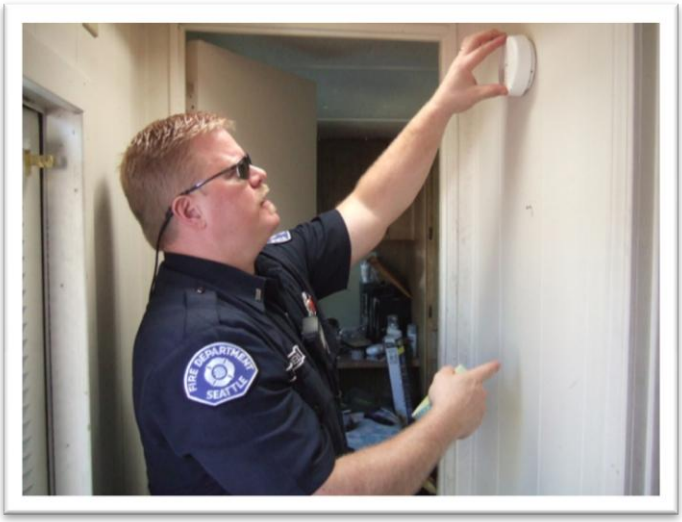
Seattle Fire Department
Fire Prevention Report

April 2010
Submitted by Bill Mace

Smoke Alarm Installation Program Evaluation

Executive Summary

Smoke alarms have been shown to reduce the chance of dying in a home fire by between 40-50% (USFA 2006). Even though studies continually find that approximately 94% of homes have at least one smoke alarm present, the reality is that a large percentage of installed smoke alarms (around 20%) do not work because of dead or removed batteries. Additionally, many more homes have smoke alarms that may appear to work but are quite old. National standards recommend replacing smoke alarms every 10 years to ensure proper functionality – another awareness piece unfamiliar to most people.



The Seattle Fire Department's Smoke Alarm Installation Program has the goal of decreasing the chances of being injured or dying in a home fire by providing the early warning detection of a working smoke alarm. The target communities for this program are those which have high risk for fires and injuries -- senior citizens, low income residents, and individuals with a disability.

The majority of smoke alarm recipients in this program tend to identify as Senior Citizens. Older adults over the age of 75 have a fire death rate that is three times the national average. The Seattle neighborhoods targeted for smoke alarm canvasses had a greater proportion of residential fires between 2004 and 2007 (see Map 1) and had a higher proportion of low income households. Low income households are less likely to have working smoke alarms present. The Smoke Alarm Installation Program targets homeowners because landlord/tenant laws require the landlord to provide a working smoke alarm in rental properties.

This evaluation of the Smoke Alarm Installation Program found that the majority of homes (57%) receiving smoke alarms between January 2008 and June 2009 had never tested their smoke alarms to ensure they were working properly. For those households able to test the smoke alarm over the phone, there was a 100% success rate. Thirty-four percent of the households reached for this evaluation had heard their smoke alarm "sound off" from smoke caused by regular cooking. Three households reported being alerted to smoke from cooking left unattended.

Background and Purpose

Program background

For over 10 years, the Smoke Alarm Installation Program has provided working smoke alarms in Seattle homes without one. All Seattle Fire Department fire engines and ladder trucks began carrying smoke alarms after a firefighter suggested keeping smoke alarms on fire engines to be installed in homes needing one when on a call. Firefighter participation is an essential feature of this program and is formally recognized and outlined in SFD Policies and Operating Guidelines (section 2002-1). Since the program's inception, over 1,200 smoke alarms have been installed across Seattle. Fire Stations serving primarily residential neighborhoods have contributed the greatest to the Smoke Alarm Installation Program (Chart 1).

Top 10 Stations	2007-2009
Station 33	63
Station 24	50
Station 28	43
Station 37	35
Station 16	32
Station 32	30
Station 29	29
Station 35	27
Station 34	26
Station 30	22

Chart 1- Smoke Alarm Installations by Top 10 Stations

Purpose of the evaluation

While the Seattle Fire Department's Smoke Alarm Installation Program has been popular and well received among Seattle residents for several years, until now, it has never been evaluated for functionality or effectiveness in alerting people to potential fire emergencies. This evaluation attempts to better understand these issues by contacting smoke alarm recipients at 6 months to 1 ½ years after installation took place.

The purpose of this evaluation is to determine the effectiveness of this program by (1) inquiring into whether any of the smoke alarm program participants have been alerted to smoke because of the installed smoke alarm and (2) inquiring into the frequency of working smoke alarms installed between January 2008 and June 2009. The smoke alarm recipients contacted for this evaluation all received an installed smoke alarm by Seattle Firefighters or by Public Education Staff. There were 157 households meeting these criteria and were attempted to reach. Smoke alarms given to Fire Stoppers participants or shared with partnering organizations were not contacted nor was any household who received smoke alarms as a giveaway.

Brief program description

The Smoke Alarm Installation Program allows for someone to receive an installed smoke alarm in their home at no cost. The smoke alarms are installed by firefighters. There are three primary ways for a household to receive a smoke alarm. (1) A firefighter may initiate the installation of a smoke alarm while on a call to an individual's home. (2) A person may contact Public Education to request a smoke alarm or (3) a person who happens to live in a neighborhood where a smoke alarm canvass is occurring can receive one or more. Most installations are generated by individuals who call Public Education after learning about the program from a flyer, presentation, or fair. With the exception of the Deaf/HOH smoke alarms, all smoke alarms come equipped with long-life lithium-powered batteries which are supposed to last up to 10 years.

To qualify for a free smoke alarm with installation a person must live in the City of Seattle and identify as either a senior citizen, low income, or have a disability. Studies show that these populations are at a higher

risk of experiencing a home fire and less likely to have a working smoke alarm at home. (Harvey 2004; Istre, 2001; USFA 2006)

Public Education conducts all outreach efforts using a variety of print and online media and marketing techniques to reach the target populations. Flyers are shared with City of Seattle agencies such as the library system, parks and recreation, and senior services. The Department of Neighborhoods also posts flyers at all of its neighborhood centers and publishes an advertisement in its community newsletter. Articles and announcements are also shared with agencies serving senior citizens who on occasion make referrals to Public Education. Additionally, community organizations serving the targeted populations also receive information to share with their members. Every time Public Education participates in a fair, a smoke alarm sign-up sheet is available for fair attendees to request a free smoke alarm.

One of the most successful ways of reaching people who need smoke alarms is by doing door-to-door canvassing. The smoke alarms canvases have targeted low-income neighborhoods where home fire incidents have been highest. The most recent neighborhood canvasses have taken place in South Park, Rainier Beach, and Haller Lake.

The program is set up so that an interested person can contact Public Education and make the request. If smoke alarm program criteria are met, a Form 115 is filled out and faxed to the fire station whose district the home pertains to. The officer who receives the fax is supposed to contact the person making the request directly to set up a time to install the smoke alarm. Upon installation, the Form 115 is signed by the officer and the homeowner. The Form 115 is then returned to the Public Education section where the person's name, address, phone number, date of installation, number of smoke alarms, and local fire station are entered into a database located at *O:\PubEd\Smoke Alarms\Smoke Alarm Installation Program.* Additionally, all Form 115's are stored with Public Education.

If a Form 115 is not returned to Public Education within a couple of weeks, the homeowner is called to ask if they have been contacted by their local fire station. If no contact has been made, a second fax of Form 115 is sent to the station and labeled "second request".

Seattle residents who are Deaf or Hard of Hearing (Deaf/HOH) may request a special smoke alarm that uses either a strobe light or bed shaker device to alert the person of smoke. Usually, a person will send Public Education an email or call using a phone sign language interpretation service. After the installation appointment is made, a Public Education Specialist and a uniformed member from Special Hazards Unit install the smoke alarm. At every installation, the homeowner receives a handout explaining what the Seattle Fire Department personnel will be doing with instructions on how to test the smoke alarm. After determining the best place to install the smoke alarm, the unit is installed and the recipient is shown how and when to change the battery and test the smoke alarm. A home fire safety checklist is also left with the individual.

Regardless of the type of smoke alarm installed, all smoke alarm recipients receive a card with information about the smoke alarm, the included long-life battery, and how and when to test the smoke alarm. The Seattle Fire Department recommends monthly testing of smoke alarms.

Evaluation Methods

Data collection methods

All households receiving an installed smoke alarm between January 1, 2008 and June 30, 2009 were contacted for this evaluation. The data for this evaluation was collected by directly calling the smoke alarm recipients. Deaf residents were emailed the survey or called using a sign language interpreter phone line. Smoke alarm recipients were called between 10:00AM and 5:00PM Monday through Friday. At least two attempts were made for each possible recipient.

Data sources

The smoke alarm recipients were asked four questions:

1. *Has the smoke alarm installed by the Seattle Fire Department alerted you to smoke or fire? If yes, explain what happened.*
2. *How often do you test your smoke alarm(s)? (bi)monthly, 1X year, 2X year, never, other____*
3. *Would it be possible for you to test the smoke alarm we installed right now so that I can hear it?*
    - *No, not possible to check now.*
    - *Yes, sounded.*
4. *Do you need any additional smoke alarms?*

Data limitations

The data was collected from Seattle homeowners who had received a smoke alarm between January 2008 and June 2009. While repeated attempts were made to contact households, many could not be reached. The most common barrier was from disconnected phone service and changed phone numbers.

The data collected required recipients to recall if and when their smoke alarm sounded because of smoke. For some of the recipients, this was hard. Many of the smoke alarm recipients have disabilities that could hinder one's ability to remember.

The biggest challenge was getting recipients to test their smoke alarms over the phone while being surveyed. Because of limited physical abilities, many could not test their alarms. As a result, just over 50% were able to test the smoke alarm for the interviewer.

Results

- Number of households reached: 97 (61%)
  Number of households attempted to reach: 158

- Total number of reached households able to test smoke alarm over the phone: 48 (50%)
  100% of the 48 tested smoke alarms sounded when tested during phone interview.

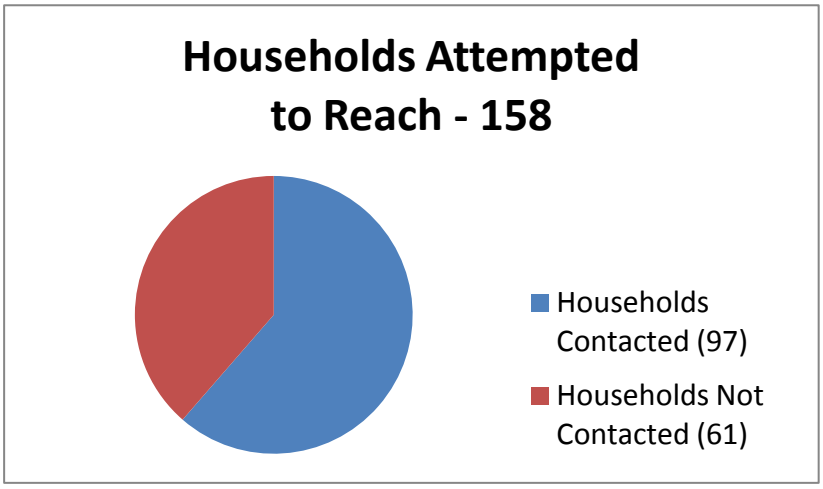
- Number of reached households who reported being alerted by the smoke alarm since installation: 37 (38%)
  - 34 sounded while cooking (31 reported "sound offs" from regular cooking smoke, 3 reported sounding from burning food left on stove)
  - 1 sounded from fireplace flue was closed
  - 1 sounded from bath steam
  - 1 could not determine what made the smoke alarm sound

- Frequency of testing – Total: 97 households
  55 – Never tested (57%)
  15 – Once a year (16%)
  19 – Twice a year (20%)
  1 – Four times a year (1%)
  3 – Every two months (3%)
  1 – Every month (1%)
  1 – Sometimes (1%)

- Number of household requesting additional smoke alarms: 7

Discussion of the Results

Chart 2

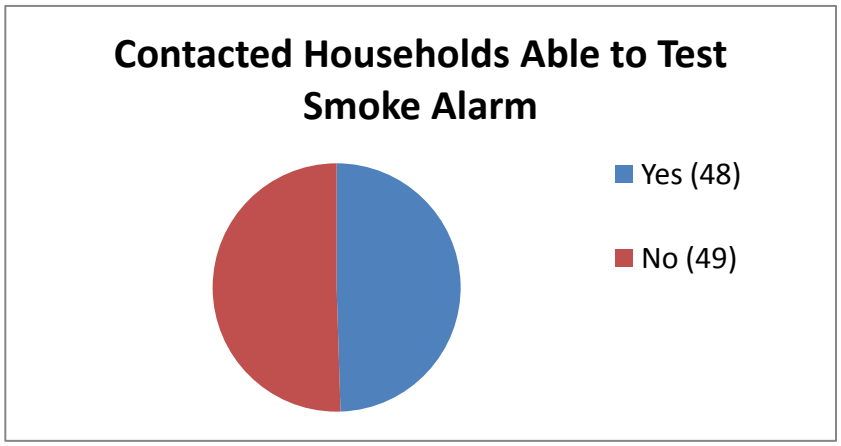


Sixty-one percent of the households receiving smoke alarms between January 2008 and June 2009 (97 out of a total possible of 158) were reached for this survey (Chart 2).

Thirty-seven of the reached households reported to hearing the smoke alarm sound because of smoke or steam. Thirty-three of the households reported regular cooking smoke as the cause of smoke alarm sounding. However, three of the households reported the smoke alarm sounding from burning food as a result of unattended cooking in the kitchen.

Slightly less than 50% of the households contacted for this survey were able to test their smoke alarm during the interview (Chart 3). The smoke alarm sounded in all 48 households that were able to test their smoke alarm for the interviewer. This "live" test was used to help determine the continued workability of the smoke alarms. For every household reached who was unable to test their smoke alarms, they received an explanation on how to test their alarms and asked to have a friend or relative test it for them at a later time. Most of the people who did not test their smoke alarm over the phone were not physically able to stand on a step stool to test it. Given this high smoke alarm sounding rate among those able to test their smoke alarm during the interview, there is a 95% confidence level with a 10% margin of error that the untested smoke alarms in the other 49 households reached for this survey would have also sounded.

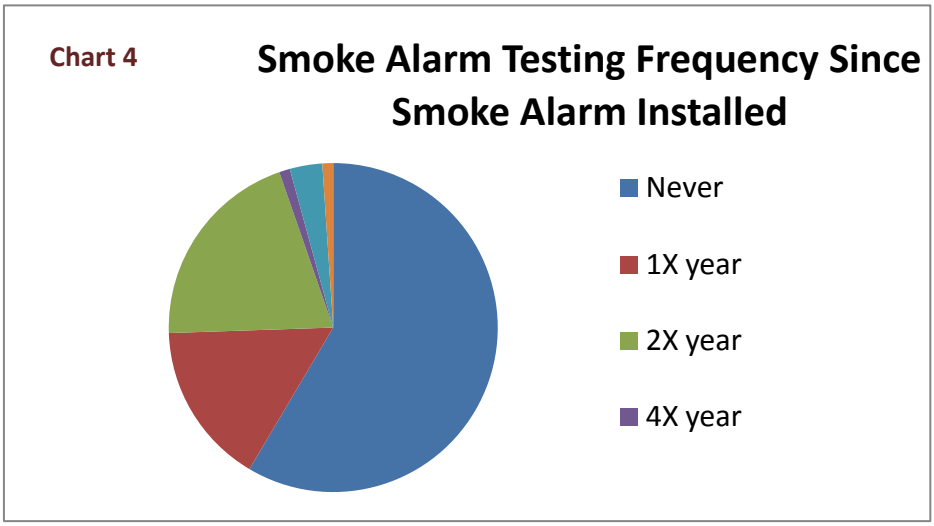
Chart 3



The survey results on the testing frequency clearly demonstrated that smoke alarms are not being tested on a regular basis. Only 42 out of 97 (43%) reported to have tested their smoke alarm at least once since it was installed (Chart 4). The Seattle Fire Department recommends monthly smoke alarm tests. As described above, the risk associated with standing on a chair or ladder to test their smoke alarms was too great for many program participants and a factor in the low smoke alarm test rate.

Even when the smoke alarm recipient is shown how to test the smoke alarm and left with information on how to test it, infrequent testing may result. For example, individuals receiving Deaf/HOH smoke alarms were shown by Public Education staff how to test the alarm yet when contacted for this survey, only one out of four individuals had tested their smoke alarms at least once.

Chart 4



The survey results showed that many people did not know how to test their smoke alarms. Some respondents reported that they did not know that they needed to test it at all. Some participants mentioned that they thought testing the smoke alarms was not necessary because they were powered by long-life batteries. Others reported that they thought smoke alarms only needed to be tested during daylight saving time changes. Several households relied on the "sound offs" which occurred during regular cooking as proof that the smoke alarm was working and therefore did not need to be tested further. These comments indicate some confusion on the part of individuals when it comes to the frequency and correct methods to test smoke alarms.

Seven households responded that they needed an additional smoke alarm. In two of the cases, the homeowners had removed the smoke alarms. One person told the interviewer how she knocked it down because it was continually beeping. A second person disabled her alarm for a similar reason. In both cases they did not attempt to reinstall or replace the alarms. The other respondents who requested an additional smoke alarm wanted better coverage in their homes such as on another floor.

Most all households continued to express gratitude for the smoke alarm program and the smoke alarm they received. While not a part of the survey, many people expressed satisfaction and a sense of security knowing that their smoke alarm was installed and continues to work.

Conclusions and Recommendations

As noted above, three households reported to being alerted by their smoke alarms while they were not attending to their cooking. They all reported to burning whatever they were cooking. Fortunately, none of these three cases required a response from the fire department. In all three cases, the homeowner was able to deal with the burning food without any problem. While it is impossible to know if the smoke alarm prevented a more serious problem for these three households, one could speculate a worse outcome without the early alert from the smoke alarm installed by the Seattle Fire Department. These types of situations support the need to continue installing smoke alarms in the homes of high risk Seattle residents. The cost of installing one or more smoke alarms is far less than the costs associated with Fire Department response to a home fire and the loss suffered by the victim of a fire.

Every single smoke alarm that was tested over the phone sounded -- proof of its continued operational ability and indicating a strong probability that other smoke alarms installed during this time frame would achieve similar results. The households surveyed for this report all had relatively new smoke alarms – installations occurred between January 2008 and June 2009. Future surveys that evaluate smoke alarm program effectiveness after five years would be worth doing to better understand long term smoke alarm functionality.

Unfortunately, 50% of the households contacted could not test the smoke alarms on their own. This simple test of pushing a button on the smoke alarm is a challenge for a large number of people who receive smoke alarms from the Seattle Fire Department. Only 43% of contacted households reported to testing their smoke alarm at least once since being installed. The message to test and inspect smoke alarms could be better. Many people were unaware of the "test" button on their smoke alarm. A few people thought that smoke alarms were only tested during the daylight saving time changes that occur twice a year. Perhaps they mistook the highly recognized "change your clock, change your battery" slogan for the smoke alarm test frequency. A "test your smoke alarm" campaign to increase awareness could benefit Seattle residents. As evidenced in this survey, many people may know what to do but do not have the ability to test their smoke alarms. A community wide campaign to encourage people to check their smoke alarms and those found in the homes of people they care for could encourage people to be more open to asking for assistance in testing smoke alarms. Even though the smoke alarms came with information on how to test their smoke alarm, many people did not know how to test it. The interviewer talked many people through the process of testing their smoke alarms and found that many people struggled to locate the test button even while up close to the smoke alarm. Smoke alarms could contain more visible and clearly labeled test and hush buttons to make testing easier.

A study by the National Institute for Standards and Technology confirmed that smoke alarms consistently provided time for occupants to escape from most residential fires (NIST 2008). The Smoke Alarm Installation Program is one means to help those Seattle residents at highest risk from being injured or dying in a home fire with the installation of a smoke alarm. Smoke alarms have been proven to provide the added time necessary to deal with or escape a home fire. The continued success of this program is an important component of the fire and injury prevention efforts of the Seattle Fire Department.

Summary of Recommendations:

- *Demonstrate smoke alarm test to recipient with every installation*
- *Clearly mark "test" and "hush" buttons on all installed smoke alarms*
- *Improve messaging on smoke alarm testing to wider community*
- *Follow up survey after 4-5 years to evaluate smoke alarm functionality and testing frequency*
- *Continue installing smoke alarms within homes of people at high risk of experiencing a home fire*

References

Bukowski, Richard et al. (2008) *Performance of Home Smoke Alarms - Analysis of the Response of Several Available Technologies in Residential Fire Setting.* National Institute for Standards and Technology

Harvey, Pauline et al. (2004) *Strategies to Increase Smoke Alarm Use in High-Risk Households*. Journal of Community Health, Vol. 29, No. 5

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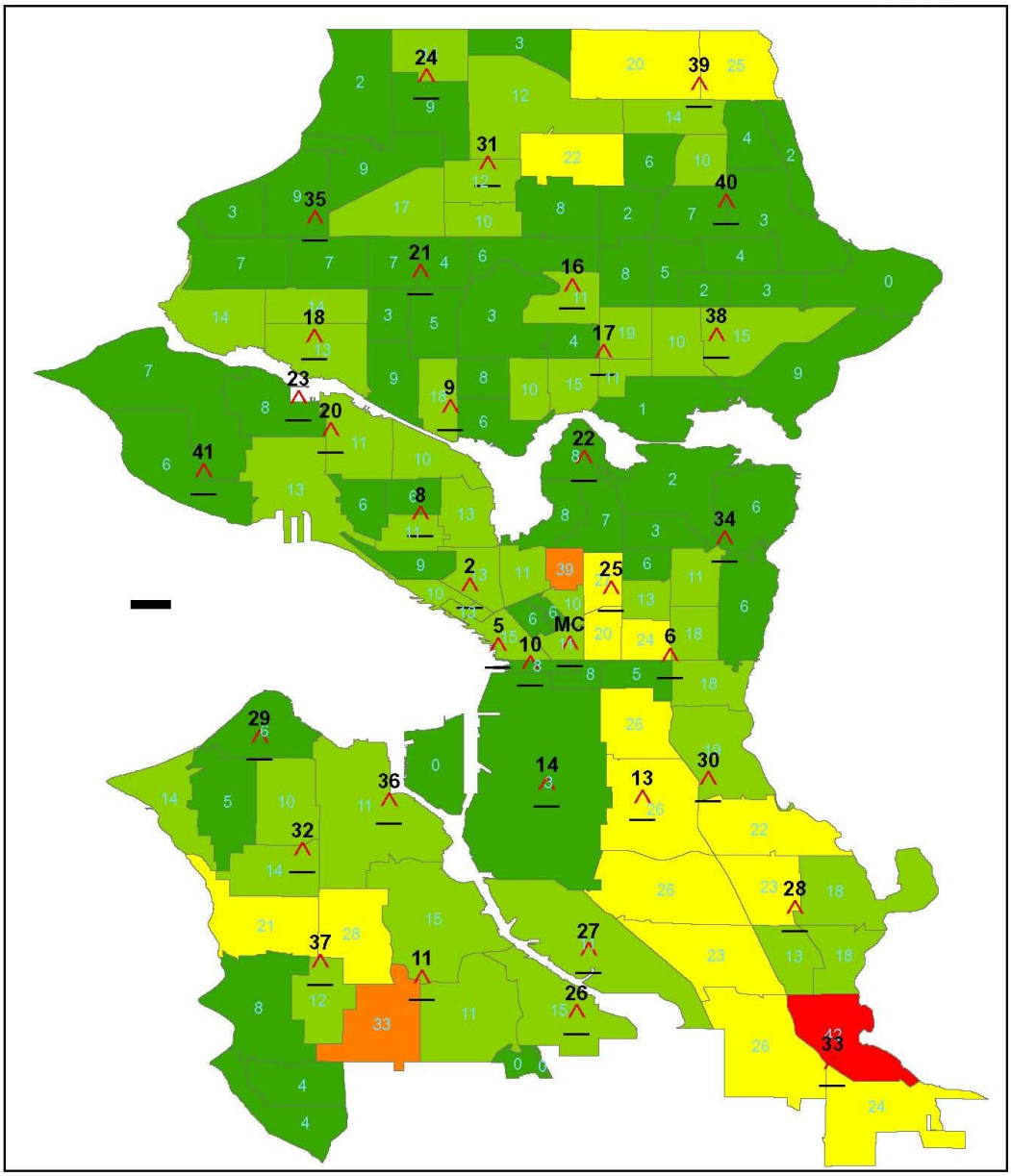
Ta, Van et al. (2006) *Evaluated Community Fire Safety Interventions in the United States: A Review of Current Literature*. Journal of Community Health, Vol. 31, No. 3

Public/Private Fire Safety Council-USFA (2006) *Home Smoke Alarms and Other Fire Detection and Alarm Equipment* – White Paper http://www.usfa.dhs.gov/downloads/pdf/white-paper-alarms.pdf

Home Structure Fires
Jan 2004 - Dec 2007



Legend

Fire Stations

Home FIBs 2004-2007 by Census 2000 Tracts

Count_

- Under 10
- 10 - 19
- 20 - 28
- 29 - 39
- 40 and over

0 0.5 1 2 3 4 Miles

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