

**MEASURING THE FERNDALE FIRE DEPARTMENT SMOKE ALARM PROGRAM
AFTER A DECADE**

LEADING COMMUNITY RISK REDUCTION

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ABSTRACT

The Ferndale Fire Department launched a program in 1992 offering free smoke alarms to single-family citizens based on a variety of factors including age and income. The problem that faced the Ferndale Fire Department was the absence of a blueprint to measure the effectiveness and significance of the delivery of the smoke alarm program as it passed its 10-year plateau. The purpose of this Applied Research Project (ARP) was to examine the impact that the smoke alarm program has had on Ferndale stakeholders after a decade, and determine whether it should continue in its current delivery mode as smoke alarms reached or exceeded their life expectancy date. The following questions were addressed:

1. What impact has the free smoke alarm program had on its stakeholders?
2. What is the attitude of homeowners in regards to smoke alarms?
3. Is there a correlation between the age of a smoke alarm and its functionality?
4. Does the program need to be modified to improve community protection?

The descriptive methodology of research was employed throughout this project. Procedures sought to assess the functionality of smoke alarms approaching their expiration date and examine the need for program evaluation and future direction of the smoke alarm program. Included was a literature review, along with the primary focus on a causal-comparative survey of 100 smoke alarm recipients out of approximately 750 that were provided with a free battery-operated smoke alarm from the Ferndale Fire Department between 1992 and 2001.

The results emphasized the importance of replacing smoke alarms as they reach their life expectancy and demonstrated the most effective way of program evaluation

stems from door-to-door canvassing. Recommendations included advancing technologies like the 10-year battery smoke alarms and promoting fire prevention to firefighters to make prevention programs successful.

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INTRODUCTION

The survivability of occupants from fire in homes protected by smoke alarms is well documented. To promote the usage of smoke alarms, the Ferndale Fire Department launched a program in 1992 offering free smoke alarms to single-family citizens based on a variety of factors including age and income. Aside from the potential life safety benefit, the boost to the department's reputation from a public relations standpoint was not lost on its members.

When the program was initiated, there was a stipulation that distributed smoke alarms would be checked after one year and batteries replaced if necessary. This follow up never occurred. While many fire service professionals are aware that smoke alarms should be replaced every 10 years, the knowledge on the part of the public is unknown and the lack of this understanding can have deadly consequences. The problem facing the Ferndale Fire Department is the absence of a blueprint to measure the effectiveness and significance of the delivery of the smoke alarm program as it passes its 10-year plateau.

The purpose of this Applied Research Project (ARP) is to examine the impact that the smoke alarm program has had on Ferndale stakeholders after a decade, and determine whether it should continue in its current delivery mode as smoke alarms reach or exceed their life expectancy date.

The primary focus will be on a causal-comparative survey of 100 Ferndale households out of approximately 750 that were provided with a free battery-operated smoke alarm from the Ferndale Fire Department between 1992 and 2001. This accounts for eight percent of the 9,872 households in Ferndale.

Applying the descriptive research methodology, the following questions were addressed.

1. What impact has the free smoke alarm program had on its stakeholders?
2. What is the attitude of homeowners in regards to smoke alarms?
3. Is there a correlation between the age of a smoke alarm and its functionality?
4. Does the program need to be modified to improve community protection?

BACKGROUND AND SIGNIFICANCE

Seeing the success of similar programs in the area, the Ferndale Fire Department (FFD) launched a free smoke alarm program in August 1992. Residents that fell within at least one of three categories qualified. If a Ferndale resident was a senior citizen, handicapped, or below a certain income level, they would qualify for one free alarm for their home.

In December, that same year, Ferndale made local and national news when the Yapple family of five, including children ages 7, 5 and 2 died in a house fire, resulting in the worst fatal fire incident in Ferndale since 1964. Occurring just three weeks before Christmas, an electrical overload of Christmas tree lights was the cause determined. The house was not protected by a smoke alarm (Ferndale Fire Department, 1992).

The program received a great deal of publicity and as one may expect, its pinnacle was reached after the Yapple fire. All too often, tragedies are often the wake-up call for a community, and this fire was no exception. With the 28 days left in 1992 after the fatal fire, the Ferndale Fire Department distributed 134 smoke alarms or 48% of the 259 distributed in 1992.

In the program's first four years, 606 smoke alarms were distributed or 79% of all smoke alarms to date. The last three years has demonstrated the waning of program awareness or need with only 56 (7%) of all alarms distributed. The majority of those (43) were distributed in 2001 at a community-wide event introducing the fire department's new fire safety house.

Two Ferndale fire fatalities involving two adult males in separate incidents in 1999 and 2002 reinforced the importance on educating the public of working smoke alarms. One victim succumbed to smoke inhalation after falling asleep with smoking materials. Upon examination of the smoke alarm, it was discovered that a battery was within the unit, but had been separated from the terminals by a fraction of an inch. Speculation was that nuisance alarms were the reason the battery was deactivated from the alarm (FFD, 1999).

The second fatality occurred in 2002 when the wife of the victim awoke to a sounding smoke alarm, followed by screams from her husband that he was on fire. Flames engulfed the victim and nearby combustibles blocked the front door preventing his escape. Because of the presence of a working smoke alarm, the wife escaped out the bedroom window. Of note is that both these fatalities were influenced by the presence of alcohol and drug use (FFD, 2002).

To try to revitalize the education on working smoke alarms, a new program was launched in 2002 for a nine-week trial period. The "Did you check" program involved the coordination between the Ferndale Fire Department and local pizza companies, and a weekly delivery to an unsuspecting homeowner. If homeowners were found to have all smoke alarms in working condition, the pizza was provided free of charge. If non-

working smoke alarms were found, the batteries or alarms would be replaced as needed, and the homeowner would pay for their pizza as they normally would. Though a public relations success, the absence of working smoke alarms surprised the firefighters. Out of nine deliveries, six homes had working smoke alarms or 67% and three homes had no working smoke alarms. In addition, two new alarms and three replacement batteries were provided.

Three out of nine homes without working smoke alarms may not seem significant. However, as mentioned earlier, Ferndale has 9,872 single-family households. If the “Did You Check?” Program is extrapolated to the entire population and 67% have working smoke alarms, this leaves 3,258 (33%) potential families without working smoke alarms. Even with that figure cut in half, a significant portion of the population may still be unprotected. With today’s widespread information on their effectiveness, there is no reason for all homeowners not to have the required minimum of working smoke alarms.

Throughout this research project, it is important to understand the difference in terms that are often used interchangeably. For clarity, the two types of notification devices are smoke alarms and smoke detectors. While smoke detectors are apparently the term most are familiar within the fire service vernacular, the proper term for audible alarm devices in single-family residential units are smoke alarms. This project will focus on smoke alarms.

The significance of this project stems from the National Fire Academy’s (NFA) Executive Fire Officer (EFO) Program as required by ARP guidelines (National Fire Academy Operational Policies and Procedures, 2001, p. II-2). The significance includes

two modules from the relevant course Leading Community Risk Reduction (LCRR). More specifically, the module on assessing community risk, which has the terminal objective of identifying and quantifying risk to lives, property and community vitality (NFA, 2003a, p. SM 2-1). The second module utilized is evaluating. The terminal objective of this unit is providing the student with evaluation information from a community risk reduction initiative, and modifying the risk reduction initiative to improve its effectiveness (NFA, 2003b, p. SM 6-1).

The significance of this project as they pertain to the goals of the United States Fire Administration (USFA) is twofold. First, is to promote a fire department initiative that is comprehensive and reduces risk to the community. The second correlating goal addresses the goals of reducing the loss of life from fire in adults older than 65 and children younger than 14. It is the citizens within these age groups that are the most vulnerable to fire deaths and injuries (Culp, 1999).

LITERATURE REVIEW

To solidify a basis for this research, evaluation of existing material on the subject is necessary. Over the past few decades due to their low cost and effectiveness, numerous fire departments throughout the United States have employed free smoke alarm programs to their citizens. Developed in the 1960s, smoke alarm technology protected only 4% of American homes by 1970. Nearing the end of the 1990s, approximately 94% of American homes are now protected (Martin, 2000).

The rapid growth in use, coupled with clear evidence of their lifesaving effectiveness, made the smoke alarm a fire safety success story. Smoke alarms have cut the risk of dying in a home fire by 40 to 50 percent, although the estimated impact of

smoke alarms on death rates fluctuates from year to year. Though homes protected by smoke alarms exceed 90%, a survey conducted by the National Smoke Detector Project discovered that one-fifth of homes that have smoke alarms have smoke alarms that do not work (Ahrens, 1998).

Departments around the nation have had innovative smoke alarm distribution programs with varying degrees of success. In Hobbs, New Mexico, the city averaged 1.2-fire deaths per year from 1970 to 1989. Since their smoke alarm program began in 1990, the City of Hobbs has not had a fire death.

The Amarillo Fire Department in Texas utilized retired firefighters to install smoke alarms on two afternoons per week. They are exploring the possibility of installing 10-year smoke alarms to eliminate the need for changing batteries annually. In Richmond, Virginia, the fire department has a standard operating procedure of checking smoke alarms in any home they respond to, including medical emergencies, if the situation allows the time (Treadwell, 2000).

To more effectively involve suppression personnel, Southey (1995) recommends that each vehicle in the department that responds to fire or medical emergencies be equipped with spare smoke alarms and batteries. Personnel will be encouraged to check homes they respond to for working alarms and if needed, replace batteries or replace alarms with new ones.

The impact of fire department initiated programs and smoke alarms on the stakeholders are substantial as proven in 2002 as fire deaths dropped sharply with the lowest number the National Fire Protection Association (NFPA) has ever recorded. According to Dr. Hall, NFPA's assistant vice president for fire analysis and research,

“these statistics show that we have learned the lessons of fire safety, and hundreds of our friends and loved ones are alive as a result” (National Fire Protection Association, 2003a, ¶ 6). Not only did fewer people die in fires in 2002, but also fewer were injured. There were 18,425 civilian injuries, a decrease of 9.2 percent from 2001 and the lowest number since 1977.

According to the NFPA, most fire deaths nationwide occur in the residential setting and 2002 was no different where fire departments in the United States (U.S.) responded to a fire every 19 seconds. From these responses, 2,670 people died in home fires accounting for 79% of all U.S. fire deaths (National Fire Protection Association, 2003a).

Ahrens (1998) points out that numerous factors may be involved in fire deaths and injuries, including complacency from nuisance alarms, and impediments in getting to that part of the population that may be hard to reach, specifically the impoverished. Lives have been lost when real alarms were mistakenly thought to be false. In other words, the principal problem with non-operational smoke alarms is the human factor: lack of knowledge, neglect, and misapplication.

How one reacts during a fire is related to the role assumed, previous experience, education, and personality; the perceived threat of the fire situation; the physical characteristics and means of egress available within the structure; and the actions of others who are sharing their experience (Bryan, p. 4-3, 2003).

Understanding the homeowner’s attitude towards smoke alarm protection is advantageous. In a study by NFPA, if a smoke alarm went off in the middle of the night, only 39 percent said they would leave the house immediately. Fifty-six percent would

investigate to find the source of the alarm. Further compromising the family's safety is that only 25% have actually developed and practiced a home fire escape plan to ensure they could escape quickly and safely (NFPA, 2003b).

America's indifference to fire is noted from the 2000 publication *America at Risk*. "Losses from fire at the high rate experienced in America are avoidable and should be unacceptable as losses caused by drunk driving or deaths of children accidentally killed playing with guns" (Diamantes, 2001, p. 3).

Another factor for consideration is the presence of drugs and alcohol and their affects on a person's ability to escape. Correlating with the last two fire deaths in Ferndale is evidence that reports, smoking combined with drug and alcohol use is an even greater risk and may lead to victim's falling asleep or passing out with a lighted cigarette. Of the 70 people killed in fires in the state of Washington in 2002, 24 victims or 34% died after consuming alcohol or drugs ("Dangerous Mix," 2003).

The gravity of these social ills detracts from fire problem awareness. In the publication *Solutions 2000* (1999) from the Federal Emergency Management Association (FEMA), it notes that the U.S. is more entranced with crime and gives it disproportionately greater attention than its relative risk. Alcohol has been a persistent threat to public health and deaths due to fires are highly associative with intoxication: about half of adult fire fatalities are legally drunk (Federal Emergency Management Association, 1999). Research into alcohol and drug-related fire deaths and its lessening does not appear to be widely examined. Numerous studies show the correlation between the two, but there is little available on solving the problem.

Along with addressing human behavior, the functionality and maintenance of smoke alarms with age needs to be taken into account. The fire service may be missing an important step by insuring that once smoke alarms are installed, that they are properly maintained. There is a need of an evaluation process to determine the program's effectiveness (Treadwell, 2000).

Testing of smoke alarms is an important factor in determining operability. After 10 years, a smoke alarm will have gone through 3.5 million air-testing cycles. Nationally, millions of household alarms have reached their useful cycle and are in need of replacement. The National Smoke Detector Project found in a study that roughly half of the inoperable alarms studied were more than 10 years old.

Part of the problem with aging alarms is "sensitivity drift" which refers to a shift in the range of visibility obscuration or particulate density that will activate the smoke alarm. This shift can mean either an increase in nuisance alarms or a decreased ability to react promptly to real fires (Braden, 1999).

The limits of the effective life span of smoke alarms have been known by the smoke alarm industry for over thirty years, yet there is currently no requirement that older alarm units be replaced. As the alarm approaches 10 years of use, the importance of replacing smoke alarms, and not just the batteries must be realized. Like any other household appliance, smoke alarms have a limited effective life span. In tests conducted, as smoke alarms reach an age of ten years; their reliability declines sharply (Munger, 1999).

Authors Ahrens (1998), Smith (1994), and Johnston (2000), link the most common types of smoke alarms found in older residences, and their likelihood to function properly. Approximately 50% of smoke alarms more than 10 years old collected in a national study were found inoperable (Ahrens, 1998).

In Ferndale, most homes were built 40-70 years ago and are primarily battery powered. As a study by Smith (1994) indicates, smoke alarm installations in older residences are likely to be battery-powered, and not hard-wired to the home's electrical service. This increases the likelihood of replacing or repairing (dead battery) an inoperable battery powered smoke alarm.

Therefore, the more of the following criteria residences indicate the greater likelihood of needed smoke alarms, and targeting these groups would reduce death and injury from fire:

- Older dwelling's (built before 1970, 1980, 1990, etc.)
- Households with low-income (< \$15,000 annual income)
- Households with younger (< 5 yrs.) or older (> 65 yrs.) occupants

Statistical data indicates that the age of the household occupant correlates to home fire deaths and is an important consideration when designing a smoke alarm program (Johnston, 2000).

Few fire departments actually track any life saving or injury prevention statistics based on their smoke alarm program. Linking the smoke alarm program to department performance helps justify expenditures and documenting "lives saved" enables fire departments to validate the costs associated with their program (Culp, 1999).

While the nation's fire service has numerous fire alarm programs to protect the population, surviving a fire is based on the principles of detection and notification. Detection and notification does not solve the problem of surviving fires, but the early warning can best be accomplished through available smoke alarm technology.

Smoke alarms do not prevent fires. In fact, reducing the frequency of fires may be difficult because of the socio-economic living conditions of a community and altering those influences is beyond the mission of the fire service. Therefore, if a goal of the fire department is to reduce fatal fires, the first step requires determining the effectiveness of smoke alarm usage in the community (Moody, 1998).

After analyzing the target audience to initiate a department's smoke alarm program, a process for program modification may need to be considered. Regardless of innovation or distinctive launches, prevention programs may run their course in a few years.

For these reasons, the method by which smoke alarms are distributed may be as essential as the program itself. The methods of distribution vary with departments and regions, with fire prevention week and related public relation events being a popular time for distribution.

Some lower income areas of a community may not have access, or may lack awareness to fire department activities. In these communities, the citizens would benefit from fire departments personally canvassing the neighborhoods. In these areas, even if people were not at home, utilizing informational door hangers in impoverished areas to raise awareness of the community's smoke alarm programs have proven successful.

In one study of smoke alarm programs, the canvassing of neighborhoods was proven to be the most efficient method of distribution. Canvassing allows for multiple avenues of engagement, drawing people out of their homes, provides for interaction, and allows for the teaching of adults. It also takes the program and the smoke alarms to the people, who normally would not respond to another method, and does not wait for the citizens to come to the program (Douglas, Mallonee, & Istre, 1998).

Behavioral change must occur for “prevention” based programs to be successful. Not only on the part of the public, but also on the firefighters who need to get out into the community and physically install smoke alarms and educate the citizens. This will require an adaptive change to their regular routine. Many in the fire service are loath to dedicate staff and resources to the very effort that led to the development of the municipal fire service in this country: fire prevention (Diamantes, 2003).

When it comes to fire prevention, the United States is considerably different from Europe. In the U.S. the first priority of the fire service is suppression. Very few personnel and resources are allocated to public education efforts. In the United Kingdom, most members of the fire service are expected to be involved in the delivery of public fire education (FEMA, 1999).

In 1973, the report studying the risk facing the U.S. from fire entitled “*America Burning*” was released and seen as a significant milestone for fire prevention and protection. Part of the findings included the need for greater energy and funds to be devoted to fire prevention, which could yield huge payoffs in lives and property saved.

While great improvements and awareness of fire prevention strategies improved, the U.S. continues to still have one of the worst fire problems in the industrial world. The

continued fire problem led to a recommissioned panel for *America Burning* in 2000.

Their findings included:

The frequency and severity of fires in America do not result from a lack of knowledge or the causes, means of prevention or methods of suppression. We have a fire “problem” because our nation has failed to adequately apply and fund known loss reduction strategies (Diamantes, 2001).

In the event of fire, who has the best opportunity to save lives? Is it the fire service? How many firefighters do you know who have ever saved a life? Contrast that to how many potential victims got themselves out of a fire. Then contrast the saves to the number of lives lost. Eighty four percent of all fatal fires burn ten or more minutes before the fire department is notified. Notification alone would result in dramatic reductions in life loss (Stevens, 1995).

The fire service needs to share in the blame and responsibility of public education. What is the root cause of public apathy towards smoke alarm usage? We know that people remove batteries from nuisance alarms caused primarily by cooking. The fire service has not adequately researched alternative measures to address the main cause of non-operating smoke alarms. Out of all smoke alarms sold in the United States, 99% are the ionization type. In an attempt to reduce false alarms caused by sensitivity and cooking, the fire service has not adequately educated the public on the difference between photoelectric and ionization smoke alarms (Coleman, 1995).

When it comes to evaluating the effectiveness of smoke alarm programs, there is very little data existing with regard to the most effective ways to distribute free alarms. There are new alarms on the market that have a silencer button, which can be pressed

to silence the alarm for up to three minutes, if caused by nuisances. If the smoke is too dense, the unit will continue to sound until there is no longer a serious situation (Ahrens, 1998).

Martin (2000) states that *working* smoke alarms remain the best protection against fire in the home, until residential sprinkler systems become the norm rather than the exception. No person should lay their head to rest unprotected by a smoke alarm.

There is no shortage of research on fire departments with smoke alarm programs. While many research papers recognize the importance of program evaluation, the information found on such evaluation was minimal. As many departments' programs approach or exceed 10 years, it is time for the fire service to recognize the importance of smoke alarm program evaluation.

PROCEDURES

The methodology utilized for this Applied Research Project is descriptive with the purpose of measuring the success, shortcomings, and future direction of the smoke alarm program within Ferndale as it passes its 10-year plateau. This will be done for the greater good of the community without emphasis on the fire department's public image. Furthermore, it is expected that citizen awareness of working smoke alarms will be heightened, and fire department members will better understand the future direction of the program.

Research largely consisted of Executive Fire Officer (EFO) Applied Research Papers, journals, case studies, books, or the Internet. The primary source of material

was obtained from the Learning Resource Center (LRC) in Emmitsburg, Maryland during the author's attendance at the National Fire Academy's LCRR Program.

The guidelines of the EFO Program stipulate that to assure confidence in the data, a 95% level of returned surveys would be necessary. Out of 100 surveys distributed, with 25 to each quadrant, 34 were returned for a response rate of 34%. The purpose of equally distributing surveys to each quadrant was to note any trends specific to geographic regions. For instance, were there areas that had less working smoke alarms Seven surveys were returned from the southeast, nine from the northeast, ten from the southwest, and eight from the northwest.

Instrumentation

Surveys were distributed by one of the following two processes. Canvassing neighborhoods door-to-door and the mailing of surveys. The objective of the survey is to evaluate the current smoke alarm program through an examination of Ferndale households that have been recipients of a free smoke alarm since its inception in 1992. A secondary objective is to evaluate the function of all smoke alarms in the home.

A residential survey (Appendix) will allow the Ferndale Fire Department to analyze its current smoke alarm program. The first step was to develop a comprehensive citizen survey requesting information including the address, quadrant, and year smoke alarm distributed; possession of distributed smoke alarm; whether or not there were smoke alarms on every level; the need for replacement of alarms; the removal of batteries due to nuisance alarms; any residents over 65 or under 14 years of age; any interest in 10-year battery smoke alarms; and allowing for the testing of alarms.

Review of Ferndale Fire Department Smoke Alarm Distribution Records

A review of all smoke alarms distributed between the August 1, 1992 inception through the end of 2001 was conducted. The City of Ferndale is divided into quadrants. To examine the program's effectiveness, an equal amount of homes (25) from each quadrant were surveyed. Using a causal comparative survey, 100 out of approximately 750 smoke alarm recipients from 1992 through 2001 received a survey.

Research questions one and two asked if participants still had the smoke alarm issued by the Ferndale Fire Department, and if that alarm was still functional. Targeted, for better accuracy were names and addresses of smoke alarm recipients still believed to be living in the home that received the smoke alarm.

The recipients of free smoke alarms from the Ferndale Fire Department are presumed to be single-family homeowners, since local codes address multiple-dwellings, requiring the hard wiring of smoke alarms with battery backup. Homeowners receiving free smoke alarms in 2002-2003 will not be interviewed since it is assumed that smoke alarms should function for one year without malfunctioning.

Understanding that simply having an alarm does not guaranty protection, question three set to determine if residents had proper coverage with an adequate number and spacing of smoke alarms. Question four asked residents if they had ever replaced smoke alarms. This question was designed to evaluate knowledge on the citizen's behalf regarding the recommended replacement of smoke alarms every 10 years. In question five, stakeholders were asked if batteries had ever been removed due to nuisance alarms. Many fire deaths have occurred in this country (including Ferndale) when batteries have been removed or smoke alarms disabled.

Knowing that the greatest at risk age groups are citizens over 65 and younger than 14, questions six and seven asked how many household residents there were within those age groups.

Question number eight sought the recipient's awareness of newer smoke alarm technologies. Specifically, knowledge of the 10-year lithium smoke alarm battery with a nuisance alarm button that can be silenced when accidentally sounded by careless cooking, shower steam, or other unintentional activation. If the chamber is not clear of particles in three minutes, the alarm will sound again indicating a true emergency. Would residents be likely to purchase these smoke alarms, which are available for less than twenty dollars? The literature review revealed that economics are a factor with smoke alarm protection and would be a consideration of Ferndale residents.

Concluding the survey was question nine, which asked residents to test their smoke alarms to ensure proper function. Unlike question two, this was not limited to the alarms distributed from the Ferndale Fire Department, but included all smoke alarms within the home surveyed.

Assumptions and Limitations

It is assumed that homeowners were able to understand and complete surveys as instructed; that they were truthful in their surveys, including the testing of their alarms; and, they were able to identify the smoke alarm provided to them from the Ferndale Fire Department.

Limitations included a lack of identifying the various brands of smoke alarms purchased by, and donated to the Ferndale Fire Department. Smoke alarms were simply handed out to qualifying residents and the alarm was never identified as coming

from the Ferndale Fire Department or their date of distribution. This lack of tracking on the part of the fire department and the absence of follow-up contact with citizens to ensure an effective installation program may limit the ability to accurately measure the program's success.

Another limitation was the conflicting data from organizations that measure fire statistics in the U.S., including fire departments. Percentages gathered on smoke alarm usage, fire deaths, and correlating the two, was often unscientific, and underscored the difficulty in measuring effective smoke alarm programs, and their direct relationship in saving lives.

Definition of Terms

Ionization – use a radioactive source to produce electrically charged molecules (ions) in the air. When smoke enters the chamber, it attaches itself to the ions and reduces the flow of electric current, thus setting off an alarm.

LCRR - Leading Community Risk Reduction

Photoelectric – sound when the smoke is dense enough to deflect a beam of light.

Smoke Alarm – a unit used to detect the presence of smoke and sound an alarm.

Smoke Detector – a component of an alarm system used to detect the presence of smoke. This device does not sound an alarm but transmits a signal to a control unit that in turn sounds an alarm.

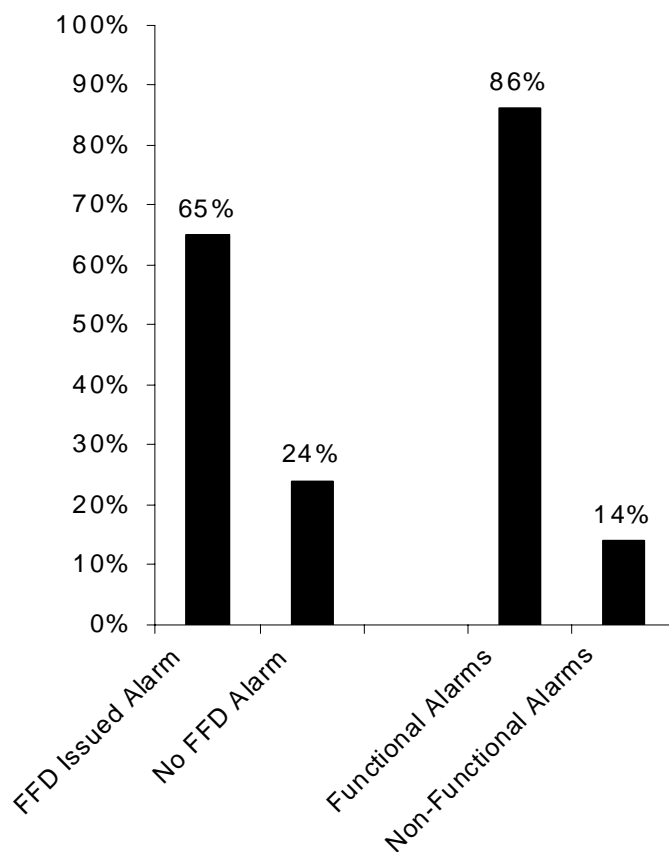
Stakeholders – any individual or group of people who may be impacted by, or have a special interest in, a community risk reduction initiative.

RESULTS

In research questions one and two, residents were asked if they still had the smoke alarm they were issued from the Ferndale Fire Department and if those alarms were still working. Sixty-five percent still had their fire department distributed alarm, of which 86% were still functioning. Twenty-four percent no longer had their issued alarm (Figure 1). Eleven percent of homeowners were unsure if the smoke alarm in their home were fire department issued.

The smoke alarm program is now over 10 years old, which is also the suggested lifespan of smoke alarms. Of the aforementioned percentage of working smoke alarms, the non-functioning 14% of alarms were issued in the program's first two years, 1992 and 1993.

Figure 1.
Functional Smoke Alarms Issued From the Ferndale Fire Department



Smoke alarm protection

There is no shortage of documentation on the importance of having working smoke alarms on every level. To that end, residents were asked in survey question three if smoke alarms protected all levels of their home. Seventy-four percent (25 out of 34) stated having smoke alarms on every level.

With a lack of education or program assessment, survey question four asked residents if they had ever changed smoke alarms in their homes. Nearly half (47%) stated replacing smoke alarms within the last 10 years. Of those that had replaced alarms, their reasons included frustration from numerous nuisance alarms, donating smoke alarms issued from the fire department to family members, and some actually sensed that their alarm had passed its life expectancy date and was due for replacement.

The majority of research indicated the failure of smoke alarms was largely attributed to the absence of batteries. When asked in research question five if they have ever removed smoke alarm batteries due to nuisances such as cooking, shower steam, etc., more than half of the respondents (53%) replied that they had on occasion, removed batteries. In effect, this has a dynamic impact by reducing working smoke alarms by approximately 50% at different times in homes surveyed.

Addressing the vulnerability of the elderly and children under the age of 14, homeowners were queried in questions six and seven, as to whether residents within these age groups were living in the home. Fourteen households had 18 citizens 65 or older and nine homes had 13 children 14 or younger. The percentage found protecting the most vulnerable over 65 and below 14 years of age was 84% (41/49).

Survey question eight sought to answer if residents would be interested in 10-year battery smoke alarms with a silence feature for nuisance alarms? Just over half of those surveyed (56%) stated an interest in a 10-year smoke alarm with silence features. Once again those percentages changed dramatically when interviewed personally. Only 38% of those personally visited, expressed an interest in purchasing the more reliable extended life alarms. The 44% of mailed surveys and 62% of door-to-door responses uninterested in the alarms were largely unaware of the latest technology and content with their current protection.

Some homeowners displayed an interest in the 10-year alarms and intended on purchasing the newer-type alarms. The primary reason was upon learning of the “silence” feature that would help homeowners temporarily disable nuisance alarms caused primarily by cooking

Finally, residents were asked if they would test all their smoke alarms for functionality. On occasion, during personal visits, the citizen’s responses regarding smoke alarms were proven incorrect when it came down to working smoke alarms. In other words, those surveyed believed their alarms were working until they were actually tested. This question did not simply focus on the free fire alarms from the Ferndale Fire Department, but covered all smoke alarms within the home in regards to functionality. Of the total number of smoke alarms tested, Ferndale residents were found to have 84% functional. However, the percentage represented is not indicative of the overall safety of the citizens, since five homes were found without smoke alarms and not every home had adequate protection on every level.

Homeowner's comments were overwhelmingly supportive of the current program and appreciative of the survey and the consideration for their welfare. Comments included:

- "Thank you for your concern about the Ferndale residents."
- "The free smoke alarm program is great and I hope that Ferndale keeps it going. Thank you very much."
- "Keep up the good work."
- "Thanks for your concern-it's appreciated."
- "I think they should be in every building where there are people. Your program is great."

FUTURE CONSIDERATIONS

Though not an intended component of the survey, a trend noticed almost immediately was the difference in working smoke alarms between participants that mailed their surveys back and from those who were personally visited and their alarms tested on site. In homes personally visited, many homeowners believed their smoke alarms were functioning prior to testing. This was not always the case. In total, 38% of homeowners were visited personally. These homes tended to have less working smoke alarms than those who returned surveys via mail. Sixty-four percent of visited homes had functioning smoke alarms. This compares with 88% of the residents having working smoke alarms that mailed in surveys.

In total, five homes were without smoke alarms. The five homes without smoke alarms were located in all quadrants. No trend of higher vulnerability was recognized in one quadrant versus another. Four out of the thirteen homes personally visited were

found without any smoke detection (31%). Contrast that figure to only one resident (2%) that stated having no working smoke alarms who mailed back their survey.

DISCUSSION

The residents of Ferndale have attitudes similar to the rest of the country when it comes to smoke alarm usage. Likewise, the Ferndale Fire Department has an approach to smoke alarm programs that are consistent with many fire departments around the country that have free smoke alarm programs.

With numerous nationwide smoke alarm programs in place, their importance has been demonstrated for both the safety of the citizens and for the positive reputation fire departments have enjoyed through their success. Most fire deaths still occur in homes with no smoke alarms, or smoke alarms not functioning properly. Smoke alarms have proven their worth over the last three decades as deaths have dropped 50%, and the majority of homeowners do have working smoke alarms. The survey results were also consistent with national studies relating age to function and reliability. As any appliance gets older, its reliability decreases. The same holds true for smoke alarms. The shortcoming lies in the lack of emphasis on smoke alarm replacement. With fire departments improving program evaluation, a natural result would be age awareness of existing smoke alarms.

But, as Moody (1998) questions, how much impact or control do fire departments have on the safety of the citizens and at what point do homeowners assume personal responsibility? The root causes of many fire deaths, including the last two in Ferndale, lie in behaviors such as alcohol and drug abuse that go beyond working smoke alarms.

Addressing these social behaviors and their factors in surviving fires goes beyond the scope of most fire departments.

The basis for need of prevention programs can be established premised on past events, and in such studies as *America Burning*. But, as with most prevention programs, the means of measuring success is difficult. Once in place, the difficulty becomes in attempting to evaluate statistics of events that may not occur.

Not only is the measurement of prevention programs lacking in local fire departments, but as a whole, the fire service has under performed in smoke alarm education (Coleman, 1995). They, along with municipal leaders have failed to shift resources and funding to prevention efforts as many successful European countries have done. Certainly many fire departments have made great strides in promoting prevention with innovative programs, but it remains a secondary function in the mindset of too many in this country.

While a great deal of lip service has been given emphasizing the importance of fire prevention, the fact remains that the future of the fire service remains focused on fire suppression. In other words, a status quo, reactionary in nature, with continued minimal support for proactive prevention efforts. As Diamantes (2003) notes, that “behavioral change” necessary on the part of firefighters has a long way to go.

Apathy to the nation’s fire problem appears to be affecting Ferndale as well. The survey results demonstrate that many people assumed they had working smoke alarms, when the opposite was true. It is also a logical hypothesis that a certain percentage of homes not visited may have completed their surveys without actually testing their smoke alarms.

The most disconcerting aspect of the survey may be that out of the 34 homes surveyed, 15% (5) had no smoke alarms within the home. This is slightly better than the national average of 20% of U.S. homes absent of working smoke alarms, even after three decades of life safety messages from organizations such as NFPA and the nation's fire service, underlying the importance of having properly functioning smoke alarms. Not to mention the frequency of television newscasts where victims of smoke inhalation may have survived, but for the absence of smoke alarms.

The results of last year's "Did you check?" program found one-third or 33% of homes were without working smoke alarms. By the omission of smoke alarms from their homes, this population's chances of dying in a fire have jumped 50% and the five fire deaths in the Yapple family appear to be ancient history in Ferndale just 10 years after the tragedy. While the impact the Ferndale Fire Department may have on its resident's behavior is limited, the organization should still review why with its free smoke alarm program, that such a large percentage of citizens are still unprotected.

With many smoke alarms in Ferndale approaching or surpassing their life expectancy, it was thought there would have been a stronger interest in new technology, such as the 10-year smoke alarm battery. The large percentage of Ferndale residents uninterested in this smoke alarm technology 44%, or 38% of those visited personally, may be an indication that the impact of the smoke alarm and smoke alarm programs may have reached their pique on stakeholders.

This may become a significant problem across the U.S. as smoke alarms age, thereby decreasing their functionality. Without proper maintenance or timely replacement, positive strides in reducing fire deaths may be challenged as complacency

and continued reliance on old alarms that have yet to fail, provides a false sense of security.

Before castigating the entire fire service, it is important to recognize the limitations of enforcement for single-family residential properties. While a fire marshal or inspector can force a business owner to replace smoke alarms every 10 years through code enforcement, the same rights of enforcement do not apply in a person's home. Therefore the mission becomes one of education and promoting awareness of personal responsibility for one's own well being.

As discovered during the survey process and supported by Douglass, Mallonée, & Istre (1998), the most accurate measurement of functioning smoke alarms is through door-to-door canvassing. Simple questions on paper often turned into more insightful comments from citizens and revealed more of their attitudes on fire safety when visited personally. People will be more receptive to programs where a personal interest is shown for their safety as compared to receiving flyers, surveys, or other contact methods. This provides an opportunity for the fire service to show a genuine interest in the citizen's welfare. In return, support for local fire departments improves from the citizen's perspective, whether that was the intended goal or not.

Though improvement is needed, the fire service should remain committed to smoke alarm programs that have saved lives since their inception decades ago. Contrary to criticisms and shortcomings regarding the lack of internal program evaluation, the fact remains that smoke alarm programs have resulted in more smoke alarms in the home, where previously they were lacking. With those essentials in place, the fire service must decide the goals and direction of their own programs.

RECOMMENDATIONS

Free smoke alarm programs are beneficial to the community from a life safety standpoint and beneficial to fire departments from a marketing and public relations point of view. The problem facing the Ferndale Fire Department is the absence of a blueprint to measure the effectiveness and significance of the delivery of the smoke alarm program as it passes its 10-year plateau.

Whether implementing for the first time, or revising an existing program, members of the Ferndale Fire Department should consider revising the smoke alarm program by placing an emphasis on a purpose behind the curriculum. The end needs to justify the means, and the ability to define the desired results provides clarity and purpose prior to program implementation. Though the desired results may seem obvious, the motivations can be wide-ranging aside from the potential lifesaving benefits.

An imperative for program success is addressing the attitude of the firefighters. Firefighters have to buy into fire prevention programs such as smoke alarm giveaways, than need to be trained on the importance of fire prevention. It is incorrect to assume that most firefighters are aware of fire prevention technology, and its dramatic role in reducing fire deaths. It is the role of fire prevention bureaus to share their knowledge with the firefighters. That is where the essential firefighter “buy in” begins. Eliminating this step will likely doom a program initiative before it begins.

An unforeseen benefit discovered was the impact that personal visits had on the results. Talking with residents face to face provided information that cannot be retrieved from paper. If possible, personal visits should be a part of the program. Some fire

departments have had success by going door-to-door and utilizing door hangers to contact those citizens that are hard to reach by other means.

Recent technologies, specifically the use of 10-year battery smoke alarms should be advanced to reduce the frequency of non-working alarms or battery removal. These alarms could be part of a new program beginning with a large education effort of the firefighters and the community. To ensure proper placement, and to guarantee that they are installed at all; firefighters should install smoke alarms in residences. By installing, residents would be less likely to remove and give the alarm to a family member or friend, who was not a resident. This would require a small amount of training to make sure firefighters knew the proper placement locations.

Like any long-term programs, smoke alarm programs should have goals, objectives, a process for program evaluation, and an ability to adjust. Evaluation should include documentation to include the address and date of distribution. This will allow firefighters during program evaluation to identify the age of the distributed alarm. The benefits for follow-up with the community have been proven and needs to be considered in the planning.

Finally, the fire service needs to get serious about fire prevention efforts in this country. Like much of the public, we are guilty of apathy and not truly committed to ending the high number of fire deaths in the U.S. each year. Training on prevention should be initiated at the academy level and its importance emphasized throughout a firefighter's career.

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**APPENDIX
CITIZEN SURVEY OF SMOKE ALARM PROTECTION**

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RESULTS

Ten years ago, we started a free smoke alarm program and this home received one in **(YEAR)**. To continue this program, we need to determine the program's effectiveness and success. By answering a few short questions, you can greatly assist us in further protecting Ferndale. The results of this survey will remain anonymous.

1. Do you still have the smoke alarm issued by the Ferndale Fire Department?
YES **(22)** NO **(8)** UNSURE **(4)**
2. Does that smoke alarm still work? YES **(19)** NO **(3)** N/A **(12)**
3. Do you have smoke alarms on every level? YES **(25)** NO **(9)**
4. Have you ever replaced a smoke alarm? YES **(16)** NO **(18)**
5. Have you ever removed a battery due to a nuisance alarm i.e. cooking, shower steam, etc?
YES **(18)** NO **(16)**
6. Are there any residents over 65 old? YES **(18)** NO **(16)**
7. Are there any residents under the age of 14? YES **(12)** NO **(22)**
8. If a smoke alarm with a 10-year battery and silence feature for nuisance alarms were available for less than \$20, would you be likely to buy one? YES **(19)** NO **(15)**
9. To conclude this survey, will you test your smoke alarms? YES **(34)** NO **(0)**

<u># of Homes Surveyed</u>	<u># Battery-Operated Alarms</u>	<u>Working</u>	<u>Not Working</u>	<u>No Smoke Alarms Present</u>
34	76	64	12	4

Homeowner Comments: _____

This survey will help the Ferndale Fire Department better protect our citizens like you by addressing the life safety needs. Thank you for your time and have a nice day.