer to test faucet temp., wooden spoon with message
Duration of Programming	Piloted and never implemented
MFB Man hours for Programming	N/A
Audience Size	N/A
Indicators of Effectiveness	N/A

Isolated Elderly	
Target Group	Isolated elderly
Program Objectives	· Identify areas of the home that present risk · Identify problems the elderly face with fire safety issues · Develop strategies for the effective implementation of fire safety behaviour and practices
Offered to	Care takers of the isolated elderly
Offered by	MFB
Managed by	Community Education -
Program Process and Materials	· Workshops for care taker organizations · Care taker's guide brochure
Duration of Programming	N/A
MFB Man hours for Programming	N/A
Audience Size	N/A
Indicators of Effectiveness	N/A

New Zealand programs

The CLASP programme (Community Liaison Ambassadors Safety Project)	
Target Group	General Community
Program Objectives	· Visit homes in the community · Install smoke alarms in the homes that need them · Speak about home fire safety advice
Offered to	General Community
Offered by	NZFS
Managed by	
Program Process and Materials	· Trained door to door ambassadors · Smoke Alarms · Home escape plan kits
Duration of Programming	N/A
MFB Man hours for Programming	N/A
Audience Size	N/A
Indicators of Effectiveness	N/A

Home Safe Home	
Target Group	Elders and the Disabled
Program Objectives	· Fire risk · Fire Dynamics · Fire Risk Management · Knowledge to persuade the elder's family to enforce fire safety education
Offered to	Care takers of the elderly and disabled
Offered by	NZFS
Managed by	
Program Process and Materials	· Training to educate care givers how to educate regarding fire safety · Tool box so they can install smoke alarms
Duration of Programming	N/A
MFB Man hours for Programming	N/A
Audience Size	N/A
Indicators of Effectiveness	N/A

C'mon Seniors get Fire Wise - Confident Living	
Target Group	The elderly
Program Objectives	· The use and maintenance of smoke alarms · Home fire safety
Offered to	The elderly at recreational group meetings
Offered by	NZFS
Managed by	
Program Process and Materials	· Flip Chart with fire safety messages · Educational fire safety video
Duration of Programming	N/A
MFB Man hours for Programming	N/A
Audience Size	N/A
Indicators of Effectiveness	N/A

Marae (cultural buildings)	
Target Group	Maori Communities
Program Objectives	· Need for fire risk management
Offered to	Maori Communities
Offered by	NZFS (MLO)
Managed by	
Program Process and Materials	· Presentations from a fire fighter · Fire safety video
Duration of Programming	N/A
MFB Man hours for Programming	N/A
Audience Size	N/A
Indicators of Effectiveness	N/A

Similar Programming

Florida Bicycle Helmet Education	
Target Group	Children aged 7 to 14
Program Objectives	Provide education on proper helmet use Teach audience how to avoid bicycle crashes
Offered to	Children aged 7 to 14
Offered by	Broward General Medical Centre
Managed by	Broward General Medical Centre
Program Process and Materials	Nurses visit schools Use anecdotal stories to drive home importance of helmet use Video about helmet safety and use
Duration of Programming	N/A
Man hours for Programming	N/A
Audience Size	· 20 - 30 People
Indicators of Effectiveness	Information collected by BGMC Emergency department showed an increase in helmet use in target audience

Ticketing Incentives	
Target Group	Police officers (US)
Program Objectives	Increase ticketing of unbuckled drivers Make safety belt usage a habit among drivers Increase revenue of police departments to pay for overtime hours
Offered to	Police officers
Offered by	Washington State Police
Managed by	
Program Process and Materials	Officer incentives: personalized scale-model police cruiser after 40 citations
Duration of Programming	· 2 Years
Man hours for Programming	Normal police officer shifts + extra hours
Audience Size	Police force
Indicators of Effectiveness	Incentive program raised $140,000 to help pay for overtime

"Click it or ticket" Campaign	
Target Group	Drivers (US)
Program Objectives	Make safety belt usage a habit Heavy media coverage and word-of-mouth to increase safety belt usage
Offered to	Drivers
Offered by	Police departments
Managed by	Police departments
Program Process and Materials	· TV and radio commercials
Duration of Programming	· 2 Years
Man hours for Programming	· Normal police officers shift + extra hours
Audience Size	· Countrywide
Indicators of Effectiveness	· Statistical decrease of accidents without seatbelts

Freddy Finger Campaign	
Target Group	General Public (City of Austin, TX)
Program Objectives	Get people to test and maintain the smoke alarms in their homes Create a clear, consistent message that can be reused every year
Offered to	Citizens of Austin
Offered by	Austin Fire Department
Managed by	
Program Process and Materials	Create a recognizable mascot for the program Hold a public event to roll out the program, distribute information and materials (foam fingers, door hangers) Canvass city, distribute door hangers and stress importance of working smoke alarms Work closely with local media to spread awareness of program and its message
Duration of Programming	N/A
Man hours for Programming	N/A
Audience Size	Citywide
Indicators of Effectiveness	Three weeks after the campaign began, two families escaped home fires thanks to working smoke alarms that had been fixed in response to the campaign. Continuing reports of smoke alarms saving lives, no structure fire fatalities since a young woman died the day after the campaign rollout

15 Appendix C

A 43	Primary Language Spoken at Home?	A 44	Ever receive fire safety presentation?	A 45	Over 55 years of age?
A 46	Live alone?	A 47	Have caretakers?	A 48	Belong to any community groups?
A 49	Income?	A 50	Is this property a rental unit?	A 51	Receive pamphlet/talk upon moving in?
A 52	Smoke Alarm work upon moving in?	A 53	Occupant ever changed batteries?	A 54	

CODES	PRIMARY LANGUAGE SPOKEN AT HOME?
1	English
2	Greek
3	Italian
4	Spanish
5	Horn of Africa
6	Chinese
7	Vietnamese
8	Other

CODES	EVER RECEIVE FIRE SAFETY PRESENTATION?
1	Yes
2	No
3	Unsure

CODES	OVER THE AGE OF 55?
1	Yes
2	No

CODES	LIVE ALONE?
1	Yes
2	No
3	Sometimes

CODES	HAVE CARETAKERS?
1	Yes
2	No

CODES	BELONG TO ANY COMMUNITY GROUPS?
1	Yes
2	No

CODES	INCOME LEVEL
1	Upper Socioeconomic Class
2	Middle Socioeconomic Class
3	Lower Socioeconomic Class

CODES	IS THIS A RENTAL PROPERTY?
1	Yes
2	No

CODES	RECEIVE PHAMPHLET/TALK UPON MOVING IN?
1	Yes
2	No

CODES	SMOKE ALARM WORK UPON MOVING IN?
1	Yes
2	No
3	Unsure
4	Installed after occupant moved in

CODES	OCCUPANT EVER CHANGED BATTERIES?
1	Yes
2	No
3	Unsure

16 Appendix D

Postal Code	Instances without working alarm	Instances of Fire	Non-compliance Rate
3000	34	60	56.7%
3002	7	13	53.8%
3003	1	2	50.0%
3004	0	1	0.0%
3006	3	12	25.0%
3011	19	34	55.9%
3012	17	34	50.0%
3013	9	19	47.4%
3015	15	28	53.6%
3016	13	28	46.4%
3018	2	11	18.2%
3019	6	22	27.3%
3020	24	61	39.3%
3021	24	64	37.5%
3022	1	3	33.3%
3023	10	20	50.0%
3025	8	20	40.0%
3028	9	30	30.0%
3031	22	59	37.3%
3032	11	35	31.4%
3033	5	7	71.4%
3034	3	9	33.3%
3036	4	10	40.0%
3037	0	2	0.0%
3038	9	29	31.0%
3039	7	12	58.3%
3040	7	26	26.9%
3041	3	7	42.9%
3042	7	14	50.0%
3043	9	12	75.0%
3044	6	25	24.0%
3046	15	36	41.7%
3047	11	40	27.5%
3048	8	19	42.1%
3049	4	12	33.3%
3051	10	28	35.7%
3052	1	8	12.5%
3053	18	49	36.7%
3054	9	15	60.0%
3055	10	20	50.0%
3056	21	54	38.9%
3057	5	15	33.3%
3058	14	40	35.0%

3060	4	17	23.5%
3061	4	10	40.0%
3065	7	37	18.9%
3066	11	36	30.6%
3067	1	8	12.5%
3068	12	27	44.4%
3070	22	59	37.3%
3071	12	31	38.7%
3072	18	50	36.0%
3073	22	62	35.5%
3074	4	14	28.6%
3075	8	21	38.1%
3076	4	10	40.0%
3078	5	16	31.3%
3079	5	15	33.3%
3081	20	41	48.8%
3082	9	19	47.4%
3083	4	25	16.0%
3084	11	26	42.3%
3085	1	11	9.1%
3087	1	3	33.3%
3088	1	13	7.7%
3094	1	3	33.3%
3101	11	26	42.3%
3102	3	7	42.9%
3103	4	15	26.7%
3104	8	19	42.1%
3105	2	11	18.2%
3106	3	7	42.9%
3107	6	13	46.2%
3108	11	22	50.0%
3109	2	12	16.7%
3111	4	12	33.3%
3121	31	76	40.8%
3122	14	29	48.3%
3123	5	18	27.8%
3124	10	18	55.6%
3125	13	24	54.2%
3126	5	6	83.3%
3127	7	23	30.4%
3128	6	19	31.6%
3129	11	19	57.9%
3130	15	33	45.5%
3131	12	21	57.1%
3132	4	11	36.4%
3133	8	14	57.1%
3134	16	27	59.3%
3135	9	22	40.9%
3136	18	42	42.9%
3137	5	10	50.0%

3141	23	40	57.5%
3143	3	7	42.9%
3144	7	15	46.7%
3145	11	26	42.3%
3146	6	17	35.3%
3147	10	19	52.6%
3148	4	12	33.3%
3149	11	28	39.3%
3151	1	9	11.1%
3153	3	6	50.0%
3161	8	27	29.6%
3162	5	17	29.4%
3163	16	48	33.3%
3165	6	17	35.3%
3166	1	6	16.7%
3167	2	9	22.2%
3168	9	21	42.9%
3169	10	23	43.5%
3170	2	8	25.0%
3181	20	38	52.6%
3182	25	60	41.7%
3183	20	43	46.5%
3184	8	29	27.6%
3185	8	18	44.4%
3186	10	35	28.6%
3187	7	21	33.3%
3188	2	11	18.2%
3189	3	7	42.9%
3190	5	8	62.5%
3191	5	9	55.6%
3192	5	18	27.8%
3193	8	17	47.1%
3194	6	20	30.0%
3195	2	8	25.0%
3202	0	2	0.0%
3204	16	42	38.1%
3205	10	22	45.5%
3206	6	12	50.0%
3207	10	28	35.7%
3430	0	1	0.0%

17 Glossary

AIRS: (Australasian Incident Reporting System) fire report procedures and forms used in all Australian States and New Zealand.

CALD: (Culturally And Linguistically Diverse) abbreviation used by the MFB to refer to immigrants who do not speak English as their first language or are part of an emerging community in the city of Melbourne.

Community Education Program: a program directed towards a population with the intent of conveying an informative message about an issue that affects the group of people targeted by the program. (Culture Theory, 2006)

Cultural Theory: the branch of anthropology and other related social science disciplines (e.g., sociology) that seeks to define the heuristic concept of culture in operational and/or scientific terms.

CYCCYSAB: Change your clock, change your smoke alarm battery. Smoke alarm maintenance campaign presented by the MFB.

Demographic: a statistic characterizing human populations (or segments of human populations broken down by age or sex or income etc.) (Definition of Demographic - WordReference.com Dictionary, 2005)

Egalitarian: a society without formalized differences in the access to power, influence, and wealth. (Definitions of Anthropological Terms, 2005)

Fatalism: the idea that what will happen is determined to happen, and nothing that we do will make any difference. Thus, everything is determined by fate. (Tsamis, 1999)

FEMA: Federal Emergency Management Agency. Part of the Department of Homeland Security, tasks include “responding to, planning for, recovering from and mitigating against disasters.” (FEMA History, 2004)

GIS: (Geographical Information System) Computer software capable of cross referencing points on an electronic map with the census data for a given census district. Use of this software enables the user to see general trends or characteristics of the people whole live in the given census district.

Hierarchical: (classified according to various criteria into successive levels or layers) "it has been said that only a hierarchical society with a leisure class at the top can produce works of art"; "in her hierarchical set of values honesty comes first" (Wordnet Search 2.1)

Individualism: a belief in the importance of the individual and the virtue of self-reliance and personal independence; the doctrine that government should not interfere in commercial affairs. (Definition of Individualism, 2005)

MFB: Metropolitan Fire Brigade. The community safety organization of Melbourne, Australia. Tasks include responding to fires, medical emergencies, car accidents, hazardous materials emergencies, as well as educating the community safety and emergency prevention. (Emergency Response)

MFD: (Metropolitan Fire District) Land area of responsibility of the MFB

MFESB: Metropolitan Fire and Emergency Services Board. See MFB.

MLO: (Multicultural Liaison Officer) Station officer in each of the respective zones of the MFD that is in charge of carrying out/directing education of CALD and elderly communities

NCHS: National Centre for Health Statistics. Compiles statistical information with the goal of improving the health of the nation's citizens. Tasks include documenting the health status of the population and its subgroups, identifying health problems and trends, and providing input and evaluations concerning health policies and programs. (Sondik, 2006)

NCIPC: National Centre for Injury Prevention and Control. Federal agency tasked with reducing "injury, disability, death, and costs associated with injuries outside the workplace." (About NCIPC, 2004)

NFPA: National Fire Protection Association. An international non-profit organization that performs research and provides training and education concerning fire prevention and safety. (About Us, 2006)

Partnership: Outsourcing of education or statistics gathering tasks to local organizations that may have better contact reaching those that are hard to reach.

Prospect Theory: We tend to value a gain that is certain more than a gain that is less than certain, even when the expected value of each is the same. The opposite is even truer for losses: we will clutch at straws to avoid a certain loss, even if it means taking even greater risks. (Prospect Theory, 2006)

Risk: the possibility of suffering harm or loss; danger. (Risk: Definition, synonyms)

Risk Communication: "...an integrative process of exchange of information and opinions among individuals, groups, and institutions; often involves multiple messages about the nature of the risk or expressing concerns, opinions, or reactions to risk messages or to the legal and institutional arrangements for risk management." (Risk Communication Defined, 2004)

Risk Literature: material concerning the topic of risk or any related topic (risk communication, management, perception, etc.)

Risk Management: The process of analysing exposure to risk and determining how to best handle such exposure. (Risk Management Definition, 2005)

Risk perception: A subjective appreciation by individuals which will more often than not bear little relation to the statistical probability of damage or injury. (Risk Perception, 2004)

USFA: United States Fire Administration. Part of the Department of Homeland Security, tasks include reducing "life and economic losses due to fire and related emergencies through leadership, advocacy, coordination, and support." (About USFA, 2006)

18 References

- Abelson, R., and Levi, A. (1985). Decision Making and Decision Theory. In G. Lindzey, and Aronds, E. (Eds.), *Handbook of social Psychology: Volume 1. Theory and method*. New York, NY: Random House.

- About ncipc. (2004). Retrieved Feb. 22, 2006, from NCIPC Web site: http://www.cdc.gov/ncipc/about/about.htm.

- About us. (2006). Retrieved Feb. 22, 2006, from NFPA Web site: http://www.nfpa.org/categoryList.asp?categoryID=143&URL=About%20Us.

- About usfa. (2006). Retrieved Feb. 24, 2006, from U.S. Fire Administration Web site: http://www.usfa.fema.gov/about/.

- Barnett, J (2006). MFB. Retrieved January 17, 2006, from Melbourne Project Centre Web site: http://users.wpi.edu/~jbarnett/oz06/

- Brace, Ian. (2004). *Questionnaire design*, Kogan Page.

- Benelli, Eva (2003).The role of the media in steering public opinion on healthcare issues. *Health Policy*. *63*, 179-186.

- BRK Electronics, (2001). Installation tip: avoid these locations when installing smoke alarms. Retrieved Jan. 20, 2006, from BRK Electronics Web site: http://www.brkelectronics.com/downloads/installation/IN_SA_where_NOT_to_install.pdf.

- BRK Electronics, (2001). Installation tip: recommended locations for installing smoke alarms. Retrieved Jan. 20, 2006, from BRK Electronics Web site: http://www.brkelectronics.com/downloads/installation/IN_SA_where_to_install.pdf.

- Bruck, D. (2001). The who, what, where and why of waking to fire alarms: a review. *Fire Safety Journal*, (36), 623 – 639.

- Centre for Disease Control, (1999). Framework for program evaluation in public health. Retrieved Feb. 25, 2006, from Framework for Program Evaluation in Public Health Web site: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4811a1.htm.

- Culture theory. (2006). Retrieved Feb. 24, 2006, from Wikipedia.com Web site: http://en.wikipedia.org/wiki/Culture_theory.

- Dake, K. (1991). Orienting dispositions in the perception of risk: an analysis of contemporary worldviews and cultural biases. *Journal of Cross-Cultural Psychology*, (22), 61-82.

- Definitions of anthropological terms. (2005). Retrieved Feb. 22, 2006, from OregonState.edu Web site: http://oregonstate.edu/instruct/anth370/gloss.html.

- Definition of demographic - wordreference.com dictionary. (2005). Retrieved Feb. 22, 2006, from WordReference.com Web site: http://www.wordreference.com/definition/demographic.

- Definition of individualism. (2005). Retrieved Feb. 22, 2006, from WordReference.com Web site: http://www.wordreference.com/definition/individualism.

- DeNoma , J. (2001). Retrieved Mar. 22, 2006, from Mad Cows, Mad Corn and Mad Communities Web site: www.o4r.org/pf_v6n2/dread.gif

- Douglas, M. (1978). Cultural bias. occasional paper no. 35. *Royal Anthropological Institute of Great Britain and Ireland*.

- Emergency response. (n.d.). Retrieved Feb. 22, 2006, from Metropolitan Fire and Emergency Services Board Web site: http://www.mfbb.vic.gov.au/default.asp?casid=570.

- Federal Emergency Management Agency (FEMA). (1991). *Short guide to evaluating local public fire education programs*. FA-101, 1-11.

- Federal Emergency Management Agency. (1997). *Socio-economic factors and the incidence of fire.* FEMA, United States Fire Administration, National Fire Data Centre (FA 170)

- Fema history. (2004). Retrieved Feb. 22, 2006, from FEMA Web site: http://www.fema.gov/about/history.shtm.

- Fischoff, B., Slovic, P., Lichtenstein, S., Combs, B., and Read, S. (2000). How Safe Is Safe Enough? A Psychometric Study of Attitudes Toward Technological Risks and Benefits. In P. Slovic(Eds.), *The Perception of Risk* (pp. 80-104). London: Earthscan.

- Gamache, S. (1997). Reaching high-risk groups. In A.E Cote, *Fire Protection Handbook* (18th edition). Quincy, Massachusetts, National Fire Protection Association, 2/41-2/54.

- Gillespie, Nancy…[et.al] (2001).A Review of Selected Poverty Programs in Nicaragua's PRSP Portfolio. *Government of Nicaragua.*1-51.

- Goddard, G. (1996). *Fire statistics, UK 1994: Summary.* London: Home Office

- Green, Anita (2005).Evaluating the impact of a partnership for creating change in substance misuse practice in St. Petersburg, Russia. *Nurse Education in Practice*. *5*, 340-347.

- Grisanzio, J. (1996). What do Americans know about fire safety? *NFPA Journal*.

- Hall, J.R, Jr. (1998). *The US fire problem overview report: Leading causes and other patterns and trends.* Quincy, Massachusetts, National Fire Protection Association.

- Jacobsen, Hilary (2006).A comparison of on-campus first year undergraduate nursing students' experiences with face-to-face and on-line discussions. *Journal of Professional Nursing*. *17 (3)*, 7-14.

- Kidde Australia, (n.d.). How smoke alarms work. Retrieved Jan. 20, 2006, from Kidde Web site: http://www.kidde.com.au/How+Smoke+Alarms+Work.shtml.

- Kothari, Anita (2005).“Interaction” and research utilization in health policies and programs: does it work?. *Health Policy*. *72*, 117–125.

- Lott, A. , and Lott, B. (1985). Learning Theory in Contemporary Social Psychology. In G. Lindzey, and Aronds, E. (Eds.), *Handbook of social Psychology: Volume 1. Theory and method*. New York, NY: Random House.

- McDonald, Jeannette (2002). Is “as good as face-to-face” as good as it gets?. *Journal of Asynchronous Learning Networks*. *6*, 10-23.

- McCabe, M. (1990). Is national fire safety week a waste of time? *Fire Prevention, 232.*

- Metropolitan Fire and Emergency Services Board. (2003). Human Behaviour in Fires Research Project.

- Miller RE, Reisinger KS, Blatler MM, et al: Pediatric counselling and subsequent use of smoke detectors. Am J Public Health 1982;72:492

- National Centre for Health Statistics. (1994). Compressed mortality mile. *In: Evaluation of Three Smoke Detector Promotion Programs. American Journal of Preventive Medicine*, *3*(15), 165 - 171.

- National Centre for Injury Prevention and Control. (1995). Injury mortality: national summary of injury mortality data: 1986-1992. *In: Evaluation of Three Smoke Detector Promotion Programs. American Journal of Preventive Medicine*, *3*(15), 165 - 171.

- Orme, Judy (1999). Young people's views on drug education in schools: implications for health promotion and health education. *Health Education*. *4*, 142-152.

- Prospect theory. (2006). Retrieved Feb. 22, 2006, from Changing minds and persuasion Web site: http://changingminds.org/explanations/theories/prospect_theory.htm.

- Risk communication defined. (2004). Retrieved Feb. 24, 2006, from VA WRIISC DC Web site: http://www.va.gov/wriisc-dc/risk/definition.asp.

- Risk: definition, synonyms. (n.d.). Retrieved Feb. 22, 2006, from Answers.com Web site: http://www.answers.com/risk&r=67.

- Risk management definition. (2005). Retrieved Feb. 24, 2006, from InvestorWords.com Web site: http://www.investorwords.com/4304/risk_management.html.

- Risk perception. (2004). Retrieved Feb. 22, 2006, from European Environment Information and Observation Network Web site: http://www.eionet.eu.int/gemet/concept?cp=7240.

- Rogers, G. (1997). The dynamics of risk perception: how does perceived risk respond to perceived events. *Risk Analysis*, *6*(17), 754 – 757.

- Rogers, G. (1997). Dynamic risk perception in two communities: risk events and changes in perceived risk. *Plan Management*, *40*(1), 59-79.

- Shults, R. (1998). Evaluation of three smoke detector promotion programs. *American Journal of Preventive Medicine*, *15*(3), 165 - 171.

- Sondik, E. (2006). About nchs. Retrieved Feb. 22, 2006, from NCHS Web site: http://www.cdc.gov/nchs/about.htm.

- Thompson, P. G. (1997). Recruiting older people to a home safety program. *Medical Journal of Australia.* 167, 439-440.

- Towner, Dowswell, & Jarvis. (2001). Updating the evidence. a systematic review of what works in preventing childhood unintentional injuries part 2. *Injury Prevention*, (7), 249 - 253.

- Tsamis, W. (1999). Philosophy glossary. Retrieved Feb. 22, 2006, from Apologetics.org Web site: http://www.apologetics.org/glossary.html.

- U.S. Fire Administration (USFA)/ Federal Emergency Management Agency (FEMA). (2004). Residential structure fires in 2000. *Topical Fire Research Series*, *3*(9), 1-6.

- United States Fire Administration [USFA]. (1998). *A profile on the rural fire problem.* USFA, Federal Emergency Management Agency (FA-181/August 1998).