

PROVING PUBLIC FIRE EDUCATION WORKS

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ABOUT TRIDATA

TriData Corporation specializes in fire protection studies and technology for government and private industry. A particular specialty is fire data and data systems. TriData is the sole distributor of a unique high volume smoke removal fire apparatus, conducts fire investigations, and provides litigation and legislative support.

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EXECUTIVE SUMMARY

Despite a long-term downward trend, the United States continues to have one of the highest fire death rates per capita in the world. Part of the reason for this is the lack of adequate public fire education. That stems partly from a lack of confidence that public fire education really works. Unfortunately, local government budgeteers and many fire chiefs are among the skeptics who question public fire education's effectiveness.

This report provides data that indicate that good public fire education does, indeed, work. It also describes a methodology for evaluating public education, with the hope that as more people know how to evaluate their own programs, they will be able to marshal better evidence for budgets and public support.

When we set out to research this study, the goal was to find five or six good evaluations and perhaps another 10 or 15 lesser ones. As our research progressed, we found more than 70 good examples spread across the United States and Canada, from large cities to small rural communities. The case studies range from narrow-cast programs aimed at reducing fires from cooking with oil, to comprehensive multi-year, citywide programs that attempt to reduce the entire fire problem.

This collection of case studies not only shows that public education works, but demonstrates that it is probably more productive in terms of casualties and dollar loss saved per staff-year than any other aspect of fire protection. It is the height of foolhardiness to cut public fire education efforts if one is interested in the public's safety, and in the productivity of fire departments. Evidence in this report

suggests that tripling the size of public education efforts, which can be accomplished by a minor shift in staff assignments in most departments, would produce enormously beneficial results. Some cities have done exactly that.

The assembled case studies also provide a wealth of examples of different types of public education programs. Names, addresses, and telephone numbers of contacts for the programs are provided for those who want additional information.

Methodology for Evaluating Public Fire Education

The best evaluations are those that can show whether the public education program made a difference in bottom-line effectiveness—fires, deaths, injuries, and/or dollar loss—and can show that it was the program that caused the change and not external factors. To do this, you need to examine the trend in your community before and after the program starts. You also should compare fire statistics for the area with the program to parts of the community or other communities without the program. External factors such as climate, the economy, and population mix need to be taken into account in making the evaluation, and in comparisons with other communities.

When the bottom-line impacts cannot be determined apart from the effects of external factors, retreat to the next best measures: changes in fire safety behaviors such as maintaining smoke detectors or removing hazards, changes in the environment such as installing detectors, changes in fire safety knowledge as measured by pre- and post-tests and also tests of retention, and the percent of the target population reached by

the program.

Anecdotes also can be a valid indicator of effectiveness if they are well documented and the "saves" are linked to information or training obtained from the public education program. Several anecdotes are much more powerful to prove a program's effectiveness than a single anecdote, which can be dismissed as a fluke.

Though often used, "evaluation" in the form of how well people like a public education program is very weak evidence of impact and not likely to persuade a budgeteer.

Complex statistical analyses usually are not necessary to show effectiveness when the program caused major changes. Where powerful math is needed, the impacts are unlikely to have been large, though there are important exceptions to this. Fire departments should try to find local statistical talent from universities or other sources to assist in evaluation design and analysis of data if they do not have the talent on staff. Appendix A provides guidance on confidence levels obtainable for different size samples before and after a program starts.

What Makes the Best Programs Work?

The successful programs we identified have a number of factors in common.

- They have "*champions*" who see the program through and lead its implementation.
- They are situated in departments with *magnanimous chiefs* who allow their public educators room to be innovative and to seek outside resources.
- They *carefully target* a par-

ticular aspect of fire safety, or strike in force across a broad front over and over, reaching a large percentage of the population.

- *Market research* in one form or another is used to tailor the programs to their intended audience.
- *Powerful allies* are obtained, often in the business community or the education community to get through bureaucratic barriers and provide assistance.
- The *materials* used in the program may not be fancy but they are clear and in abundant quantity.
- The programs reach a *significant percentage of their target audience*, with public educators often going door to door, literally or through the media, to have a broad impact.
- They often *repeat messages* over and over, just as an ad campaign would.
- The good programs are *adaptable*, changing goals and materials as the fire problem changes.
- And they often are *refined by testing* in a small area for a small target population before they are implemented communitywide.

★ ★ ★ ★ ★

The irony of the fire situation in the United States is that we have some of the best public fire educators and the most creative public education programs in the world, but they are not given adequate support. Proving that public education works can help make it a higher priority in the fire service and can help the United States reduce the level of fire deaths per capita to that in the rest of the Western world. To achieve this goal we encourage public fire educators to evaluate their programs and to publish the results.

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I. INTRODUCTION

"If the fire service leadership is not convinced that public education works, they will continue to cut that activity when budget crunches occur. . . . The field of public education will continue to be thought of as a luxury item, or a 'fluff' program which has little substance. . . . rather than [having the] ability to make a difference."

Jim Crawford, Assistant Fire Marshal, Portland, Oregon; winner of the International Association of Fire Chiefs Fire Service Award for Excellence, 1989.

Most citizens and firefighters believe that educating the public about fire safety is one of the most important ways to reduce the fire problem. Or do they? You could not tell from looking at the allocation of resources to fire safety education within fire departments, schools, or other organizations.

Many people, in fact, give lip service to public fire education but do not really believe deep down that you can educate "all those careless people" not to start fires, or "all those malicious people" not to intentionally ignite fires.

On the other hand, many believe heart and soul that educating people, especially young children, is the bedrock of fire protection and that it does, indeed, work.

What both groups lack is solid data supporting their views. Remarkably few studies have been published that address the question of whether public fire safety education works, and the characteristics of what it takes to make it work. An intensive literature search of published material from the past two decades turned up few articles with hard data to convince an objective reader that public fire education is effective.

This lack of published material showing that public education works was identified as one of the major barriers to improving public fire education in the United States.¹ Mayors and fire chiefs alike have

noted that without such data, it is hard to argue for increased public education resources—and in some cases, any resources. While it is self-evident that applying water to a fire puts it out, it is much less evident that pouring fire safety education on a kid makes a difference in the number of fires.

Most people in the fire service now know that the United States has one of the very highest fire death rates per capita in the western industrialized world. The number of fire deaths in the United States fell from the 8,000 level of the 1970s to under 6,000 in 1989. On a per-capita basis, the drop in the death rate was even sharper. And the number of fires dropped from 2.6 million in 1975 to 2.1 million in 1989. Yet, after all that good

progress, we still have among the highest fire incident rates and fire fatality rates per capita in the world.

Undoubtedly, part of the reduction in deaths and fires has been due to the tremendous increase in the use of smoke detectors during this period—one of the great public safety education feats of this century. Part of the decrease probably also can be attributed to increased prevention education, though we do not know how much.

There is hope that we can further reduce fires and fire casualties by making our environment safer with materials and structures that are fire resistant, by making improvements in products that generate heat to reduce their likelihood of starting fires, and by adding sprin-



Kevon Harris of Prince George's County, Maryland, demonstrates stop, drop, and roll. Knowing how to prove the impact of such training can affect funding for public safety education.

¹ Philip Schaenman, et al., *Overcoming Barriers to Public Fire Education in the United States*, TriData Corporation, Arlington, Virginia, 1987.

klers to extinguish fires and smoke detectors to detect fires in the earliest stages. Nevertheless, it seems highly likely that we can continue to make major inroads in reducing the fire problem by raising the awareness of the public that there is a fire problem, and by providing the education and motivation to do something about it.

Purpose

This study aims to develop a body of data that can be laid at the feet of decision makers to show that public fire education does, indeed, work, and works exceptionally well when done right. It is also the purpose of this report to stimulate others to publish their evaluations, and to give public educators and others some of the basic concepts for conducting evaluations, so that more people will be able to undertake evaluations to add to the body of proof and thereby help the entire profession.

In short, we want to:

- Provide data and success stories to help make the case for increased fire safety education;
- Stimulate more people to undertake and publish evaluations of fire safety education programs; and
- Provide some of the tools for conducting evaluations.

Methodology

The basic approach of this study was to find good public education efforts that had been evaluated, especially those evaluations that had never been published. We identified examples by contacting many public educators, looking for leads at fire world meetings around the country, and utilizing our own network of contacts as well as that of other leading prevention specialists.

We sent press releases on the study to all major fire magazines and were fortunate to have the International Association of Fire Educators distribute 1,000 letters to public educators on the organization's mailing list.

The response was sparse. And fewer than one in 10 of the public educators we sought out in the first phase of the research had substantive evaluations. (We subsequently learned that just asking them for the information stimulated several to start planning evaluations.)

Only a handful of evaluations were identified that could be considered even fairly rigorous. The state of the art of evaluating public fire safety education simply must be improved. Nevertheless, we amassed a large number of examples that, taken together, show that good public fire education programs do produce a public that is more safety conscious and, in some cases, a dramatically reduced level of injuries and deaths. Considering the small amount of funds spent on almost all public fire education programs, they would have to be judged highly cost-effective based on the results unearthed here.

To the best we can determine, no one previously had undertaken a comprehensive study of evaluations done by the fire service. A doctoral thesis written in 1976 by Donald Carter at the University of Tennessee found little in the literature to that date.² Since then, the authors learned of only one other similar study, which happened to be contemporaneous with this one: Dr. Larry Doolittle of Mississippi State University has undertaken a study of "Wildland Fire Prevention Program Evaluation" for the U.S. Forest Service. He, too, found little documentation of evaluations.^{3,4}

One fire department, St. Petersburg,

Florida, took a unique look at whether public education could make a difference (as opposed to whether it actually did). Stimulated by an Urban Institute study of how to measure effectiveness of municipal services, which was undertaken jointly with St. Petersburg and Nashville, Chief Jerry Knight had his first arriving fire officers determine whether each fire could have been prevented by public education or by an inspection prior to the fire, or whether it was relatively unpreventable.⁵

The study covered data from about 1972 to 1980. The results overwhelmingly showed that most fires in St. Petersburg (about 80 percent) were judged to be preventable by education. Especially significant was that this was reported by St. Petersburg's suppression officers. As a result of this finding, Chief Knight increased the staff of the public education section in St. Petersburg. He disbanded a company staffing a piece of support equipment and added three positions to public education (the rest of the unit's staff went to increase the size of other companies). Public fire education and prevention are considered the Department's prime responsibility, with suppression second.

Organization of the Report

The next chapter, Chapter II, describes some practical approaches for evaluating public fire education programs. Chapter III, the bulk of this report, gives examples of evaluations from around the United States and Canada. Chapter IV identifies some of the features common to successful public fire education programs and makes recommendations for improving the state of the art of evaluating public fire education.

² This thesis is discussed in Case Study #18 in Chapter III.

³ Private communication from Dr. Doolittle to Philip Schaenman, 1989. Dr. Doolittle's study was in progress at the time of this writing, to be published late in 1990.

⁴ Toward the end of this study, the National Fire Protection Association announced a call for evaluations of Learn Not To Burn programs on a much broader basis than ever before, which holds promise of providing a wealth of evaluations in the future.

⁵ Harry Hatry, et al., International City Management Association, and the Urban Institute, *How Effective Are Your Municipal Services?*, 1977, discussed effectiveness and productivity measures to use. It was based in part on work with the cities of St. Petersburg and Nashville.

II. HOW DO YOU EVALUATE PUBLIC FIRE EDUCATION?

The term “evaluation” means different things to different people. That leads to various concepts of how to evaluate a public education program. Some people evaluate programs based on how well the public education program is accepted and used by teachers, or how well it is liked by the target audience. Others evaluate a public education program by looking at features that are thought to compose a good program, such as whether it has good graphics, is well targeted, and has input from various community groups.⁶

Another type of evaluation asks whether a program causes “institutional changes,” such as getting additional funding for public education materials, obtaining additional slots for public educators in the prevention bureau, having public education incorporated in the school curriculum, or stimulating local businesses and service organizations to participate in public safety education.

All of these concepts of evaluations are useful. All help indicate the path to program success. But they are several steps removed from being able to show that public fire education works in achieving its main purpose—reduction of deaths, injuries, and dollar loss from fire.

Many programs have side effects, secondary missions, or even hidden agendas. Public fire education, for example, can enhance the image of the fire department, demonstrate a caring city administration, and

raise or lower public fears.

A sophisticated, comprehensive set of measures of effectiveness of a public program would consider such issues, which often are important in the minds of managers under their day-to-day political pressures. But the main purpose of public safety education is to improve safety, and unless you can demonstrate that a program is achieving this goal, it will be hard to convince decision makers in the long run that the program should be supported. Sooner or later you are going to be asked about the bottom line.

A Hierarchy of Evaluation Measures

Our concept of evaluation is to focus on “bottom-line” or end impacts: Did the program work in the sense of reducing fire deaths, injuries, dollar loss, or the number of fires? Being able to show that your program made a difference in these end measures is the most persuasive type of evidence of its success.

In order to achieve a bottom-line effect from public education, a sequence of events must take place:

1. *Outreach*—You have to get safety information to the target audience, and reach enough of the audience to make a difference.

2. *Knowledge gain or refresh*—The audience must understand the material, and must remember it. The information must be relevant and accurate for improving safety. It also must add to what the audience already knows, or remind them of what they know.

3. *Behavior change or maintenance*—The target audience must act on the information gained (or refreshed). They have to recall it accurately, and be motivated to

use it. They have to act more safely, make changes to their environment, and/or know what to do when fire occurs.

4. *Environment change*—Actions taken to improve the safety of the environment need to be done correctly, and the changes must be maintained.

5. *End impact*—The behavioral or environmental changes must have a significant impact on the types of problems that actually occur, and not be overwhelmed by factors beyond control, or not addressable by public education.

Ideally, you want to show that the program caused the desired end impacts. Where it is not possible to demonstrate such “bottom-line” effects directly, then we look for the next best evidence earlier in the sequence leading to end impacts: Were there changes in behavior or environment that are likely to produce a bottom-line effect? For example, did the program change fire safety behaviors such as getting people to maintain or install detectors, or practice escape plans, or identify and discuss an outside meeting place with their family? Did the program reduce fire safety hazards that lead to fires, such as defective wiring, dirty chimneys, or wood stoves installed too close to walls? Since people usually have to change their behavior in order to change the environment, such as doing more maintenance, or hiring someone to clean a chimney, the change in hazards can be considered another way to measure changes in behavior.

If a change in behavior or environment cannot be shown, you can retreat one step further and ask whether a program caused a change in awareness or knowledge

⁶ See, for example, the excellent materials in the Pan-Educational Institute’s *Community Public Education Assessment Package*, which are discussed in Case Study #74. These materials are helpful in shaping programs that will have bottom-line effects.

of key fire safety information that leads to safer behavior and environment if the knowledge is applied. An example is knowing what kind of fuel is supposed to go into a kerosene heater, or the way to extinguish a grease fire, or the need to crawl under smoke.

Further back in the chain of proof is the extent to which people are reached by a program, especially when measured in terms of the percent of the target audience that was contacted by the program, and the frequency of contacts. Reaching 90 percent of the

schoolchildren in the third grade twice a year would be an example of this measure.

Table 1 shows the hierarchy of measures. Try to use the highest level of proof on the list that you can, to get as close to evaluating the goals of prevention directly, and to have as few assumptions stand between what you measure and what you really want to affect.

People you reach may not learn. People who learn may not act. And acting as instructed does not always work. Therefore, the closer you come to measuring the end

impact, the surer you are that there really is an end impact. But showing that any of the hierarchy of measures changed is vastly better than doing no evaluation. The intermediate measures also can be excellent proof that the public education program did, indeed, change things that led to an observed change in the bottom line, and that an observed change in end impacts did not happen by chance.

The intermediate measures also can be diagnostic and help show where in the chain the education

Table 1
A Hierarchy of Evaluation Measures for Public Education

	<u>Aspect Measured</u>	<u>Examples of Evaluation Measures</u>
Strongest proof ↓	1. End results	Number of deaths, injuries, dollar loss, or fires per capita Anecdotes of saves linked to programs
	2. Behavior or the environment	Percent of households with a working smoke detector Percent of households sprinklered Percent of chimneys cleaned at least annually
	3. Awareness, knowledge	Percent of public who know how to extinguish a grease fire Percent of public who know how to use extinguishers Percent of public aware of need to crawl low in smoke
	4. Extent of program outreach	Percent of population (or a subgroup) receiving public education materials Percent of elderly receiving safety lecture Percent of schoolchildren with x hours of safety instruction each year
	5. Likableness and usage of programs	Percent of teachers who think program materials are good and use them
Weakest proof	6. Institutional change	Introduction of safety curriculum in schools Addition of service organization to aid in dissemination

process is breaking down if there is not any change in the bottom line. They are best used in conjunction with end measures.

Sources of data for the measures range from existing, routine data collected by every department to special studies.

Outreach data may be obtained by counting attendees at public education talks, classes, and exhibits, or by tallying households visited. For TV, radio, and newspapers, their circulation or audiences usually are known and available. When a reasonably significant portion (10 percent or more) of the population is thought to have been reached, a citizen survey can be used, in the form of phone calls to random households or a mail survey. Total population of a target group often is available from U.S. Census data or local planning departments; that information forms the denominator for computing the percentage reached.

Knowledge changes usually are measured by before-and-after tests.

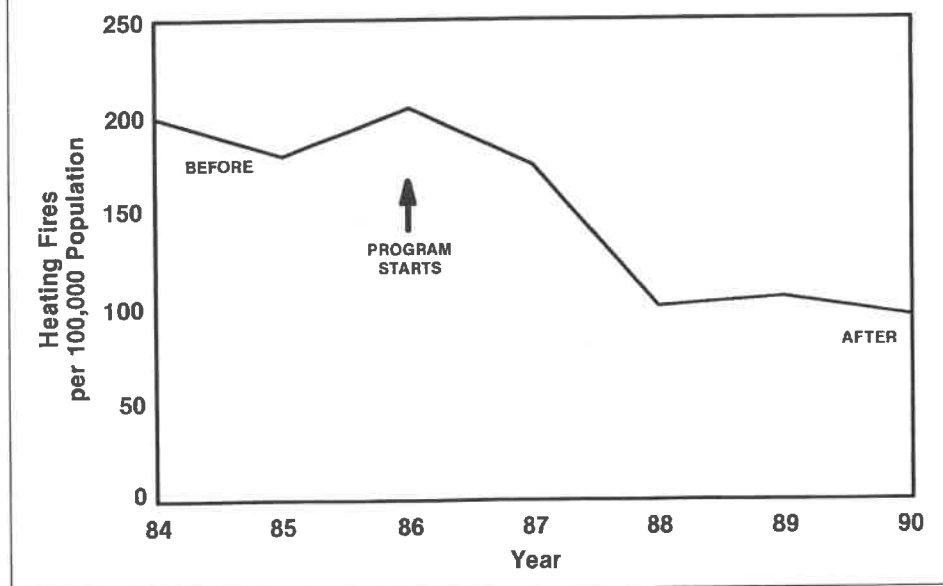
Behavior changes and environment changes can be measured by using telephone or mail surveys, or by visiting and inspecting households, or by asking schoolchildren about their households.

End impact changes are measured from fire incident and casualty report data or special studies.

We next discuss some of the approaches to undertaking evaluations with the above measures. This is a short, condensed summary of a complex subject. A more in-depth treatment on evaluation in general is available from the Urban Institute's book, *Public Program Evaluation*.⁷ Another excellent reference specifically on

⁷ Harry Hatry et al., *Public Program Evaluation, Second Edition*, the Urban Institute, Washington, D.C., 1989. Many other Urban Institute publications address the art and science of evaluation. The Urban Institute for several years had an entire department devoted to research on the subject. Its State and Local Government Research Group also did much seminal work on program evaluation, of which the above book was part.

FIGURE 1. Example of a Change Over Time That Shows a Successful Program's Impact



evaluating public fire education is the National Fire Academy's *Fire Education Evaluation Guide*.

Basic Approaches to Making Comparisons

Perhaps the most basic concept of an evaluation is to demonstrate that you get some benefit from having a prevention program compared to not having it. You can take several approaches to making the desired comparisons. You can:

- Compare your community's experiences over time, to see if there is a difference after a program started compared to the "baseline" before it started. (Changes in the community that occurred during the period used in the comparison and that could affect the results must be taken into consideration.)
- Compare one part of your community to another, to see if there is a difference between areas that have public education programs versus other areas that do not yet have the program, or had it for a shorter time or with less intensity.
- Compare your community

to other communities, especially to similar communities that have not had a comparable public education program recently. A variation is to compare like parts of different communities, such as inner-city neighborhoods or high-rise dwellers.

- Compare changes in a targeted type of fire (or fire safety behavior) to the trend in other types of fires (or other fire safety behaviors). For example, consider the change in cooking fires versus the change in heating fires after a campaign that targeted cooking fires.

Let's consider these approaches one at a time in somewhat greater depth, with some examples.

Measuring Change Over Time—

The most straightforward way to show that a public fire education program has had an impact is to demonstrate that things got better after the program started, as in Figure 1.

Sometimes the effects are not immediate, and time must be allowed to observe results. Other times the effect is expected to be immediate

but to wear off with time, in which case speed of measurement is necessary. And sometimes the changes result from uncontrollable factors outside the program. All of these issues must be addressed.

While ideally a public education program produces a drop in fires or deaths, the impact sometimes may be to reduce the magnitude of an increase, or change the rate of an increase. See, for example,

Figure 2 and the South Carolina program discussed in Case Study #66.

Often there are random fluctuations in fire experience, especially noticeable when the community is small and the number of fires also is small. It may be necessary to observe data that zigs and zags up and down for weeks or years before being able to discern the trend (as in Figure 3). Identifying

patterns with fluctuating or “noisy” data sometimes can be expedited by using averages over several points of data, or more sophisticated statistical analysis tests that help measure the likelihood that a true change has occurred.

The speed with which a prevention program has impact varies with the fire safety behavior being targeted, the frequency and timing of the message, and the receptiveness of the audience. It also may vary with the size of the audience reached. For example, if you reached one-third of the population of a city by a public service announcement (PSA) associated with a popular TV show—a very large audience for TV—you might expect an immediate drop in the type of fires targeted. If you gave instructions in the PSA on how to prevent or extinguish cooking fires, and you had averaged nine reported cooking fires per week, then it might be reasonable to expect an average of six or seven instead of nine fires per week following the broadcast, if the program was one that tended to reach a broad cross-section of households. The behavior change can be immediate for those who saw the PSA. It does not require any accumulation of knowledge over time because it is simple.

Effects of a program may be delayed when the safety behavior being sought takes time and money to implement. For example, when you instruct people to test their detectors and replace the batteries, it may take some time before they get around to doing the test, then buying the batteries or detectors, and then installing them. In contrast, there is no delay at all in being able to implement “crawl low in smoke” or “put a lid on a grease fire” for the next fires that occur.

The speed with which a prevention program has an impact also depends on the nature of the audience. If the audience is composed mostly of “safe households” with a low fire rate, it may take a while

FIGURE 2. Example of a Change in the Rate of Increase That Shows a Successful Program's Impact

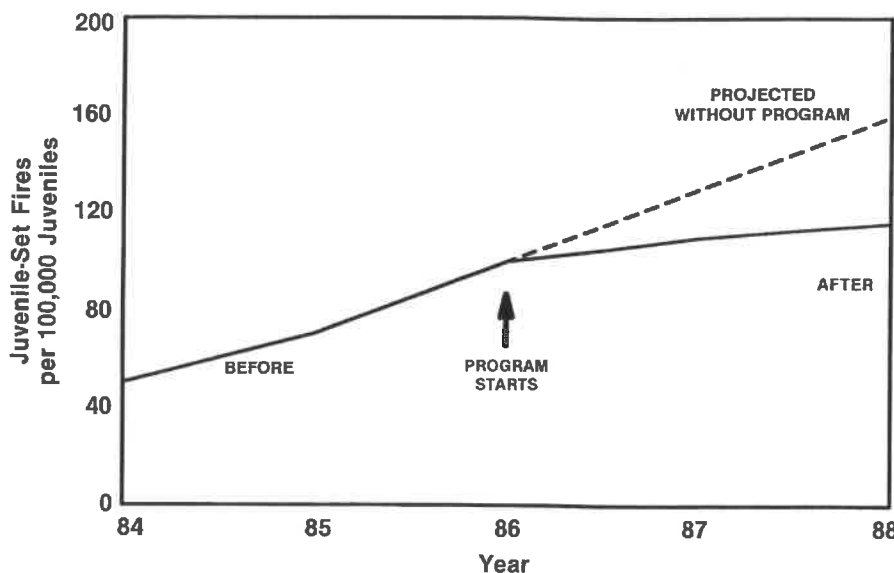
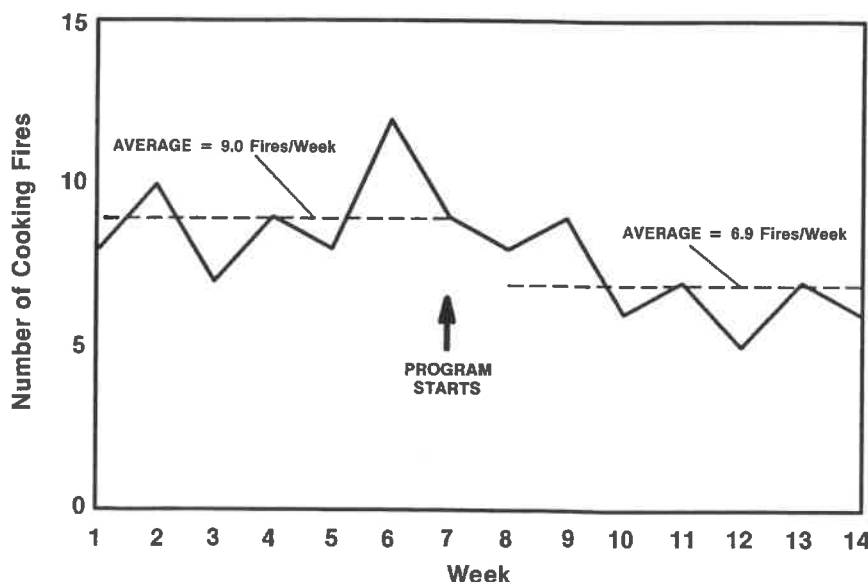


FIGURE 3. Change in Trend Visible Even With Fluctuating Data



to see any further impact.

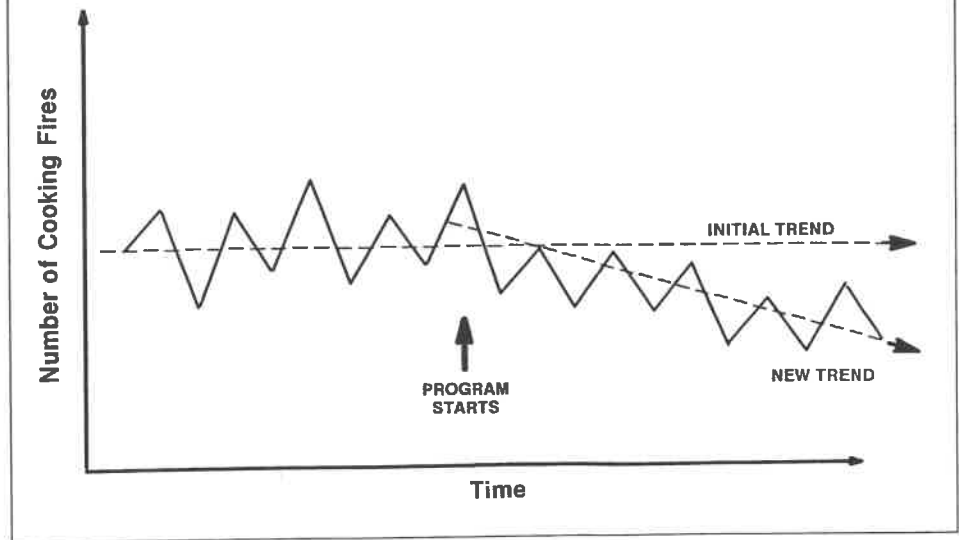
In contrast, an ad targeted to areas with disproportionately high fire rates may have impact faster, because there is more opportunity to create a larger change. On the other hand, if these households tend to ignore safety information, there could be no change. You need to consider the status of the audience in assessing program impact, especially when comparing different programs or the same program in different areas.

The effects of a program also may be delayed when the audience it is directed to is young. For example, teaching kids in junior high school to put a lid on a grease fire may not have its full effect until they begin cooking more for themselves (though they may pass the information to other members of their household or intervene in a fire themselves).

Measuring a drop in reported fires as a result of a public education program can be thwarted because of the unpredictable effects publicity can have on people's likelihood to report a fire. We know that many fires go unreported. Almost all of the unreported ones are small, though they include fires that injure and that cause hundreds or even thousands of dollars in damages.

When a public education campaign brings attention to a fire problem, more of these small fires might get reported than usual, making it appear to the fire department that the problem is worsening when it actually is not. Also, encouraging people to evacuate their homes quickly may cause some who previously would have extinguished their own fire and not reported it, to leave and report the fire. The prevention program thus could cause an upsurge in reporting of fires. As another example, asking people to refer children who set fires to a juvenile firesetter program might encourage more reporting of fires that otherwise would have gone unreported.

FIGURE 4. Example of Plotting Trends in Noisy Data



The only way to know for sure whether a surge in reported fires is due to reporting of previously unreported fires is to periodically survey the population to determine the degree of their under-reporting, and the reasons for it. Then you can determine whether fires that previously were unreported are now being reported, or truly are increasing in number.

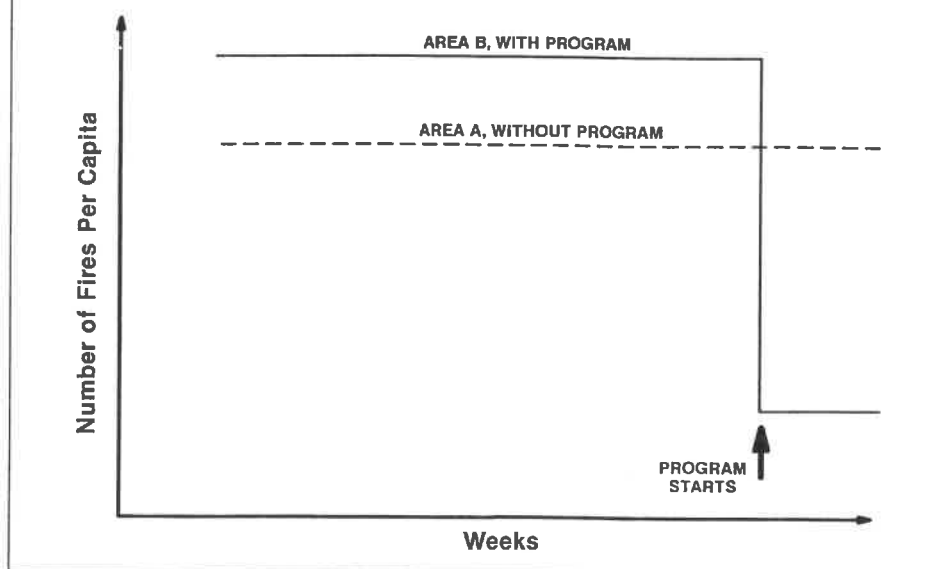
Increasing Chances for Detecting Changes—Although there are a number of reasons why it may not be easy to see a change in trend as a result of public education, there are several ways to increase the likelihood of detecting a success.

One way is to use more sophisticated statistical techniques to see if there is some signal of a change amidst the noisy, erratic data coming from the outside world. Some fire departments have people on staff or from nearby universities or other organizations who have training in statistical analysis. Modern, easy-to-use statistical computer software packages may help, too. By all means use them if available. But if it takes extremely sophisticated statistical techniques to identify a change caused by

your program, the program is not likely to be having a large effect. That is, if you can't see the effect of the program looking at the data with the "naked eye," chances are that the effect is probably not very large. There are exceptions, and even if a change is small, it may be cost-effective if only a correspondingly small effort were required to produce it.

An easier approach than employing sophisticated techniques is to collect more data over time. Average the data before the program started and compare that to the average after the program starts, as in Figure 3. The averaging will take out some of the random fluctuations, and some of the problems inherent in having only small numbers of deaths, injuries, or fires for smaller areas. Compute the trend lines (as in Figure 4). Look at fires, not just deaths, because there are usually about 100 times more fires than deaths. The impact of a program aimed at ignition prevention will show up sooner and more clearly for fires than for deaths. If your program is directed toward education about escape or preventing bodily harm after a fire starts, rather than preventing or mitigating the fire

FIGURE 5. Comparing Area With Prevention Program to Area Without Program



itself, look at the number and severity of civilian injuries, and not just deaths. There tend to be about four times more injuries than deaths, and again the effects of a program may be more readily detected.

If your community's population has not remained constant over the period of analysis, look at your data per 10,000 or per 100,000 population. (You also should look at the data on a per-capita basis when you compare your community to others.) If your population is increasing but the number of fires or deaths remains approximately the same, the rate per 10,000 people will go down. That is, when more people are at risk but the community is not experiencing more fires or deaths, that can be an indication of a successful program.

Another approach that can speed up the evaluation period is to compare different parts of the community or to compare the community with others.

Comparing Different Parts of the Community—As an evaluation tool, comparing parts of the community against each other is

most useful when a program is introduced to one area of the community and not to the others. Then you can compare the "treated" population to the "untreated" population, just like in a medical experiment (see Figure 5).

For example, you might introduce to the schools in one neighborhood a program directed at getting smoke detectors tested and properly installed. The kids might be asked to count the number of detectors they have at home, and to test them. This can be a homework exercise. Then the kids can be taught the importance of maintaining detectors and periodically testing them. Results can be monitored for the following three months by looking at fires in that school area, and determining the percent of fires in which detectors were found working versus how that area did prior to the program, and how it compares to the areas of the community without the program. If it appeared successful immediately, it could be tried in other areas. If not successful immediately, the material might be repeated and the results monitored. An attempt might also be made to determine if any out-

side factors were causing a counter or negative impact.

As another example, one year you might equip the schools in a selected neighborhood or district with a curriculum such as the National Fire Protection Association's "Learn Not To Burn," the Pan-Educational Institute's Project L.I.F.E. program, the State of Oregon's school curriculum, the new high school curriculum, "Challenge for Life,"⁸ or some other program designed for schoolchildren.

Results would be monitored for the trial neighborhood versus the rest of the community. If the program shows some success, perhaps in a few types of fires such as "children playing" or juvenile fire-setting, then it might be implemented in the rest of the community. Your chances of getting expanded implementation are much greater if you can show quantitatively that the program really made a difference in the area of the trial.

Sometimes a program applied in one area of a community inadvertently may have effects on the whole community. A marvelous example came from Edmonds, Washington, where a door-to-door home inspection program in the mid-1970s using paid elderly volunteers to make the inspections was reported to have had about as much impact in the census tracts that had not been visited by the program as in the census tracts that had been visited. The suspicion was that the publicity attendant to the program caused people to clean up their act in anticipation of having a stranger snooping around their house. The program raised awareness of fire safety even in areas that did not receive the door-to-door inspections. If you compared the areas visited by the program to the areas not visited by the program, you

⁸ "Challenge for Life" will be available through The Tobacco Institute's Fire Safety Education Program in 1991.

would have concluded that the program was not very effective, when in fact the overall impact of the program was to drop fire incidence by a whopping two thirds. The before-and-after comparison for the city as a whole made clear what most likely had happened.

It is sometimes politically difficult to run a prevention program in one area of the community and not in others unless it is clearly labeled a pilot program, and you have a plan for subsequently introducing the program everywhere. Nevertheless, whenever possible, introduce a program in one area first, and test the results in that area versus the rest of the city. Even for proven programs this initial test can help you make adjustments in the program before introducing it everywhere.

When comparing different parts of the community, make sure you compare *like areas*, if possible. You want to compare a program in a low-income area with how other low-income areas are doing without the program, or compare a moderate-income area to other moderate-income areas. This is especially important if all areas have been trending in the same direction, and the impact of the program is to reduce the rate of rise or accelerate the drop in fires or casualties.

Comparisons among areas are best made over a period of time. You need data for each area from before and after the time when a program was first started to know whether differences between areas result from differences in their characteristics or differences in the program.

Comparing Your Community With Others—Similar in principle to comparing different areas within your community is to compare your community to other communities—especially to other communities that are reasonably like yours. A variation on this is to compare your experience to that of your state. Comparisons among

communities (or areas) should be made on a per-capita basis or in terms of percentage changes or trends in the magnitude of the problem. Otherwise, differences observed in the numbers of fires or casualties may be due to differences in the numbers of people protected rather than from the results of the program.

Handling Uncontrollable Factors

It often is not enough to show that there was a change in knowledge or behavior or bottom-line measures, like injuries or dollar loss. You also need to demonstrate that the observed changes were caused by your program and not by other things going on in the world, such as an unusually warm winter that resulted in fewer heater fires, or a dramatic national fire in the news that raised awareness. Likewise, you need to check whether positive effects of

a program may have been masked by uncontrollable factors, such as a weakening economy that leads to an increase in vandalism and arson fires while you are implementing an arson control program.

The sociology of fire is complex. There are many causes of fire, and many uncontrollable factors that may affect the environment or behaviors leading to fires. A social scientist or statistician might never be totally satisfied with the degree of rigor of most evaluations that are practical, because it is difficult to account for all of the uncontrollable variables without much effort, and perhaps not even then. Nevertheless, evaluations can be useful if undertaken with a little care, because they generally lead you in the right direction.

Table 2 lists some of the uncontrollable variables that might affect results. You may think of others. The first list in Table 2

Table 2
Examples of Factors That Affect Evaluation Results

Uncontrollable Factors

- Age profile of population
- Income distribution of population
- Education level of population
- Geographical scatter of population
- Ethnic groups in population
- Weather or climate change
- Economic changes
- Migration of people in or out of community
- Nature of local business and industry

Semi-Controllable Factors

- Condition of housing
- Architecture of the home
- Hazards of new technology
- Changes in percentage of unreported fires

Starting Conditions

- Severity of fire problem (fire and death rates)
- Previous exposures of population to fire safety information
- Current level of detector usage and condition

contains variables that are largely beyond the control of the fire department. The most classic examples perhaps are the weather and the economy. The second list has factors that may not be controllable in the short run, though they may be affected by codes and other prevention efforts in the longer run. The third list has the initial conditions that need to be considered, even though they can be affected by public education.

Evaluations can be made more meaningful by comparing results for situations in which these external variables and initial conditions are reasonably similar, or at least by acknowledging the possible influence of these variables.

The need to consider uncontrollable variables can cut more ways than one. A modest reduction in the number of wood-burning stove fires that would have followed the introduction of an intense education program on the need to clean chimneys might be masked or negated by an unusually severe winter. The colder temperatures might cause a sharp increase in the use of stoves and a corresponding increase in fires that overwhelms the decrease from more people cleaning their chimneys. But the increase might be less than in earlier years when no prevention effort took place, which could be a demonstrable positive impact of the program. If there were a decrease in chimney fires in spite of a particularly cold winter, that would suggest that the program was being extremely effective, not only in reducing the normal toll, but doing so in the face of increased stove use.

The reverse situation is also possible: An ineffective public education program might appear to be effective if chimney fires drop because the winter is relatively mild and the use of stoves decreases. That type of external factor has to be considered before you start crowing about successes.⁹

To understand whether changes in fire incidence or casualties are

Table 3
Relating Evaluations to Specific Prevention Themes

<u>Prevention Theme</u>	<u>Examples of Measures to Use</u>
Use of smoke detectors	# households with detectors # reported fires (early detection leads to occupant extinguishment and fewer reports) # fire deaths
Getting out quickly from residential fires	# injuries while attempting fire control in residential fires # fire deaths # severe injuries
Need to clean chimneys	# chimney fires
Careless smoking	# fires or deaths involving careless smoking
Safe storage of flammable liquids at home	# non-arson fires where flammable liquid was material first ignited
Children playing with lighters or matches	# residential fires where heat of ignition was a match (or lighter) and ignition factor was "children playing" # children injured in above type of fire

due to the public education program or to climate change, you need to look at the data on the weather during the period in question, and perhaps some nearby communities that did not change their public safety education programs but had the same weather. Looking at the data averaged across several winters may also reveal whether a program is having an impact independent of fluctuations in climate (unless the climate takes a several-year shift in one direction).

Another approach is to compare

⁹ The chimney fire situation is a somewhat tricky example because relatively mild winter weather can cause people to reduce airflows to the firebox to reduce the intensity of the fire, which in turn can increase creosote build-up and lead to more house fires, instead of fewer.

the data from years when the uncontrollable factor—in this case the climate—was the same. Nebraska's Forest Service provided a brilliant example of this approach. Fire rates in years of relatively similar dryness were compared with respect to the intensity of the prevention programs in those years. Comparing results from years with similar weather allowed the impact of the program to stand out. Otherwise the fluctuations in dryness masked the effects of the fluctuation in the intensity of the program. (See Case Study #77 for further details on the Nebraska evaluation.)

Besides considering factors that are uncontrollable by the fire department, evaluation of public education programs must consider the relevant pre-existing fire situa-

tion in the community. This is especially important to do when effectiveness is compared to resources expended; that is, when productivity is to be measured.

Table 2 includes a list of several starting conditions to consider. The existing level of smoke detector usage, for example, will affect the apparent effectiveness of a new effort on smoke detectors. It is easier to get the middle 20 percent of households to install detectors than the last "hard core" 20 percent. It usually is easier to reduce a high fire death rate than it is to further reduce a very low death rate. It is easier to maintain new detectors than old detectors, because the new ones use less expensive batteries and are less worn out. While we may use the change in the percent of households with working detectors as a measure of effectiveness, we must realize that it gets harder and harder to reach the last 10 households. Where we start on the measure can affect where we wind up, for a given level of effort.

Focusing the Evaluation Properly

When a fire safety education program is targeted at a particular type of fire, such as grease fires on the stove, Christmas tree fires, or kerosene heater fires, the evaluation, too, should focus on how that type of fire changes over time, and how it compares to other types of fires for which there is no current program. Sometimes focusing on one type of fire may raise awareness and have a beneficial effect on many types of fires, and so the overall change in the fire problem needs to be monitored, too. But there should be an exaggerated effect on the type of fire that was the target of the program.

The same philosophy of targeting the evaluation properly applies to programs aimed at changing people's response to fire, such as escaping quickly or closing doors or using extinguishment

methods properly.

Unfortunately, people attempting to undertake evaluations often look for changes only in the larger universe of fires rather than in the target group they were after. They measure the change in all fires when a program was targeted just to residences; or they measure the change in all residential fires when the program was aimed solely at cooking fires; or they look at all cooking fires when the prevention message was targeted solely at grease fires.

You have a much better chance of detecting results if you limit your evaluation to the subject on which your message is focused. Otherwise, the results are diluted amid a larger pool of fires, and you may not be able to detect them.

Table 3 gives examples of some targeted messages and associated measures of their effects. In each case you also should compare the change in the targeted type of fire to the change in other types of fires, or fires in general, as a con-

trol. If you targeted cooking fires and they dropped, check whether heating and "children playing" fires dropped, too. And check whether cooking fires dropped in nearby communities where there was a program. If there were drops to other types of fires or in other communities, forces other than your program may be at work. Or your program may have broader impact than what it targeted.

Getting the data for exactly what you want to measure may be difficult. You then either have to retreat and find a surrogate measure, or measure the impact on the next larger category that includes the type of fire or behavior you targeted. For example, if you run a PSA about putting a lid on grease fires, but cannot easily measure the number of grease fires, you might use the number of cooking fires instead. If you focus a school program on the need for children to escape quickly from house fires, but cannot measure the number of injuries from

Table 4
Examples of Uncontrolled Variables to Consider for Particular Types of Fires

<i>Type of Fire</i>	<i>Variables to Consider</i>
Arson	Economy Change in number of 18- to 26-year-old men Change in number of teenagers Instances of civil rioting
Children playing	Change in number of single-headed households with children Number of youths Economic levels Ethnic makeup of the community
Heating	Climate (average degree-days; abrupt changes in weather)
Careless smoking	Upholstered furniture and mattress regulations Level of alcoholism Usage and maintenance of detectors Cigarette consumption

not escaping quickly, you might still track the number of injuries to children in house fires.

Just as the evaluation must be focused on the type of fires targeted by the program, so must you consider the uncontrollable factors most relevant to the type of fires being targeted. For example, the number of reported careless smoking fires will be affected by changes in the use and maintenance of smoke detectors, because detectors allow fires to be detected and extinguished before they get large enough to be reported to the fire department. However, smoke detectors will have a negligible effect on the reported number of barbecue fires or outdoor dumpster fires.

Other examples of the factors that should be controlled or considered when making evaluations of programs targeted at particular types of fires are shown in Table 4.

Measuring Change in Knowledge

One of the most common types of evaluations of fire safety education is the classic multiple-choice test. Often such tests are given before a program starts, or at the beginning of the first class, and then repeated at the end of the training using the same test instrument. Sometimes the “after” test uses a slightly different set of questions. The results of the “before” test not only establish a baseline but also give insights into exactly where the group is weak. The “after” test shows the increase in knowledge.

Pre- and post-tests do not always have to be elaborate. Sometimes a few well-chosen questions can suffice. Chesterfield County, Virginia, used a five-question test on cooking safety, as will be discussed in Case Study #48.

Figure 6 shows profiles of test scores before and after a class that was conducted over a four-day period. The scores clearly show that the class dramatically improved.¹⁰

In addition to the graphic presentation, the average score and the range of scores for the pre-test versus the post-test describe the change quantitatively. This type of evaluation can be done separately for each class or group of people, or all classes can be lumped together. The separation by class is especially useful when there are differences in the composition of the classes, or when the classes are taught by different instructors.

Retention Tests—Giving a post-test immediately at the end of training may reflect only short-term retention, though the test itself may promote retention. It is desirable therefore to administer another test several weeks to a year after the last training session. That test would measure retention and present an opportunity for a “booster shot” or reminder of the safety lesson to the students.

Practical Tests—Another testing problem is that a paper test may not reflect what a person will remember or do in a crisis. Physical, hands-on training and demonstrations of competence may be better indicators of actual performance. Few people would certify someone as competent in CPR or first-aid based solely on a multiple-choice test, yet we often do that for fire safety.

Different Pre- and Post-Tests—When the same test is used for pre- and post-tests of the same group, there might be some improvement in the score even if nothing was taught because of increased familiarity with the questions and discussion of answers among the students. That is not necessarily bad—the test itself can be part of the learning experience. But there are ways to get around the problem.

Slightly different wordings or

questions can be used in pre- and post-tests, though some of the changes then might result from differences in the test.

Another approach is to test one group before they are taught the prevention material and to test another group after they are taught the material. If the groups are reasonably similar in composition, the difference in test results will show the effectiveness of the program in improving knowledge, while requiring only one test per class and allowing all students to receive the prevention material.

This approach works particularly well when a large number of reasonably similar classes are to be taught the same public safety material—for example, all fifth grade classes. The test might be given to every other class before the material is taught, with the remainder given the post-test. The large number of classes is likely to make the difference between the two groups unimportant. To take the other extreme, you would not want to use this approach on only two classes, especially if one were a slow class and the other an honors class. (More on this version of before-and-after testing is discussed in Case Study #31 in Chapter III.)

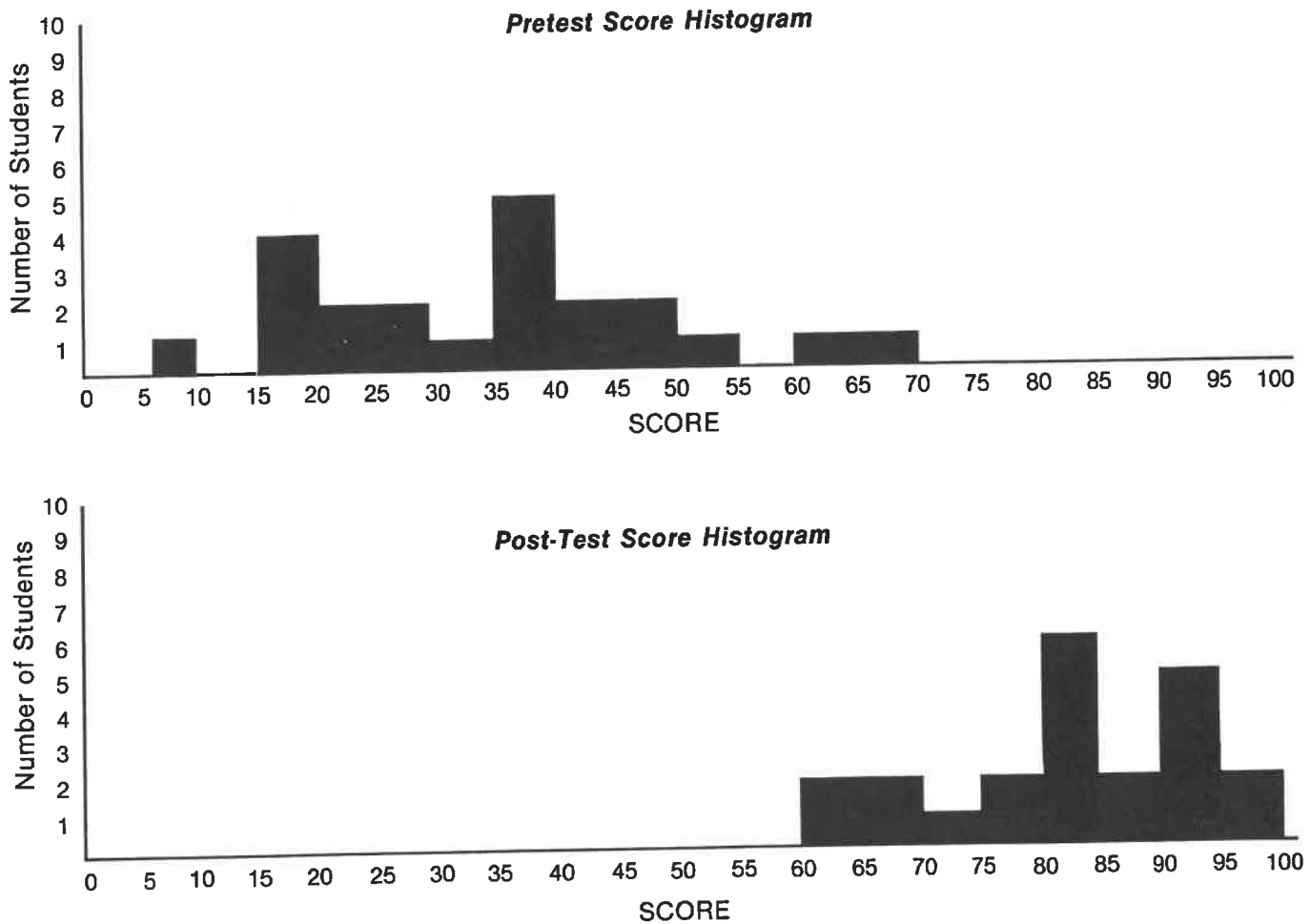
Evaluating Juvenile Firesetter Programs

Juvenile firesetter programs are different in nature from other prevention programs, and their evaluation requires some special considerations.

First, juvenile firesetter programs often are aimed at both the curious child and the disturbed or malicious child. The “bottom-line” effect of the program is manifested in part by whether there is a reduction in “children playing” fires, and in part by whether there is a reduction in arson. Both of these categories need to be monitored, because sometimes fires are simply relabeled and shifted from one category to the other rather than truly reduced. A “get-tough” policy with children can result in label-

¹⁰ This example was drawn from a class of fire-fighters taught about fire safety education, but the data could have been for a class of kids or a group of elderly.

FIGURE 6. Example of Plotting Pre- and Post-Test Scores



ing fires as arson that previously would have been called "children playing." Conversely, a more sympathetic attitude toward juvenile firesetters could cause a shift from labeling fires as arson to "children playing." Differences in legal definitions of arson from place to place also can muddy inter-city comparisons if both categories of fires are not considered.

Second, a common practice in evaluating juvenile firesetter programs is to consider "recidivism rates," the rates of repeat fires from children that have been treated by the program. Recidivism rates usually are quite different for the curious firesetter than for the dis-

turbed or malicious firesetter. It is easier to "cure" the curious child than the disturbed child. Rates therefore should be measured separately for these two categories. If not, one program can appear to be more successful than another simply because one has a greater proportion of the easier-to-cure, curious-kid cases.¹¹

Also, curious firesetters may have a low recidivism even without any program. A truly fair evaluation would consider their recidivism rates with and without the program. A recidivism rate of 5 percent

¹¹ Special thanks to Pat Mieszala, who first pointed this out.

might appear good at first, but would not be so good if the rate without the program was 4 percent.

Is the Change a Fact or a Fluke?

The majority of fire departments do not have a trained statistician, though many departments have someone with some knowledge of formal statistical techniques. Unfortunately, real-world statistical situations often require considerable expertise to be able to say that with such and such a confidence level the impact of a program is real. You have to deal with the factors that confound simple statistical approaches.

Standard statistical formulas actually may be invalid for many situations, such as when the samples collected are not truly random samples, and the assumptions behind the formulas are not met. We recommend that fire departments seek statistical expertise either from among their own personnel or from outside sources such as local universities or statistical consultants to assist in their evaluations.

Despite these caveats, some basic ideas from mathematical statistics can give at least a rough, ballpark feel for whether observed changes are likely to be significant. This material is offered in Appendix A, as much to give the reader a feel for the kinds of situations that are not "statistically significant" as they are to be a guide for quoting statistics.

What many statisticians do not like to let on is that, in many cases, common sense and good judgment are needed to say whether a change is likely to be real or not, and not just fancy statistical formulas.

It is also useful practice to periodically review previous evaluations to see if initial findings about effectiveness or lack of effectiveness held up over time. Sometimes what seemed like a true program impact may appear to be a fluke after a few years' data is collated. Sometimes it goes the other way; a program with little impact initially starts to have a large cumulative impact after a year or two.

Another kind of statistical evaluation problem comes when trying to separate the impacts of two or more programs that overlap in time. For example, it is difficult to separate the impact of fire department programs on smoke detector purchases versus the impact of TV ads. Comparing communities with and without fire department programs but exposed to the same TV ads may give some insight into whether the programs in question add anything. Sophisticated statis-

tical techniques can be applied, but require the use of expert statisticians.

Proving Effectiveness After a Program Is Terminated

Sometimes the value of a program is not evident until after it is gone. Just as a drop in fires, fire casualties, or dollar loss after a program is initiated can prove it worked, so can a rise in these measures after the program is dropped. Likewise, drops in smoke detector maintenance, drops in fire safety knowledge, and increases in numbers of hazards found per home after a program terminates can all indicate the effectiveness it had.

Proving that there was a real loss after a budget cut or reallocation of resources causes the demise of a program is one way to fight for its restoration. It also is a valuable type of hindsight from which the profession can learn.

Of special importance after a program ends (or after an initial test of a program ends) is to see how long the good results last. You might be able to show, for instance, that half of the people exposed to a public service announcement continue to test their detectors for three months after seeing it, and then begin to forget and stop testing. Information on how fast the initial effect wears off is highly valuable for identifying the minimum repetition frequency a message needs to have a continuing impact on the majority of those who receive it. This information can be used to optimize the use of scarce prevention resources.

Use of Anecdotes

One of the favorite means of evaluating public education programs is through anecdotes of survivors who testify that they learned a safety behavior from a public education program, and it saved their own life or that of others.

Anecdotes are wonderful human interest stories and can attract the

attention of the media. To most people, including decision makers, they are more interesting and more understandable than statistics. But anecdotes alone can be dismissed as weak evidence, especially if there are only one or two. Despite the frequently made statement that "this program is worth it if only one life is saved," politicians and budgeteers do not always see it that way behind closed doors.

Nevertheless, anecdotes are a legitimate form of evaluation, especially when used in conjunction with statistics. An anecdote provides insight into a program and proves that at least in one case the program worked. *Multiple anecdotes are much stronger evidence than a single anecdote, because one event might be considered a fluke.*

Anecdotes are most credible when documented in writing by survivors or first-hand witnesses, and when they describe not only an appropriate behavior but where that behavior was learned. Preferably the anecdote should be verified by at least a telephone call or second witness. The more anecdotes on a program, the better. The National Fire Protection Association's "Learn Not To Burn" has accumulated more than 200 documented cases where its messages saved lives or reduced injury.

Anecdotes are also more impressive when at least some of them are fresh (because programs and program delivery change) and when there are a series of anecdotes, indicating consistent, long-term results.

Since it is virtually impossible to collect anecdotes for all saves associated with a program, you need the relevant overview statistics as well. A budgeteer is much more likely to continue to fund a public education program where fire deaths decreased by 10 over the previous year *and* anecdotes show that the program was a factor in the decline, than where only the statistics or only the anecdotes are

used. Together, the picture portrayed is much more convincing.

Some people denigrate the use of anecdotes because they don't add up to statistical "proof." But at the local level or even nationally it does not take that many anecdotes to drastically change our fire loss picture. If public education programs reached half the people in each community and saved three more people than currently per 100,000 public education contacts per year, the nation's fire death rate would be cut in half.¹²

Unintentional Impacts

The evaluation of a program should include a check for unintentional impacts along with expected desirable results. Some common unexpected side effects are:

- Greater reporting of minor fires that previously went unreported:

Encouraging the public to flee a fire and call 911 instead of trying to put it out can lead to an increase in reported fires. The positive aspects of a public education program some-

times are partly or entirely masked by this surge. Looking at the number of small fires apart from large fires can be a check on this.

- Increase in fires set by children:
Sometimes raising the subject of fire to children boomerangs and greater curiosity is generated instead of being lessened.
- Scares, nightmares, and other psychological problems:
Young children can have a new fear added unwittingly by a program that is too scary for their age group. Children may become fearful instead of careful.
- Intrusion into parents' lives:
Getting a child to harass parents to improve home safety or to purchase safety devices the parents feel they cannot afford can lead to complaints by the parents. Usually this is outweighed by positive feedback from parents whose safety consciousness is improved. But complaints should be taken seriously, and the curriculum and instructors reviewed to see if the safety message can

be delivered effectively without unwanted side effects.

★ ★ ★ ★ ★

In summary, we recommend trying to focus evaluations on the end impacts of a program such as the change in casualties, or as close to the end impacts as you can come in the hierarchy of measures. Intermediate measures such as knowledge change or behavior change are useful for proving that it was the program that caused the change. Anecdotes add human interest to the evaluation and give specific evidence linking saves to the program. Uncontrollable factors need to be considered to show that it was the program and not outside factors that made the difference.

The next section of this book contains numerous examples of actual evaluations. They illustrate many of the evaluation approaches discussed in this section and show that scores of fire departments large and small already put many of these ideas into practice. The names, addresses, and telephone numbers in the "for more information" sections at the end of each case study are current as of the time of this report's first printing.

¹² To see this, consider that three saves out of 100,000 is equivalent to 3,000 saves out of 100,000,000 people, and our annual fire death toll per year has been about 6,000.

III. EVALUATIONS FROM ACROSS THE NATION

This chapter contains more than 70 descriptions of program evaluations that testify to the enormous effectiveness of public fire education. Scores of communities and many types of public education programs are represented. For some programs there is great detail on the evaluation, for others only a single key point. In few cases were ideal evaluations done; the state of the art of evaluation needs to be improved in all but a few departments.

Nevertheless, the data taken as a whole show **PUBLIC FIRE EDUCATION DOES WORK.** More properly, public fire education can work when done well—with well-targeted, appropriate, clear materials; with enough repetition; and with a valid evaluation to demonstrate it worked and to provide feedback.

The evaluations here are not a random sample. We included all evaluations we identified that had a reasonably credible approach and results. Most of the examples use quantitative measures of the kind discussed in Chapter II, sometimes in combination with anecdotes. A number of cases submitted to us were not included, usually because they did not have data on the impact caused by the prevention program.

We include brief descriptions of the programs and summaries of their evaluations, including the quantitative results and sometimes the data on which they are based. In most cases, the program described is not all that a community does in public education, but rather the program for which an evaluation had been conducted. Table 5 shows the states from which we have examples.

At the beginning of each case

study are several descriptors intended to make it easier for the reader to find relevant examples when the need arises:

- Type of jurisdiction (for example, small rural; large city)
- Primary target group (for example, elderly; whole city; eighth graders)
- Public education subjects addressed (for example, cooking fires; smoke detector

usage; multiple topics)

- Types of evaluation measures (for example, change in fire deaths; change in test scores)

For those interested in more information on the particular programs or evaluations, the name, address, and phone number of our principal contact for each case are given.

Many other effective programs have been evaluated that we did

Table 5
States Represented in This Study

Alabama		Nebraska	X
Alaska	X	Nevada	X
Arizona	X	New Hampshire	X
Arkansas		New Jersey	
California	X	New Mexico	
Colorado	X	New York	X
Connecticut	X	North Carolina	X
Delaware		North Dakota	
District of Columbia	X	Ohio	X
Florida	X	Oklahoma	X
Georgia	X	Oregon	X
Hawaii		Pennsylvania	X
Idaho		Rhode Island	
Illinois	X	South Carolina	X
Indiana		South Dakota	
Iowa		Tennessee	X
Kansas	X	Texas	X
Kentucky	X	Utah	X
Louisiana		Vermont	X
Maine	X	Virginia	X
Maryland	X	Washington	X
Massachusetts	X	West Virginia	X
Michigan	X	Wisconsin	
Minnesota	X	Wyoming	
Mississippi			
Missouri			
Montana	X	Total	34

Note: "X" means that at least one example from that state is included in Chapter III.

not learn about. The lack of examples for some states just means that we did not hear of any in those states during our research phase. We are interested in learning about them for future publications and would appreciate your assistance in identifying them.

The evaluation examples in this chapter are grouped into seven categories:

1. Comprehensive and multi-topic communitywide programs
2. Elementary school programs
3. Programs targeted at specific fire causes or population

groups

4. Juvenile firesetter programs
5. Smoke detector programs
6. National programs
7. Special topics

There is no special meaning to the order of examples within the sections.

COMPREHENSIVE, COMMUNITYWIDE PROGRAMS

This section describes evaluations of comprehensive, communitywide prevention programs that address multiple prevention topics. The communities here typically have prevention programs in the schools, programs targeted at the

elderly, smoke detector programs, exhibits in shopping malls, active fire prevention week programs, and many other programs. Included are programs that try to reach all households in the community, often with multiple types

of information.

Rather than trying to measure the impact of each program element separately, these communities look at the synergistic effects of their combined effort on the bottom line.

1. Norwood Fire Department (Massachusetts): Multifaceted Public Education

<i>Jurisdiction:</i>	Small town
<i>Target Group:</i>	Whole community
<i>Subject:</i>	Multiple
<i>Evaluation Measures:</i>	Fire and injury incidence; false alarms; behavioral changes; percent of population reached

The town of Norwood is located in eastern Massachusetts, 16 miles southwest of Boston, with a population of 30,000 people. The town is residential combined with both heavy and light industry. There are six grade schools, one junior high school, and one senior high school, as well as a regional hospital, six nursing homes, and four elderly housing facilities.

The Fire Department is fully paid with 63 uniformed personnel including a full-time fire prevention officer and a public education officer who is a line officer within the Department.

Prior to 1979, prevention was sporadic and informal. A change in leadership at that time started a process of formal prevention education. Since 1979, fire prevention and public education programs in Norwood have expanded and changed to respond to the needs of the growing community. What began as a small, school-

based program 10 years ago now includes targeted programs for hospital and nursing home staff, elderly and civic groups, babysitter trainees, and mentally handicapped residents in addition to children in Norwood's K through 6 classrooms. The elementary school programs are designed to achieve a goal per grade level.

Here is an overview of the learning objectives of Norwood's programs:

- Preschool and Kindergarten
Introduce the student to the firefighter and show how firefighters dress. Also, fire is dangerous. Burns hurt.
- Grade 1
Primary fire safety. Don't play with matches. Be careful around the stove when it is in use. Electricity contains fire; be careful with electrical appliances and lights.
- Grade 2

Some fires will happen no matter how hard we try to prevent them. What should we know about handling such situations to provide a positive outcome? Stop, drop, and roll; crawl low; window escape.

- Grade 3
The Fire Department has many functions that you should be familiar with so you can be as fire safe as possible. Prevent false alarms.
- Grade 4
Home fire escapes are necessary. Plan one for your home. Here is the information to do it.
- Grade 5
Aspects of fire safety pertaining to flammable liquids in their various states.
- Grade 6
Students are informed that much of fire and other

safety is now their own responsibility. Smoke detectors, extinguishers, driving safety, alcohol problems.

- Norwood Hospital and Nursing Homes
Staff is introduced to the true effects of fire in an enclosed space. Quick rescue procedures, alarms, simple firefighting to be learned.
- Babysitters
Training in basic fire safety planning and procedure.
- Elderly and Civic Groups
Establish true fire conditions in place of perceived conditions. Fire safety tips. Get out alive. Help teach grandchildren.
- Mentally Handicapped
Basic fire safety procedures.

The school program was developed through the use of purchased programs, such as "Captain No-burn," together with locally developed materials. The other programs were developed using available materials, especially films and videos. Each year is given a theme as a focus. Exit Drills in the Home (EDITH) is also emphasized.

An important aspect of all parts of the program is its adaptability to respond to fire problems as they arise. If the Department sees the beginnings of a trend in the fire calls within a certain group or within a certain neighborhood, such as cooking fires or match play, Department staff will go back to the schools or civic groups with a program pinpointed to that specific problem.

The school program is the heart of Norwood's fire prevention and public education program. During a recent six-month period, 10 percent of the population was reached, including more than 2,200 children in grades K through 6 in the school program and nearly 1,000 other Norwood residents in the other fire public education programs.

Table 6
Annual Responses—Norwood, Massachusetts

<u>Year</u>	<u>Building Fires</u>	<u>Grass/Brush Fires</u>	<u>False Alarms</u>	<u>Total Calls</u>
1979	174	506	224	1,900
1985	43	168	103	2,126
1987	53	59	65	2,054
1988	53	87	61	2,106

Results: The Department has compiled dramatic data from annual fire reports to show that its fire prevention and public education programs have paid off. During the past 10 years the program has been in effect, statistics show that it has been successful in decreasing the incidence and severity of alarms involving children and juveniles. In fact, no child has been injured in a fire of any type since the program was instituted in 1979—a remarkable record of success.

Table 6 shows the fire incidence by type of call for the program base year of 1979 and three more recent years.

There has been a dramatic decrease in what Chief Thomas Barry considers "juvenile-type calls," especially grass and brush fires and false alarms, which he attributed directly to the school program. Using the baseline of 1979, Barry points to the impact of the program over the years as children who started in 1979 were put through the entire K through 6 program in seven years. The false alarm rate is now one of the lowest in the area, Barry reports.

In addition to the dramatic decrease over the years in fire calls for grass and brush fires, false alarms, and building fires, Chief Barry points out a number of other areas in which the effect of the school fire prevention can be seen. There is almost a total absence of

vandalism in vacant buildings and an average of only two false alarms in schools each year. Bomb scares in the junior and senior high schools also have decreased. Fire investigators now can count on almost complete cooperation from school-age children. And the Department has a vehicle—the school program—to deal with various neighborhood fire and safety problems that arise.

In other areas of its fire prevention and education program, Barry indicates that since starting the program in medical facilities, the Department has seen a definite improvement in the time and quality of building staff response in emergency situations. In one nursing home fire, for example, the staff responded as they were trained, with the result that no one was injured.

As a final note, Chief Barry said that "we had never quantitatively evaluated our program until the time of your request. We were even more impressed after seeing our figures... and the positive results."

One of the main purposes of this report is to motivate others to do the same.

*For more information contact:
Chief Thomas Barry, Jr., or
Lt. Thomas Scott, Norwood Fire
Department, 137 Nahatan Street,
Norwood, MA 02062,
(617) 762-0080.*

2. Freeport Fire Department (Texas): "Think Fire Prevention Every Day of the Year"

Jurisdiction: Small city
Target Group: Children and their parents; elderly
Subject: Continual prevention education
Evaluation Measures: Fire incidence

Prior to 1983, public fire education for the Freeport Fire Department was limited to its observance of Fire Prevention Week. The Department responded to about 375-400 calls yearly. In late 1983, the Department adopted a new approach best expressed by the theme of its latest public fire education program, "Think Fire Prevention—Every Day of the Year." The Department decided to make fire prevention an ongoing process rather than a once-a-year focus and started going into schools, day-care centers, nursing homes, senior centers, and businesses to teach fire safety several times a year.

The Department teaches a number of fire safety messages in its program, which is primarily geared to children, their parents, and senior citizens. Besides the basic Learn Not To Burn messages, the program includes information about smoke detectors, cigarette smok-

ing safety, and holiday and home heating safety. Fire drills are conducted in schools and day-care centers, and mock fires are staged at businesses to test their procedures. In addition to making visits and conducting tours of fire stations, the Department uses slide shows, movies, and videotapes to present information and distributes handouts at parades and other public events. The program's components are similar to those used in many communities; their secret is not the materials or innovation, but rather comprehensive and repetitive outreach.

To keep things fresh, the Department continually looks for new ways to deliver the same messages. Currently the Department is building a Fire Safety Escape Trailer and a puppet stage, and restoring a 1948 American LaFrance fire truck called "Fire Prevention One" for children to ride on.

Results: The effects of the pro-

gram have been dramatic. Fire calls dropped from 385 in 1983 to a low of 197 in 1986. The average for 1983-85 was 325 calls per year. For 1986-88 it was 212, though it trended slightly upward during those three years. In 1989 it was 198; the low level continued.

At every fire education presentation, the presenter asks participants to answer a few questions with a show of hands. Fire Marshal Steve Upton reports that few children had smoke detectors in their homes back in 1983, when the program started. Now, almost 100 percent raise their hands when asked. He also noted that more children now report that their parents conduct fire drills at home.

For more information contact: Steve A. Upton, Fire Marshal, Freeport Fire Department, City of Freeport, P.O. Box 1063, Freeport, TX 77541, (409) 233-2111.



Freeport, Texas, starts its prevention program in the early grades, and continues throughout school years and into the business community, as shown in a mock hazard drill.

3. Mount Prospect Fire Department (Illinois): Multifaceted Programs

<i>Jurisdiction:</i>	Small suburban city
<i>Target Group:</i>	Whole community, especially children
<i>Subject:</i>	Multiple
<i>Evaluation Measures:</i>	Fire incidence and deaths; knowledge change; outreach

Mount Prospect, Illinois, has conducted an in-school fire safety program based on Learn Not To Burn for 17 years. Instructions tailored for individual grade and age level are given to each class, including preschool, in every school in the community. The program is complemented by an essay and poster contest during Fire Prevention Week each year. Fire drills in the schools are used as an opportunity to discuss false alarms.

While educating children is the core of the prevention program, the Fire Department has many other ways of reaching the community as well. These include:

- an annual weeklong fire safety festival at a local mall
- an ambulance awareness program, to explain the Department's services
- Boy Scout and Girl Scout fire safety programs
- programs for the staffs of group homes
- programs for the visually and hearing impaired
- senior citizen training for all high-rises and organizations
- juvenile firesetter program
- training employees of major corporations for home and workplace fire safety.

In 1988, for example, the Department estimated that its public

education unit had contact with 11,000 of the 56,000 residents and probably more than half the households in town.

For a three-year period, Mt. Prospect firefighters went door-to-door every year to visit all homes as part of a home smoke detector check, to see if detectors were installed and being maintained. They have stopped that program, but continue to put fire and smoke detector messages in local newspapers and the village newsletter.

Deputy Chief Lonnie Jackson says the poster and essay contests have shown a marked change in the focus and attitude about fire among the community's children over the years. In the early 1970s, he says, kids wrote about and drew scenes of the ravages of forest fires. "I do not propose to say that forest fires are not an issue, but suburbanites are dying from toxic smoke and house fires, not forest fires," Jackson explained. In the last poster contest, he says, the posters and essays showed the impact of the fire safety program in changing the attitudes of the children and refocusing their attention. They dealt primarily with house fires; exit drills; smoke detectors; and stop, drop, and roll, as well as the lessons they were taught in the classroom about safety

with matches and preventing false alarms.

Results: Jackson says the comprehensive education program and a persistent, long-term effort across the board is the major reason for the community's low fire incident and death rates.

During 1988 fewer than 20 real fires were reported in a community of 56,000 people, and no malicious false alarms or fire deaths were reported. In the 17 years of the program, the community has lost only 13 people, of whom nine were senior citizens and one a 3-year-old whose family had been in town only a couple of months.

This record is particularly significant when you consider that Illinois has had one of the higher fire death rates among the states. Mt. Prospect would have been expected to have had about 25 or more deaths over that period if it had the national or state average fire death rate. For the past eight years the community has had no residential fire deaths, but the Department keeps the effort going on all programs.

*For more information contact:
Deputy Chief Lonnie Jackson,
Mount Prospect Fire Department,
1601 Golf Road, Mount Prospect,
IL 60056, (708) 437-0934.*

4. Conroe Fire Department (Texas): Comprehensive Fire Reduction Program

Jurisdiction: Small city
Target Group: Whole community
Subject: Multiple
Evaluation Measures: Fire deaths; dollar loss

Conroe is a small, rapidly growing city 40 miles north of Houston. Its population in 1970 was 12,000. It grew to 18,000 by 1980 and to nearly 30,000 by 1990. Until 1980 the Department was mostly volunteer and worked from one station. The Department conducted little or no public fire education. During the 1970s this small municipality experienced very high fire losses. From 1973 to 1981, 21 people died in house fires—an average of 2.3 per year or about 14 per 100,000 population. This was over four times the national rate. Dollar loss was approximately \$400,000 per year.¹³

In March of 1981 a newly hired fire chief, John Cook, Jr., began to make changes that included giving emphasis to prevention, with top priority to public education. He also added a full-time public education officer. As part of this emphasis the Department worked with local schools in developing methods for teaching children fire safety. Conroe also strengthened its codes and passed a sprinkler ordinance. (The community now has more than 100 installed sprinkler systems, versus 10 in 1981.) Further, the Department added dual purpose inspectors who assist with public education programs. Finally, Chief Cook strengthened arson investigation and publicized arrests.

The new program reached thousands of people in the community. In addition to children at school, programs were conducted at day-care centers, retirement homes, civic clubs, church groups, and apartment complexes. To get

more of the Department involved, a committee of firefighters chaired by the public education officer produced and presented the programs—an unusual approach.

Another key activity thought to have increased the quality and effectiveness of the program was to have local teachers teach the firefighters about methods of instruction, how to target various age groups with different levels of presentations to fit their interests, and how to help area schools meet state instructional requirements. Local school officials also were cooperative in helping the Fire Department reach large numbers of children each year.

The public education program also was thought to share a role with other Department programs—such as increased company inspections, training, physical fitness programs, and response to medical emergencies with fire apparatus—in raising the Department's visibility in the community. The Department felt this, in turn, had some impact on increasing public awareness of fire safety. In previous years, fire apparatus usually left the station only on emergency responses or to get fuel.

The number of personnel dedicated to prevention was increased from two in 1981 to six in 1988, out of a department of 51 employees, with some of the lieutenant/inspectors doubling as suppression officers.

Results: Since 1981, fire loss dropped from more than \$25 per capita to \$10 per capita, despite inflation. Even more remarkable, the community had only one fatality in those nine years, and that was from an industrial explosion. No residential fire fatalities occurred. Based on the national average death rate, about five or

six fatalities would have been expected to occur during that period. (The community had experienced 21 fatalities in a comparable period prior to the program.)

"We cannot point to any single phase of our efforts," said Chief Dave Miller, "but the combination of increased public fire safety education, greater prevention and inspection efforts, stricter building and fire codes and ordinances, increased sprinkler requirements, more visibility of the Fire Department, demolition or renovation of substandard housing, increasing career manpower, and opening additional fire stations all played an important part in our successful efforts."

In a recent lecture to a group of high school seniors, one of the students stated that she had been given at least one of the Conroe public fire safety education programs each year for the previous eight years (since the fifth grade). She noted stop, drop and roll; install and check smoke detectors; and EDITH (Exit Drills in the Home) as lessons she learned over the years. Several other students echoed the same sentiments. "If we continue these same programs in the future, we should have a very fire safety conscious adult population for years to come," said Miller.

"There is nothing more gratifying to a fire chief than being able to say with some reliability that without our efforts, if past trends had continued, there would have been 21 less people walking around town today. This is how I measure success!"

For more information contact: Chief Dave Miller, Conroe Fire Department, 505 West Davis, P.O. Box 3066, Conroe, TX 77305, (409) 760-4688.

¹³ For additional information on Conroe and its program, see Dave Miller, "Prevention Program Provides Positive Results in TX," *American Fire Journal*, January, 1990, pp. 34-40.

5. Cobb County Fire Department (Georgia): Comprehensive Fire Prevention Program

Jurisdiction: Large suburban county
Target Group: Whole community
Subject: Multiple
Evaluation Measures: Fire incidence; insurance rates

In 1976, Cobb County Fire Chief David Hilton reorganized the Department's Fire Prevention Bureau and strengthened it by allotting 10 percent of the total budget to prevention. He added specially trained/qualified staff, focused program activities on educating the public about fire safety, and developed a fifth grade fire prevention curriculum. By 1980, the Chief had brought the building department and Fire Prevention Bureau closer, created an arson division, enhanced training, and toughened permit requirements for fireplace installation. A landmark residential sprinkler program was initiated as well.

The fifth grade safety education program was begun in 1977, along with a home inspection program. Fire safety education for kindergarten children was added in all public and private schools in 1982.

These school programs, coupled with the home fire safety survey program, constitute the Bureau's main attack in preventing single-family residential fires. "It's the only way to get at this population

group," said Fire Marshal Nathan Wilson. A strict code enforcement and inspection program deals with multi-family residences and other occupancy types.

Results: The Cobb County Fire Department developed a trend analysis of its fire experience for 1971-88. The population rose from 197,000 to 429,000 during that 17-year period. Based on that increase, the number of fires projected for 1988 was 7,298; in actuality there were only 2,476 fires, almost exactly the same amount as in 1971 when the population was less than half the current figure (see Figure 7).¹⁴

Looked at another way, if Cobb County were an average U.S. county, it would have had about 4,100 fires, or two-thirds more than it did.

Residential structure fires, too, went down from 541 in 1971 to 344 in 1988. As a corollary, homeowners insurance premiums fell

¹⁴ The Cobb County evaluation demonstrates an excellent idea for evaluation: projecting a trend line to show what the future might have been without the public education program.

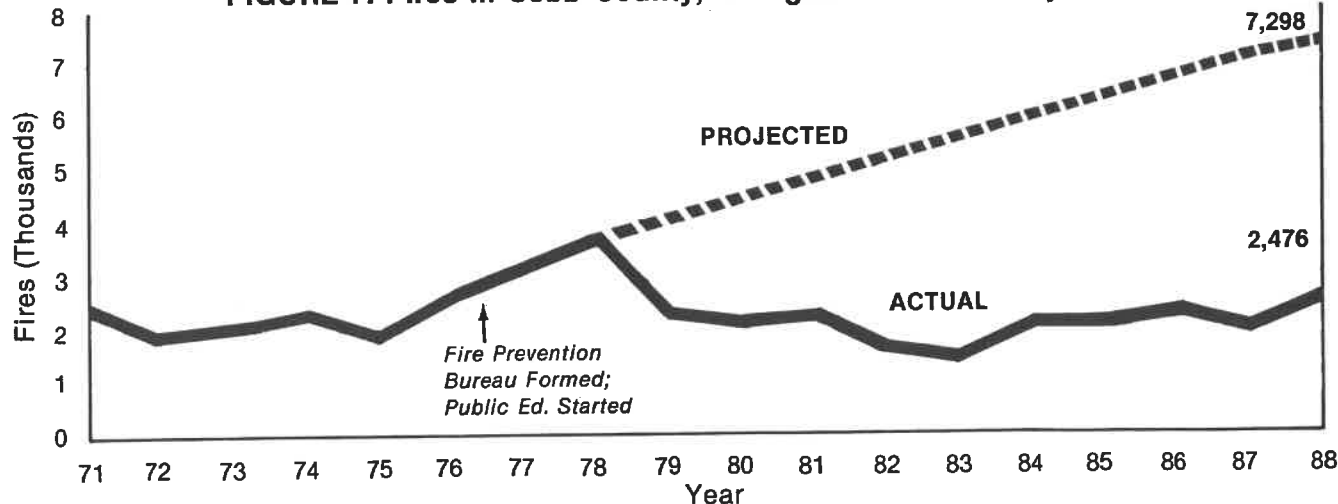


Cobb County, Georgia, firefighter assists student with escape plan.

from \$530 per \$100,000 to \$340. Even more important, fire deaths for 1972-80 totaled 53, versus 38 for the same length period 1981-89, despite the much larger population in the latter period. This is an extraordinary long-term achievement in prevention.

For more information contact: Chief David Hilton, Assistant Chief N. K. Arrington, Deputy Chief H. Lewis Young, or Fire Marshal Nathan Wilson, Cobb County Fire Department, 1596 County Farm Road, Marietta, GA 30060, (404) 427-8159.

FIGURE 7. Fires in Cobb County, Georgia: Actual vs. Projected



Note: Projection from 1979 based upon population growth

6. Huntington Fire Department (West Virginia): Home Fire Safety Program

Jurisdiction: Small city
Target Group: Homeowners
Subject: Home safety
Evaluation Measures: Hazard reduction

In 1977, Huntington began a six-month project employing seven retired senior citizens on a part-time basis to conduct door-to-door safety inspections of private homes. The program was established as one of two pilot cities sponsored by the National Fire Prevention and Control Administration (now the United States Fire Administration) and by the National Council on Aging. The Fire Department previously had used uniformed firefighters as surveyors, but that effort met with a negative response from the community, which suspected the

Department of looking for fire code violations.

The entire city was surveyed because there was no single area where fire incidents were concentrated. In fact, after the project began, officials found relatively few differences in the type and number of hazards among income groups. A Fire Department lieutenant selected the fire safety materials, prepared a 104-hour training package, and trained the surveyors. The surveyors also were counseled by a psychologist on how to deal with people and received training in CPR. The training included sev-

eral practice inspections. The "six-month" project has been ongoing since its inception; in 1987 the Department was using four senior citizen women to do the surveys.

Results: From November 1977 to July 1978, 1,012 homes in a 2.5 mile area were surveyed, 45 percent of the homes that were visited. The number of alarms in this area fell from 144 in 1977 to 67 in 1978—a drop of 47 percent.

The Hazard Reduction Surveyors uncovered 1,233 separate hazards in this area, an average of 1.18 hazards per inspection. Poor house-keeping and electrical hazards were the most commonly encountered problems, in 31.9 percent and 30.7 percent of households, respectively. The Department has no direct data on the proportion of the hazards identified that were subsequently corrected by residents. However, the surveyors noted numerous instances where corrections were made, and residents called and wrote to the Department indicating that other improvements were made.

For more information contact: Chief C. J. Rickman, Huntington Fire Department, 839 Seventh Avenue, P.O. Box 1659, Huntington, WV 25717, (304) 696-5950.



Huntington, West Virginia, trained senior citizens to do home fire safety surveys for the city.

7. Countryside Fire Protection District (Illinois): Comprehensive Public Education

Jurisdiction: Suburban/rural
Target Group: Whole community
Subject: Multiple fire safety
Evaluation Measures: Fires; deaths; injuries; dollar loss; test scores

The Countryside Fire Protection District is made up of 24 full-time and 25 part-time firefighter/paramedics staffing two stations and providing prevention, suppression, and emergency medical services to a rapidly growing suburban Chicago-land area. The 26-square-mile district incorporates parts of four townships and parts of four villages with a total population of 26,000.

The District underwent a reorganization in 1985 with the goal of providing better services. The Fire Prevention Bureau expanded its personnel and programs dealing with prevention of fires and burn injuries. The Bureau's new commitment included the following objectives:

- Increase the number of firefighter/paramedics involved in fire prevention to include nearly all of the full-time and part-time staff.
- Change the method of teaching from "TELLING FIRE PREVENTION" to "SELLING FIRE PREVENTION."
- Provide firefighter/paramedics with a well-rounded public safety education and prevention background. (The Fire Inspector Level 1 and Public Education Officer Level 1 programs were used to accomplish this.)
- Increase the number of firefighter/paramedic hours of contact with citizens.
- Target fire and burn prevention programs to their respective audiences.
- Update safety messages and audio-visual aids for each of the programs.
- Involve the business community, school community, health community, and others



Paramedicine for tots is part of Countryside, Illinois, Fire Protection District's Burn and EMS Safety program.



The inflatable firefighter "Wiff," a creation of the Wauconda, Illinois, Fire Department, is used in public fire education programs in many Countryside Fire Protection District departments.

Table 7
Countryside Fire Protection District, Illinois
Area Fire Department Comparison

	<u>Countryside Fire Dist.</u>	<u>Fire Dept. A</u>	<u>Fire Dept. B</u>
<i>Square Miles</i>	22	9	28
<i>Population</i>	26,000	17,050	28,000
<i>Assessed Value</i>	\$269 mil.	\$207 mil.	\$311 mil.
<i>ISO Rating</i>	4	5	4
<i>Structure Fires</i>			
1986	72	17	57
1987	52	18	47
1988	51	29	51
1989	32		
<i>Structure Fire Loss</i>			
1986	\$400,000	\$1,290,000	\$ 372,453
1987	230,500	135,850	706,393
1988	249,273	656,300	1,092,365
1989	42,000		
<i>Fire Deaths/Injuries</i>			
1986	0 / 0	0 / 2	0 / 8
1987	0 / 0	2 / 0	0 / 6
1988	0 / 5	1 / 2	1 / 9
1989	0 / 3		
<i>Public Education Contacts</i>			
1986	4,500	342 hrs.	10,000
1987	6,000	634 hrs.	18,311
1988	9,265	441 hrs.	11,054
1989	12,050		
<i>Fire Safety Inspections</i>			
1986	1,100	746	969
1987	2,280	750	1,024
1988	2,657	832	1,247
1989	3,510		

NOTE: Countryside data is for fiscal years, others for calendar years.

in the selling of fire and burn prevention.

These changes revitalized a 15-year-old public fire education program. Business community, school community, and health community support allowed the expanding prevention program to make use of people and resources to sell fire prevention.

The fire prevention program, as in many communities, has several components:

- School fire safety program (preschool, K through 8)
- Employee training in local businesses
- Hearing impaired program
- Community presentations
- Boy Scout merit badge
- Youthful firesetter program
- Fire safety inspections

The number of public education contacts from this program was increased from 4,500 to 12,000 over the four-year period. Fire safety inspections increased from 1,100 to 3,500 in the same period. Those are very large numbers for a community of 26,000.

Results: The four-year effort from 1985 to 1988 helped reduce the number of structure fires by 55 percent, and the dollar amount of fire losses by 90 percent. This occurred at a time when one neighboring fire department's fires increased by 71 percent and a second one went down by 10 percent. Before the prevention program, Countryside had the highest per-capita fire incident rate in the area. After the program, the rate was lower than that of neighboring communities.

Structural fire injuries increased from zero to an average of four per year; that is unexplained but still very low for a community of 26,000 people. See Table 7 for the detailed comparisons.

For more information contact:
 Assistant Fire Chief James D. Spiegel, Countryside Fire Protection District, 600 N. Deerpath Road, Vernon Hills, IL 60061, (708) 949-6611.

8. Oregon Rural Fire Districts: Rural Fire Safety Program

Jurisdiction: Rural
Target Group: Rural homes; elderly
Subject: Detectors; escape
Evaluation Measures: Fire incidence rate; dollar loss; outreach (percent of homes reached)

A rural fire safety program was conducted in Seaside, Oregon, during 1976-79.¹⁵ Seaside has a population of 5,000 and is on the coast of Oregon. The Department got into the prevention business in a big way when it realized that its fire calls had risen sharply and could outstrip its ability to keep up. Its program was based on door-to-door home safety surveys by three fire safety technicians who each received three months of training. They were paid for by a reduction in the fire apparatus replacement budget.

The Seaside staff conducted home inspections in their own community and two neighboring ones. They traveled under the banner of a "Stop Fire" symbol developed by Chief Floyd Pittard to avoid controversy over one jurisdiction's "flag" being flown in others.

¹⁵ Chief Floyd Pittard of Tualatin, who contributed this information, was then chief in Seaside.

The safety technicians focused on the elderly, who made up a third of the resident populations. They installed detectors, discussed maintenance and testing of detectors, and usually did a home hazards survey.

Results: More than 75 percent of residences were inspected. The program reduced home fire incidents by 61 percent within two years, from 33 in 1977 to 13 in 1979. Apartment and hotel fires dropped from 10 in 1977 to 7 in 1979. In contrast, grass, brush, and trash fires, which were not addressed by the program, went up by 47 percent, from 17 to 25. There also was a drought in this period, increasing flammability of the brush. Overall, fire incidence dropped 28 percent. The targeted residential fire problem thus was affected the most by the program, as would be expected. Dollar loss dropped 67 percent.

A similar "Rural Fire Safety

Program" was conducted in the LaGrande Rural Fire District in the 1970s. Fire incidence dropped 60 percent at the conclusion of the program. It was implemented by the Future Farmers of America.

Edmonds, Washington, (near Seattle) had a similar experience in a more urban setting circa 1975-76. Teams of trained elderly inspectors went door-to-door with a home safety survey. There, too, the results were spectacular—a two-thirds drop in fire incidence during the few years the program lasted.

This set of experiences demonstrates the dramatic reduction possible with a comprehensive program of home inspection surveys and person-to-person outreach.

*For more information contact:
Floyd Pittard, Chief of Operations,
Tualatin Valley Fire and Rescue,
20665 S.W. Blanton Street, Aloha,
OR 97007, (503) 649-8577.*

9. Oak Lawn Fire Department (Illinois): Home Survey and School Program

Jurisdiction: Town
Target Group: Preschool to eighth grades
Subject: Multiple
Evaluation Measures: Structural fires

The Fire Department of the Village of Oak Lawn, Illinois, increased its public fire education efforts tenfold during the late 1970s and early 1980s.

In-school instruction for preschool and elementary grades and a series of home safety surveys are the cornerstones of the Department's expanded program. Indi-

vidual plans of instruction are designed for each school grade, the lessons increasing in depth and complexity as grade level increases. Each lesson plan combines the use of lecture, visual aids, and handout materials to emphasize specific fire safety messages. Lower grades focus on basic fire safety behaviors such as stop, drop, and

roll; home exit drills; and the importance of smoke detectors. Upper grades are exposed to fire safety procedures for a wider variety of fire scenarios, including those involving cooking, smoking, and flammable liquids.

A Fire Safety Home Survey program began in 1980-81. Survey teams of fire personnel visited in-



The Oak Lawn, Illinois, program ranges from classroom lectures... to hands-on extinguisher training.

dividual homes in the community to deliver packets of fire safety information, including information on the importance of smoke detectors, and to interview household members. The interviews included determining whether dwellings were protected by smoke detectors and answering questions about smoke detector installation and maintenance. An attempt was made to visit all residences in the village in a four-year cycle. The Village of Oak Lawn now has an ordinance mandating detectors in

new residential construction, and the State of Illinois enacted legislation effective in 1988 requiring detectors in all single-family dwellings.

Results: The expansion of public fire education contributed to a steady decrease in the number of structure fires from a high of 289 in 1980 to 70 in 1985. The number of fires has remained consistently low since 1985. Fire deaths were already low, averaging one every two years, and have remained so. There have been fewer fires in residences that participated in the

home survey program than in those that had not participated. In 1986 only 4 out of 40 residential fires in the community occurred in homes that had participated in the survey program. In 1987, only 2 of 30, and in 1988 only 6 of 34 residential fires occurred in the homes of survey participants.

For more information contact: Thomas Moran, Division Chief, Bureau of Fire Prevention, Oak Lawn Fire Department, 6451 West 93rd Place, Oak Lawn, IL 60453, (708) 636-4400.

10. Houston Fire Department (Texas): Cease Fire Club and Prevention Center

Jurisdiction: Large city
Target Group: Whole community
Subject: Multiple
Evaluation Measures: Fire incidence; dollar loss; life loss

In the early 1980s, the Houston Fire Department and a group of private citizens jointly founded the city's Cease Fire Club and the Citizens' Fire Prevention Training Center.¹⁶

The Club was a 300-member non-profit organization whose membership income went toward com-

plementing and expanding the fire prevention efforts of the Houston Fire Department. Members of the Club included many of the community's leaders—individual citizens, corporate executives, and professionals in fire-related business and industry.

One of the Club's major projects was the Citizens' Fire Prevention Training Center, a 5,500-square-foot training center that

featured displays, activities, and training classes all centering on fire prevention and fire safety for the general public. The building and displays were donated.

Other programs of the Cease Fire Club included seminars on fire protection, awards for the outstanding fire inspector and fire investigator, group tours through the prevention center, a junior fire marshal program, and a juve-

¹⁶ Fire Marshal E. A. Corral, "Houston's Center for Fire Prevention," *International Fire Chief*, August 1984.

nile firesetter program (described in Case Study #55).

The program received much favorable media attention and publicity, which added to its public awareness and education functions.

Results: During the first year of the program, Houston's fire losses were down approximately \$11 million and lives lost were down from a high of 68 to 32 despite

the fact that Houston annexed territory during that period, and fire losses would have been expected to increase. The city estimated that for every dollar spent, \$27 was saved.

The activities of the club were curtailed when Houston fell on hard economic times during the oil industry's recession. However, as the local economy is coming back,

so are the activities of the Cease Fire Club. "The beneficial results of this activity are clearly evident," said Fire Marshal E. A. "Eddie" Corral, "and the program is too important to abandon."

For more information contact: E. A. "Eddie" Corral, Fire Marshal, Houston Fire Department, 410 Bagby, Houston, TX 77002, (713) 247-5000.

11. King County Fire District No. 39 (Washington): Home Fire Safety Survey

Jurisdiction: Suburban
Target Group: Homes
Subject: Home fire safety
Evaluation Measures: Hazards removed; homes with detectors; population reached

The Federal Way Fire Department in the State of Washington's King County Fire District No. 39 chose to establish a home fire safety inspection program as a means of reducing potential fire incidents and educating the public about fire safety. Using the "Project Ridfire" model developed by the old National Fire Prevention and Control Administration, Mission Research Corporation, and others, Federal Way used firefighters to conduct home safety surveys. They stressed that the visit was not an inspection and that the owner/occupant was not required by law to correct or replace any item noted on the form they left behind.

Results: In the summer of 1988, Boyd Johnson (who, incidentally, was the creator of Pluggie, the talking robot fire hydrant) evaluated the impact of the initial home safety surveys. He mailed letters to 28 citizens whose homes had been surveyed. The 12 question-

naires returned noted a total of 89 hazards, of which 67 (75 percent) were reported as having been corrected. The respondents often listed the specific hazards that were removed. Several respondents volunteered reasons for delaying the removal of the rest of their hazards. These households were thought to be reasonably representative.¹⁷ The survey and evaluation cost the Department a total of only \$7.50 out-of-pocket.

By the end of 1989, the Fire Department's statistics showed that firefighters surveyed 264 homes altogether, found 1,203 behavioral or physical hazards, and installed 123 detectors. One-third more of the homes surveyed now have working detectors than be-

fore. The hazards found included such diverse problems as not having or not practicing an escape plan, lack of an extinguisher with adequate pressure, lack of 911 stickers on or near phones, inadequate clearance between heating devices and combustibles, poor condition of electric cords, small electrical appliances left plugged in when not in use, and hot water temperature too high.

In a supplementary program, Federal Way conducted 459 fire safety classes, which 12,000 citizens attended. This represented 13 percent of the community's population. Additional people were reached through the Department's large annual mall show.

For more information contact: Penny Hulse, Public Education Officer, Federal Way Fire Department, 31617 1st Avenue, S., Federal Way, WA 98003, (206) 839-6234.

¹⁷ The Ridfire project cited earlier described a door-to-door house inspection program in Edmonds, Washington, in 1975 in which 50 percent of the hazardous conditions were found to have been corrected, based on actual resurvey of the households.

12. Oneco-Tallevast Fire Control District (Florida): General Fire Prevention and Public Education

Jurisdiction: Town and suburban county
Target Group: Whole community
Subject: Multiple
Evaluation Measures: Fire and casualty incidence

The Oneco-Tallevast Fire Control District (now the Southern Manatee Fire and Rescue District) is located in southeastern Manatee County, Florida, and covers 34 square miles. Fire and basic rescue services are provided to a growing population of more than 30,000 people.

In 1986 and 1987 the Department was running public education activities in the second grades of four elementary schools, and visiting the schools once per year during Fire Prevention Week. In 1988, the Department hired a full-time public educator to handle in-school programs, public information/media communications, and a variety of other public education programs. This expansion allowed the Department to triple the number of classroom visits, instruct more than 2,800 children annually using a Fire Safety House, implement the *Learn Not To Burn Curriculum* in grades K through 5 (with state and local funding), and promote a host of special safety campaigns covering everything from smoke detectors to Christmas tree safety. The programs implemented during 1988 and early 1989 were as follows:

- Annual school poster/billboard contest
- Fire safety exposition

- Sesame Street preschool program
- Residential smoke detector awareness program
- Mobile home fire safety program
- Juvenile firesetters program
- Nursing home fire safety
- Kitchen safety
- Disaster preparedness
- Fireworks safety
- Christmas tree safety
- Radio and TV public service announcements

Results: Table 8 shows the trends in reducing fires and casualties. The total number of fires and structural fires have been decreasing, while the population has increased.

More years of data and more in-depth analysis are needed to see whether the changes are linked directly to the program, but the 1988 "full bore" program seems to be yielding results.

In addition to the statistics, the Department has found that after it visits schools, parents report that their children have insisted that smoke detectors and fire extinguishers be checked.

For more information contact: Lynn Rosenbaum, Public Education Specialist, or Tom Hennessy, Deputy Fire Marshal, Southern Manatee Fire and Rescue District, P.O. Box 731, Oneco, FL 34264-0731, (813) 755-5555.

Table 8
Oneco-Tallevast Fire Trends

	<u>1986</u>	<u>1987</u>	<u>1988</u>
Total Fires	200	150	126
Total Structure Fires	63	54	32
Dollar Loss (Thousands)	534	1312	512
Civilian Injuries	5	11	5
Civilian Deaths	1	1	0
Suspicious and Incendiary Fires	32	26	36
Matches-as-Ignition-Source Fires	8	2	3
Lighters-as-Ignition-Source Fires	3	2	1

13. Farmington Hills Fire Department (Michigan): Three Programs

Jurisdiction: Mid-size urban
Target Group: Whole community
Subject: Stop, drop, and roll; cooking safety; smoke detectors
Evaluation Measures: Anecdotes; fire incidence; dollar loss; outreach

Farmington Hills (population over 70,000) has a fire chief with a keen interest in prevention. The Department's prevention programs and the number of people reached by them is shown in Table 9.

These statistics do not include major events that the Department participates in annually, such as the Memorial Day parade, Founders Festival Week activities, and the Annual Fire Prevention Open House conducted on the first Sunday in October. Including these events, the total number of contacts is approximately 25,000.¹⁸ In addition, the city installs smoke detectors free of charge in the house of any homeowner. From 1985 to 1989, 588 detectors were installed in the homes of the elderly.

Results: Fires dropped 19 percent from 1988 to 1989, and dollar loss 21 percent. No fire fatalities have occurred for a decade.

In a previous one-year period, three of the city's prevention programs each recorded a save.

A 6-year-old boy who had attended one of the school programs put on by "Fireman Mike" reduced the severity of his injuries when his clothes caught fire. Older boys he was playing with in a tent ignited a can of dry gas with a cigarette lighter, catching his shirt on fire. The boy, Ray Rudski, crawled from the tent, according to the *Farmington Observer* of September 22, 1986, covered his face, and rolled in the grass to extinguish the fire. He

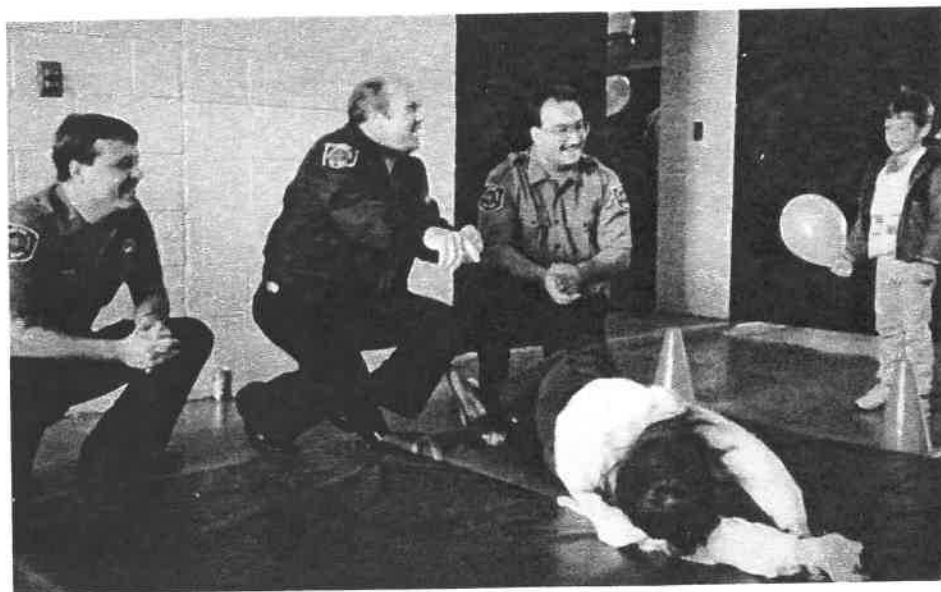
then called to his friends to get a hose and douse him with water. The elementary school program includes training on stop, drop, and roll and cooling a burn. His mother came running and put him in a tub of cold water. She had learned to do this from watching an episode of ABC TV's "20/20" program in which parents talked about what to do if their children got burned. The boy received second- and third-degree burns, but would have been more seriously injured without the fire prevention education in his class.

On April 17, 1986, at 9:00 p.m., a smoke detector went off in the home of Malcolm and Betty McKinstroe, a retired couple. They had a large basement fire that they knew nothing about until the alarm at the top of the basement stairs sounded. The couple and their dog escaped uninjured. Their home suffered \$100,000 in damages, but they



The Farmington Hills, Michigan, Fire Department installed smoke detectors in the homes of many elderly.

felt they could have been killed and might have lost their whole house if the Farmington Hills Fire Department had not installed the smoke detector for them and educated them about what to do if it



Stop, drop, and roll instructions in Farmington Hills, Michigan, led to saving the life of a 6-year-old boy.

¹⁸ Some of the people in these counts are double counted when they attend more than one prevention event. The same may be true for the programs listed in Table 9. A citizen survey can be used to determine the percent of households or people reached by the fire department's programs if a more accurate count is desired.

Table 9
1989 Public Education—Farmington Hills, Michigan

<u>Type of Program</u>	<u>Number Delivered</u>	<u>Children Reached</u>	<u>Adults Reached</u>
Health Care Facilities/Sr. Citizen Groups	20	—	341
Business Community Programs	10	—	861
School Programs Performed by Department	88	2,790	317
Tours of Fire Stations	35	610	254
Middle School Programs	25	499	13
Safety Town Visits	16	272	161
Elementary School Assembly Programs	33	6,032	293
Subdivision Parades/School Fairs	22	1,194	510
Miscellaneous Public Education Programs	14	1,538	202
		12,935	2,952
Total People Impacted		15,887	
Percent of Population		23%	

ever went off.

The third incident, on November 17, 1987, involved a kitchen fire that was out upon arrival of the Fire Department. The homeowner told the responding fire-

fighters that she learned how to put out grease fires at a fire safety program approximately one month earlier. She stated that she had no idea what to do until she attended the program.

For more information contact: Chief Richard A. Marinucci, Farmington Hills Fire Department, 28711 Drake Road, Farmington Hills, MI 48331-2525, (313) 553-0740.

SCHOOL PROGRAMS

These are evaluations of programs directed toward children and young adults. Most of the programs were delivered in

elementary schools. A few deal with middle schools or junior highs, and one with a university. We found one evaluation of a

high school level program, which appears in the "Special Topics" section of this report.

14. Virginia Beach Fire Department (Virginia): Fifth Grade Safety Program

<i>Jurisdiction:</i>	City
<i>Target Group:</i>	Fifth graders
<i>Subject:</i>	Home fire escape plans; burn prevention and first aid; fire hazards in the home; and more
<i>Evaluation Measures:</i>	Parents' perceptions, actions; detector and extinguisher usage; knowledge gain; anecdotes

Virginia Beach has developed and institutionalized a four-lesson school fire safety program covering home fire escape plans, fire hazards in the home, burn prevention, first aid, and fire safety information on arson, outdoor fires, and various other topics. The

program is taught twice a week for two weeks every year to all fifth graders in elementary schools. Letters to parents and homework are part of the course, including a survey/questionnaire that parents are asked to complete and return to the school. (One of the main

objectives is to motivate the parents to be more fire aware.) The program has been in effect since 1975.

Results: In academic year 1988-89 the schools conducted tests of student fire safety knowledge two weeks before the start of the

course and then four weeks later on the last day of the course. There were 134 fifth grade classes tested in 33 schools. Results are shown in Table 10. Pretest scores averaged 62.4 percent. Post-test scores averaged 93.0 percent, a striking improvement. Results were very similar across schools, lending credibility to the findings.

The Virginia Beach Fire Department also has tallied the parent questionnaire responses every year since 1983. The five years 1983-87 include results from 15,300 parents, about two thirds of the questionnaires sent home (an outstanding response).

Part of the questionnaire addresses the parents' perception of whether the class helped their children. Part asks if they acted on the information brought home—for example, became familiar with an escape plan, installed detectors, or removed fire hazards. Part of the questionnaire asks results independent of the child. The survey results are shown in Table 11. The questionnaire follows on page 35. The same questions have been asked each year.

Among the highlights of their findings:

- In each year, 99 percent of the parents stated that their child retained valuable fire safety information. More than 95 percent of the parents each year believed that the family benefited from the information and had familiarized themselves with the home escape plan the child prepared. (Some of these high satisfaction scores may be a desire to please children and teachers, but even discounted, the results indicate high parental satisfaction with the program, and new knowledge gained.)
- In 1983, 83 percent of the respondents had smoke detectors, while in 1987, 92 percent owned a detector. (This is higher than the national average, which has been in

Table 10
1988-89 Pre-/Post-Test Scores
Fifth Grade Fire Safety Classes
Virginia Beach, Virginia

<i>Number of Classes Tested</i>	<i>School</i>	<i>Average Pretest Score (Percent)</i>	<i>Average Post-test Score (Percent)</i>
4	Alanton Elementary	67.8	92.5
3	Bayside Elementary	62.3	94.6
9	Birdneck Elementary	61.4	92.1
3	Brookwood Elementary	62.4	95.9
3	Cooke Elementary	62.7	93.7
4	John B. Dey Elementary	62.1	93.5
5	Fairfield Elementary	60.6	92.2
4	Green Run Elementary	57.4	91.0
3	Hermitage Elementary	61.7	93.6
6	Indian Lakes Elementary	60.6	94.2
3	Kempsville Elementary	60.4	90.3
4	Kings Grant Elementary	63.1	94.2
4	Kingston Elementary	60.5	92.9
3	Linkhorn Park Elementary	63.3	92.3
3	Luxford Elementary	62.6	90.8
3	Lynnhaven Elementary	70.5	95.0
3	Malibu Elementary	70.5	94.0
3	Newtown Elementary	60.7	92.3
6	North Landing Elementary	60.9	90.8
4	Parkway Elementary	61.4	92.1
3	Pembroke Elementary	61.4	94.5
3	Pembroke Meadows Elementary	63.4	92.5
3	Point O'View Elementary	61.6	93.7
5	Princess Anne Elementary	64.5	94.1
5	Providence Elementary	62.0	93.7
5	Salem Elementary	59.3	91.2
3	Thalia Elementary	59.6	94.8
3	Thoroughgood Elementary	66.8	93.6
5	Trantwood Elementary	65.8	93.1
6	White Oaks Elementary	59.2	91.6
4	Windsor Oaks Elementary	60.8	92.8
4	Windsor Woods Elementary	59.0	92.6
5	Woodstock Elementary	62.9	94.1
134	33 Schools	62.4	93.0

the 82-85 percent range.) Over the five years of the program, detector ownership among parents of fifth graders rose 9 percent. The parents in about 14 percent of the households with detectors said they installed them as a

result of the program. High proportions of those without detectors said they would get them. Part of the increase in detector usage may have come from some households having a second child in the program reporting on results

TABLE 11. Virginia Beach, Virginia, Parents Survey—5-Year Results (in Percent)

	1983		1984		1985		1986		1987	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1. Child retained valuable fire safety information?	99.6%	0.4%	99.6%	0.4%	99.5%	0.5%	99.7%	0.3%	99.6%	0.4%
2. Family has benefited from information?	99	1	99	1	99	1	99	1	99	1
3. Familiar with Home Escape Plan?	98	2	98	2	99	1	98	2	99	1
4. Have smoke detector?	83	17	85	15	89	11	90	10	96	4
If not: considering one?*	79	21	85	15	80	96	88	12	165	71
If yes: installed because of program?*	20	78	18	96	10	89	11	96	10	90
5. Have fire extinguisher?	44	57	50	50	55	45	54	46	57	43
If not: considering one?*	69	24	73	27	79	21	78	22	80	23
If yes: purchased because of program?*	59	107	28	167	23	115	19	114	16	84
6. Removed hazards as a result of child's inspection?	49	51	50	50	51	49	51	49	52	48
7. 911 posted on all phones?	92	8	90	10	91	9	89	11	90	10

*See questionnaire on opposite page. People answering yes or no to first question may or may not have responded here, and sometimes more did, so percentages do not total 100%.

from the exposure of the first to the program.

- An increase in usage was seen with fire extinguishers; 45 percent of the respondents owned an extinguisher in 1983 and 12 percent more (57 percent) claimed to have one in 1987.
- Of those with extinguishers, about 29 percent said they were purchased as a result of the program.
- Fifty percent of all responding parents during the five years said they removed fire hazards as a result of their child's home fire safety inspection, which had been a homework assignment.

In addition to program impact as measured by the tests and parent questionnaires, the Virginia Beach Fire Department has several documented "saves" attributed to



Neve Sessoms saved his brother's life as a result of a Virginia Beach safety class. Shown with Master Firefighter Al Gumbs, who responded to the incident.

the fifth grade program.

In one success story, 12-year-old Darrell Johnson saved his family from a serious home fire

that had begun to fill his room with dense smoke. He and two brothers, ages 10 and 7, "pushed the (safety) program at home," said their father.

Eleven-year-old Neve Sessoms saved his brother and reported the house fire on a neighbor's phone. He knew not to throw water on the electrical fire and the best route for escape. He had taken the safety class two years earlier.

The multiple methods used in evaluating this program show that it was clearly effective in increasing safety knowledge in the community and stimulating behavior changes and increased safety protection in Virginia Beach homes.

For more information contact: Catherine "Cappy" Meredith, Supervisor, Fire Education Services, 2697 International Parkway 3, Suite 104, Virginia Beach, VA 23452, (804) 427-3922.

**Virginia Beach, Virginia
Parent Questionnaire on Fire Safety Program**

FIRE SAFETY QUESTIONNAIRE

Student's Name _____ School _____

Home Address _____ Teacher _____

(Names and addresses are for evaluation only & will be used for no other purpose.)

1. Do you feel as though your child has retained valuable fire safety information?

YES NO

Additional remarks: _____

2. Do you feel as though you and your family have benefited from the fire safety information brought home by your child?

YES NO

Additional remarks: _____

3. Are you familiar with the HOME FIRE ESCAPE PLAN your child completed for your home?

YES NO

Additional remarks: _____

4. Do you have a smoke detector installed in your home?

YES NO

If not, are you considering buying one?

YES NO

If yes, was the smoke detector installed as a result of this program?

YES NO

5. Do you have a fire extinguisher in your home?

YES NO

If not, are you considering buying one?

YES NO

If yes, was your fire extinguisher purchased as a result of this program?

YES NO

6. Were you able to remove any fire hazards from your home as a result of your child's inspection?

YES NO

Additional remarks: _____

7. Do you have the Fire Department emergency phone number (911) posted on all of your phones? (emergency numbers for base housing may vary)

YES NO

Remember, this is also the Rescue Squad and Police Department emergency #.

8. General Comments:

The Virginia Beach Fire Department is concerned with community safety. Your assistance in filling out this questionnaire is appreciated.

Parent's Signature _____

15. Elgin Fire Department (Illinois): Elementary School Program

Jurisdiction: City
Target Group: Grades K through 6
Subject: Multiple
Evaluation Measures: Knowledge gain and retention test scores

A comprehensive elementary school program is conducted by the Elgin Fire Department in which firefighters instruct classes in grades K through 6. The program is taught in the classroom to students in all 26 elementary schools. Lesson plans are tailored to the grade, with three or four objectives at each level.

Each student in grades 2 through 6 receives three short, identical quizzes. The quizzes are based on the teaching outlines and are therefore different for each grade level. The first quiz, a pretest, is given before the first fire safety class. The second quiz is given immediately after the presentation. This measures the immediate knowledge gain. The last quiz is given at the end of the school year, two to four months after the presentation. This is designed to measure the knowledge retained by the students. A total of 8,780 students were taught in 1989. The program started on a pilot basis in 1986 and was applied full force in 1987-89.

One of the key features of the program is that a single firefighter/instructor is assigned to approximately three schools. He or she is the only one who teaches fire safety in those schools and accountability is therefore easier. Also, the sense of identification with those schools probably increases the motivation and conscientiousness of the instructors for "their" schools.

The teaching outlines are concise, thorough, and positive, and have proven to be usable by the line fire-

fighters/instructors. An analysis of questions missed on each test is used to improve questions that might be confusing and to emphasize areas where instructors need to spend more time. The program is changed on the basis of data rather than speculation.

Results: At all grade levels both the immediate post-test and the later test of retention showed higher scores than the pretest (see Table 12). In one recent year the test of retention showed an average increase of more than 8 percentage points from the pretest. The average scores for the pretest, post-test, and retention test were 78, 93.4, and 86.6, respectively.

In every grade the retention test scores were higher than the pretest, but lower than the immediate post-test. Retention is not perfect; everyone needs periodic reminders of safety lessons to keep knowledge levels high and up-to-date.

"Booster shot" reminders are needed from time to time.

The Fire Department administration also has found a direct correlation between test scores and time spent in class on fire safety.

The Elgin program has received overwhelmingly positive evaluations from teachers involved in the program. The school principals, city council, city manager, and Fire Department are very supportive of the program. Plans are under way to add an outreach program for affected schools after a fatal fire in the community and to give public recognition of positive behaviors taken in emergency situations.

For more information contact: Firefighter/Paramedic Michael W. Falese, Public Education Coordinator, Elgin Fire Department, 550 Summit Street, Elgin, IL 60120-4219, (708) 695-6500.

Table 12
Average Fire Safety Test Scores for
Elgin, Illinois, Elementary Schools
(Percent)

	<u>Pretest</u>	<u>Post-test</u>	<u>Retention test</u>
Grade 2	84	97	90
Grade 3	81	93	87
Grade 4	62	89	78
Grade 5	85	95	92
Grade 6	78	93	86

16. American River Fire District (California): Elementary School Programs

Jurisdiction: Rural
Target Group: Grades K through 3
Subject: Detectors; escape; fire safety
Evaluation Measures: Test scores; anecdotes; outreach

The American River Fire District conducts fire safety presentations for Sacramento School District students in grades K through 3. The programs are part of a larger fire prevention program of the Fire Department. The lessons cover smoke detectors; stop, drop, and roll; home exit drills; and general fire safety. The presentations feature a talking fire hydrant robot, a film, and booklets and stickers to be taken home. The school presentations are concentrated in two 3-month periods. Presentations are available on request throughout the year for the rest of the community on a number of topics. In 1987, more than 250 presentations were made to schools and other groups, attended by more than 20,000 people.

Results: In 1982, pre- and post-tests were administered to a sample of 254 students from 10 classes, out of the 2,055 students who participated in the school program.

The tests were written with the assistance of a nearby school district.

The average score went from 79 percent on the pretest to 92 percent on the identical post-test, which was given two weeks after the presentation, and thus measured some retention. This represents a 13 percentage-point improvement in the score as a result of the program. The questionnaire results are shown in Table 13, question by question and class by class. Sharp improvement was measured on all questions but number 3. (The latter suggests a need to check on whether the instructors or materials had something incorrect, or said something that was misapprehended.)

One case has been documented in which the program's direct impact was demonstrated. Three children were in their mobile home. Their babysitter was sleeping in a bedroom while the children ate their lunch. The 2-year-old switched on

a burner on the gas stove, which ignited a box of groceries placed nearby. While Darrell, 7, ran for help, Phillip, 6, attempted to wake the babysitter. As the fire and smoke spread, he told his 2-year-old sister to get on the floor and he dragged her from the burning kitchen to the outside. The fire woke the babysitter and she exited from a rear door. The trailer was completely destroyed. Phillip credited his actions to the lessons taught by "Pluggie," the talking fire hydrant. The brothers were made "Junior Firefighters" in a ceremony by the American River Fire Chief. The incident received wide attention in the local and regional media. (See newspaper article on page 38.)

For more information contact:
Larry Alver, Public Education Officer, American River Fire District,
 5634 Robertson Avenue, Carmichael,
 CA 95608, (916) 485-6666.

Table 13
Frequency of Errors Per Question (Pre-/Post-Test)
Sacramento School District, October 1982

Question #	Class #										Total
	1	2	3	4	5	6	7	8	9	10	
1.	0/0	0/1	1/0	0/1	2/1	0/0	2/0	2/2	0/0	0/0	7/5
2.	7/0	3/4	8/7	3/1	5/1	1/1	1/3	6/4	0/1	4/3	38/25
3.	3/15	3/10	7/11	4/2	12/10	4/7	5/5	8/6	0/1	7/8	53/75
4.	3/0	3/0	7/0	1/0	11/1	0/0	1/2	6/0	1/0	3/0	36/3
5.	13/1	19/1	16/1	12/2	13/1	5/0	6/0	13/2	8/2	6/0	111/10
6.	9/1	9/0	15/9	3/1	9/2	1/1	4/1	9/4	1/1	5/1	65/21
7.	0/2	2/0	6/0	8/0	7/2	1/0	4/2	5/1	1/0	5/0	39/7
8.	12/0	9/0	19/4	4/1	12/4	0/0	5/1	11/0	3/1	13/0	88/11
9.	5/4	3/1	11/4	0/0	14/8	1/0	2/2	6/2	1/1	6/1	49/23
Summary ¹	52/23	51/17	90/36	35/8	85/30	13/9	30/16	66/21	15/7	49/13	486/180
#Students	29	27	28	27	27	21	33	31	8	23	254
¹ Total Errors Per Class (Pretest vs. Post-test)											

housekeeping. At the fifth grade level, all these concepts are reviewed and a science lesson demonstrates how clothing will burn and that what you wear does matter. This lesson also provides for a certain amount of spelling and vocabulary practice for words such as flammable, flame retardant and flameproof.

This sequence is only one example of an aspect of fire safety education that is covered again and again, but never the same way twice. It allows for the inclusion of new students, but does not bore the continuing student. (With the high mobility in the United States, programs need to account for the large numbers of children moving into or out of the curriculum.)

Recently, the stop, drop, and roll and clothing fire lessons have been adapted for use in Waterford's junior high school living skills program (during cooking class) and at the senior citizens housing facility.

Each school lesson is evaluated by the teacher after it is presented, and specific recommendations are made for suggested changes and improvements in lesson presentation. This is an important aspect that directly addresses the success of the program. Over the years, current trends have been incorporated into the program so that it stays up-to-date. For example, concern about the increased amount of construction and sewer projects involving blasting resulted in an addition to the fifth grade program to warn students (and teachers) about the dangers of blasting caps.

Results: Fires dropped sharply in the two years following the start of the program in September 1980 (see Figure 8). Much of the drop was in outside fires, which are often started by juveniles. Outside fires and fires overall have been recorded at much lower levels (see Table 14).

Vehicle fires, however, were essentially unchanged, and they are

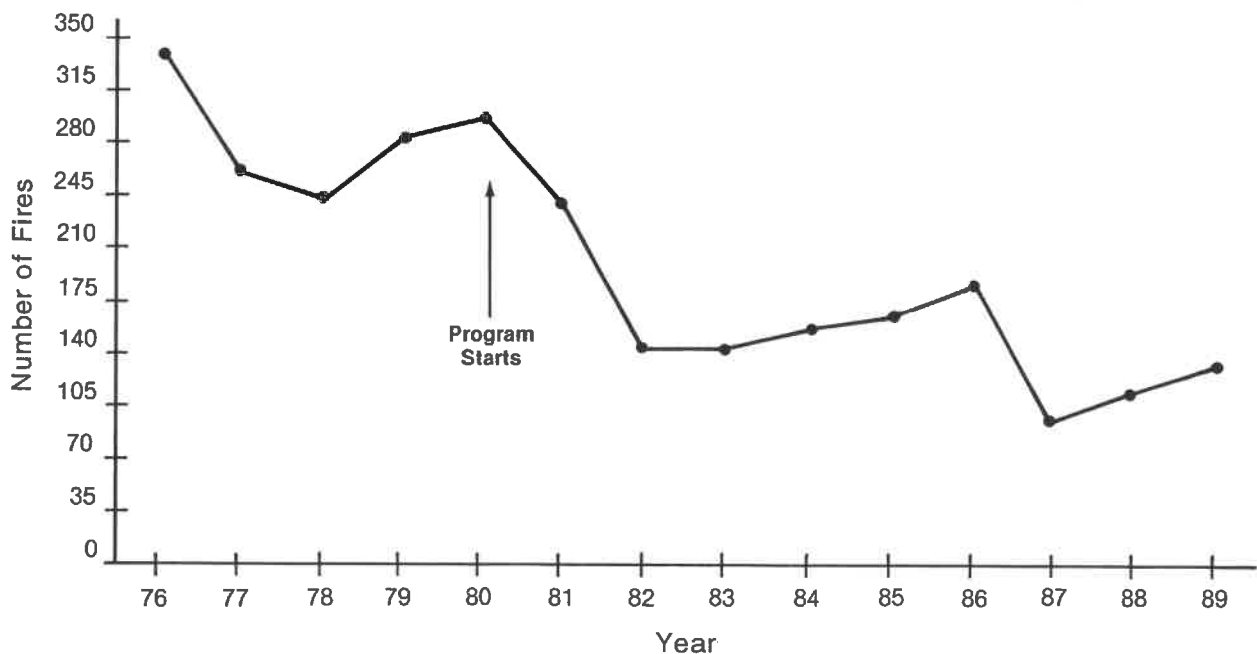
less affected by current fire public education than the other types of fires. Chimney fires, too, have had less change, though some attention is given to them in the fifth grade program.

The results in Waterford are even more striking because the population and economy increased considerably during this period.

Anecdotal evidence also suggests the program is working. Firefighters and parents report that children remember what they have been taught, and that children involved in fire situations knew what to do. In one instance, the Waterford Fire Department arrived at a fire and found a child and her mother sitting on the front porch. The mother said they had left the house at the insistence of the child, who kept saying "Get out and stay out, because Mrs. Beals says so."

A scenario that occurs quite often involves children and parents making popcorn. Several children have proudly reported that, to the

FIGURE 8. Town of Waterford, Connecticut: Trend in Fires Before and After Program Start



NOTE: This graph represents the combined number of structure, chimney, and outdoor fires. Vehicle fires have not been included because they were unlikely to be affected by the public education program.

amazement of their parents, they know how to smother a pan fire of overheated oil. Another student recently reported preventing a burn situation by removing an appliance cord hanging in front of a utensil drawer, a scenario that had been discussed in school the previous week.

In several instances, children knew when to call 911. When one 8-year-old boy saw flames shooting from a plastic trash can at the rear of his house, he dialed 911 for assistance, called out to his older brother so that the two could flee together to his grandmother's house next door, and knew enough to throw dirt on the fire to put it out. When the Fire Department arrived just moments later, the children were safely away from the potential danger, and the little boy had put out the fire. He reported that he knew what to do because he learned about fire safety in the Junior Fire Marshal program.

Some programs may have inadvertent negative side effects, and these must be watched for to avoid doing harm. A complaint was lodged against this program from a mother whose child was in the Junior Fire Marshal program. The mother said that the child had nightmares about fires happening in her home. Further investigation and follow-up by teachers and support staff indicated that the housekeeping practices in the home were so poor that the child probably found in her home every fire hazard they had discussed in class. The child had every right to

Table 14 Waterford, Connecticut Fires by Type				
	<i>Type of Fire</i>			
	<u>Structure</u>	<u>Chimney</u>	<u>Vehicle</u>	<u>Outdoor</u>
1976	87	16	40	238
1977	72	16	50	169
1978	70	16	55	157
1979	73	33	52	177
1980	75	34	47	189
1981	51	27	37	161
1982	39	38	40	67
1983	45	29	47	69
1984	56	30	59	71
1985	44	16	52	106
1986	75	19	51	92
1987	32	20	41	44
1988	32	17	47	66
1989	56	16	44	61

be scared. In a bizarre way, it was one more proof that the lessons really were sinking into the kids' minds.

One final twist on this program's effectiveness comes from the following, one-of-a-kind anecdote: As part of a writing exercise, a second grader related a frightening experience. He was delivering papers on foot one day when he was chased by a dog that he knew had bitten several children. The dog was closing in and he was very scared. He had no place to go and the dog was getting closer and closer. Relying on his own resources, he threw down his news-

paper sack, dropped to the ground, pulled in his arms and legs, and began to roll over and over. Stop, drop, and roll! Rolled up as he was, there were no extremities for the dog to grab onto. The dog was frustrated by his actions and retreated, leaving the child uninjured. His comment to his teacher was that stop, drop, and roll was all he could remember to do. In a crisis, he remembered his safety lesson.

For more information contact: Elizabeth Beals, Fire Safety Instructor, Town of Waterford, 200 Boston Post Road, Waterford, CT 06385-3898, (203) 442-0553.

18. National Safety Council: Level III Fire Safety Education Resource Unit

<i>Jurisdiction:</i>	Rural
<i>Target Group:</i>	Fourth through sixth grades
<i>Subject:</i>	Multiple
<i>Evaluation Measures:</i>	Knowledge gain

Perhaps the most detailed and objective evaluation ever made of a fire safety program was the subject of a doctoral dissertation in 1976 by Donald Carter of the University of Tennessee.¹⁹ Carter evaluated the effectiveness of the National Safety Council's (NSC) Level III fire education program, *Teaching About Safety—Elementary Education Resource Unit, Volume I, Fire*. (Levels I and II deal with kindergarten through third grade.) He also sought to determine whether the NSC program was a superior approach to integrating fire safety into various subjects.

The program was evaluated with the assistance of East Tennessee elementary schools. The first principal to agree to use of his students as subjects in the study was a volunteer firefighter—again illustrating the importance of having a friendly contact helping to break a new program into a school system. Fourth, fifth, and sixth grade students in two schools were used as the subjects of the study. They were pretested in April 1976. This was followed by 10 hours of fire safety instruction during May 1976. A post-test was administered at the end of the program. The tests were 30 minutes long, each with 25 multiple-choice questions.

A key feature of the NSC program was to require the student to think about what to do in a

variety of real-world situations, rather than telling the child what to do. A specific set of knowledge goals and teaching suggestions was given to the instructor. All of the instruction was delivered by one science educator, thereby eliminating variations in results due to different instructors.

In contrast to the specified teaching approach of the NSC program, the test control group of children in this experiment was given "integrated" instruction. It was left entirely to the discretion of the science teachers. No training materials were given to them, just the information they were to incorporate somehow into their lessons.

The NSC program and the integrated programs were taught in 20 science class periods of 50 minutes each. There were 214 student subjects in the experiment, 76 in the control group of integrated instruction, and 138 in the NSC program group.

Results: The group who had the NSC program experienced a large increase in their test scores (see Figure 9). The fourth grade boys went from a mean of 13.2 correct out of 25 questions in the pretest to 18.6 in the post-test, a gain of 5.4.

Fourth grade girls improved from 12.8 to 18.9, a gain of 6.1. Both boys and girls started at about the same knowledge level and gained about the same amount from the program.

In the fifth grade, boys' scores went from 15.9 to 20.8, an improvement of 4.9. Girls went from 16.7

to 21.5, an improvement of 4.8.

In the sixth grade, boys went from 16.5 to 21.2, an improvement of 4.7. Girls went from 14.9 to 21.6, an improvement of 6.7.

The fourth grade control group's pretest score was 13.0, about the same as the fourth grade's in the experimental group. But at the end of the test period they had not improved at all; in fact, they declined slightly. The control group fourth grade girls improved slightly, from 14.1 to 15.4. Fifth and sixth grades in the control groups either did not improve or improved one or two points.

There was no significant difference between boys' and girls' starting knowledge. The NSC program produced a very significant improvement in safety knowledge, for both boys and girls equally.

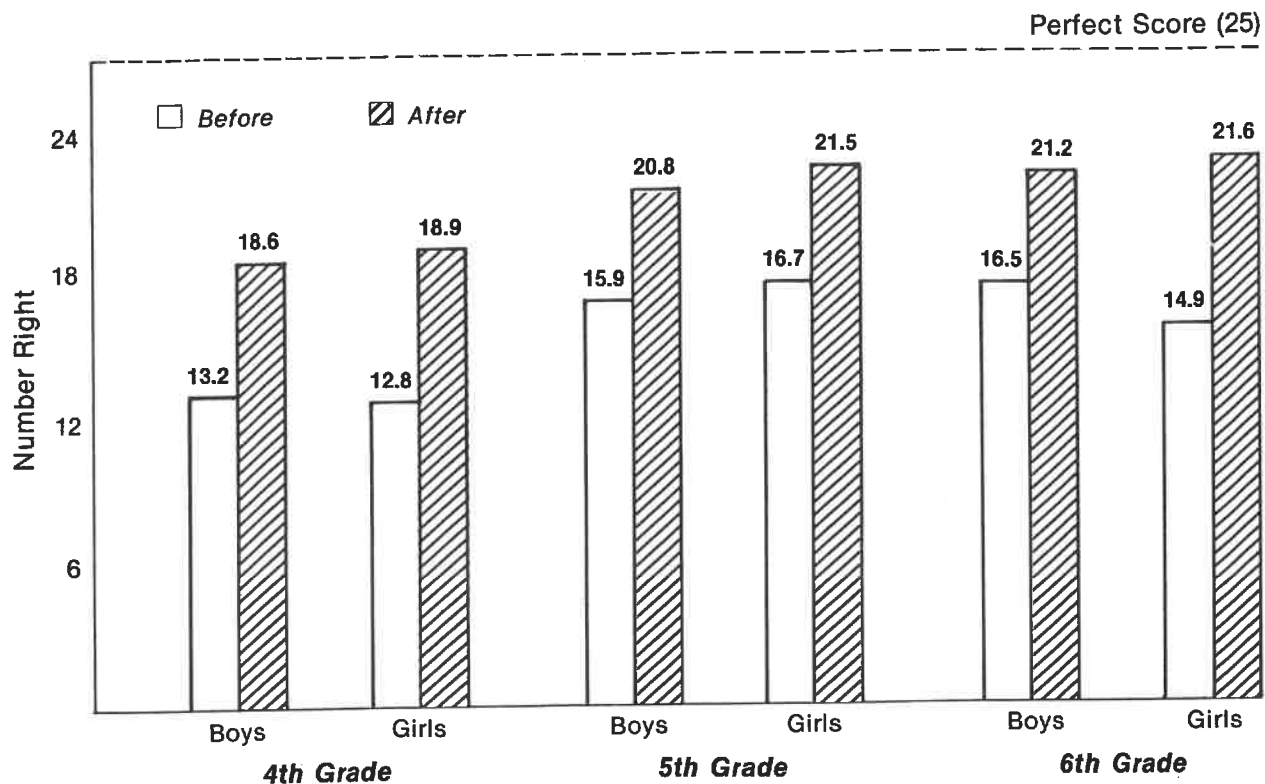
The study showed that a well-developed and well-organized fire safety program could be used by teachers who were not well-versed in fire safety themselves. There is a danger, on the other hand, in leaving fire safety to be integrated into the curriculum by the teacher: "It is possible to integrate a topic so well into another that its inclusion almost becomes lost," observed Dr. Carter.

Another finding of the study was that the same test instrument proved satisfactory across grade levels four to six.

*For more information contact:
National Safety Council, 444 N.
Michigan Avenue, Chicago, IL
60611, (312) 527-4800.*

¹⁹ Dr. Donald Gene Carter, Doctoral Thesis, "Evaluation of the National Safety Council's Fire Safety Education Resource Unit in a School Setting," University of Tennessee, Knoxville, August 1976.

FIGURE 9. Test Score Improvements from National Safety Council Fire Safety Program



19. Northlake Fire Protection District (Illinois): Learn Not To Burn Program

Jurisdiction: Small urban community
Target Group: Elementary schoolchildren
Subject: Fire prevention
Evaluation Measures: Fire incidence; injuries; dollar loss; anecdotes

Developing a keen enthusiasm for fire safety education can be effectively accomplished through a cooperative partnership between school districts, fire departments, and home, as evidenced by the success of the Northlake, Illinois, fire safety program.

In 1982, acting under the direction of Lt. Terry Pluta, Public Education Officer for the Northlake Fire Protection District, teacher Dottie Ahbe began piloting the Learn Not To Burn fire safety program in her fifth grade classroom in Northlake. After the successful pilot, the program was expanded to all fifth grade classes

and the following year to all second grade classes. The 10-week program is now a permanent part of the District's curriculum.

Results: Over a four-year period, annual residential fires fell from 19 to 14. A similar drop occurred per capita. Civilian injuries fell from 6 to 1, firefighter injuries from 3 to 0, and dollar loss per capita from \$11.89 to \$1.27. Residential fire losses dropped from \$149,000 to \$16,000 and also declined as a percentage of total dollar loss, from 44 percent to 15 percent. Non-residential losses dropped much less over that period (see Table 15).

To date, five documented saves have been credited to this program.

A 10-year-old girl escaped from a fire in her home by crawling low in smoke and exiting by a side door. She ran barefoot to a nearby restaurant, where her mom worked, to call the Fire Department.

A fire in a clothes dryer threatened a family where a 10-year-old boy woke his father and rescued his 6-year-old brother. After everyone (dog included) was safely out, the older boy ran to a neighbor to call the Fire Department.

A group of eighth graders "hanging out" experimented with a can of kerosene and started a fire.

Table 15
Residential Statistics—Northlake, Illinois

<u>Year</u>	<u># of Fires</u>	<u>Civilian Injuries</u>	<u>Firefighter Injuries</u>	<u>Residential Loss</u>	<u>Percent of Total Dollar Loss</u>
1983	19	6	3	\$148,660	44%
1984	17	4	1	72,375	31
1985	15	1	0	9,755	10
1986	14	1	0	15,941	14

One of the boys slipped and fell backwards into a flaming puddle. Panicking, he ran, which fanned the flames. A friend tackled him, rolled him on the ground, and doused him with water in a shower to cool the burns. The hero credited his knowing what to do to the fire safety program he had gone through three years earlier in the fifth grade.

A third grader vacationing with his family in Florida looked out the window and saw a light blinking and heard the horn of the fire alarm pull box. He woke everyone

up and made sure they got safely out of the condo. Everyone had to walk quickly down four flights of stairs because the boy told them they could not under any circumstances use the elevator. On the way downstairs he knocked on the neighbors' door to wake them up. Once downstairs he guided all of them a safe distance away from the building. When the firefighters arrived he was congratulated on knowing what to do. The boy told them he learned it all in his second grade fire safety program in Illinois.



Northlake, Illinois, finds it crucial to develop a Fire Department/School Administration/Teacher team for fire safety education.

The fifth save involved a fifth grade boy home alone with two younger brothers, ages 4 and 5. The boys were sleeping when the 4-year-old awoke and went into his mom's room. He poured rubbing alcohol on a lamp that had been left on and it exploded. He ran to tell the 5-year-old, who in turn woke the 11-year-old. Stopping for nothing, the oldest boy closed his mom's bedroom door, and took his brothers by the hand to the neighbor's to call the Fire Department. When the first neighbor didn't answer the door, without hesitating he took his brothers across the street to another neighbor's to call the Fire Department.

One of the unique features of this program is its heavy reliance on evaluations by all parties to provide feedback and continually improve the program. In addition to the pre-/post-tests and anecdotes discussed above, student questionnaires are used to obtain the participants' opinions on the program's value. A "Partnership Opinionnaire" is completed by teacher and firefighter pairs to cooperatively evaluate the overall effectiveness of the program. A "Teacher Opinionnaire" gives the teacher an opportunity to evaluate the degree of student understanding of the various fire safety topics. A "Firefighter Opinionnaire" gives the firefighter an opportunity to evaluate various areas of the program. A "Parent Questionnaire" allows the parents to become actively involved and stimulate them to make fire safety a daily family affair. Finally, an annual recap meeting is held with teachers, administrators, fire service personnel, and parents to comment, criticize, and suggest changes, deletions, or additions to the program.

By every measure it has proven successful.

*For more information contact:
Ms. Dottie Ahbe or Lt. Terry Pluta,
Northlake Fire Department, 118
East Parkview Drive, Northlake,
IL 60164, (708) 562-3182.*

20. Chicago Fire Department (Illinois): Elementary School Public Education

Jurisdiction: Large city
Target Group: Schoolchildren
Subject: Multiple
Evaluation Measures: Knowledge gain; death rate

From 1977 to 1987 the City of Chicago's fire deaths trended downward from a high of 196 in 1977 to a low of 95 in 1987. This sharp drop—much greater proportionally than the national drop over the same period—was thought to be due to a combination of prevention and suppression efforts. But in 1988 deaths shot up to 156, the largest one-year increase the Department ever recorded (see Figure 10). About 30 percent of the fatalities were pre-K through 8. Though still well below levels from 1977-87, the sharp change was puzzling after years of a successful program. The population of Chicago had stayed at almost exactly the 3 million mark during this period, and so the per-capita death trend also was sharply higher in 1988.

During 1988, the public education program had its highest number of contacts, more than 575,000 people. Most were children in kindergarten through grade 6.

To shed light on the effectiveness of the public education effort, an evaluation survey instrument was used in a sample of seventh grade classes in several schools in the areas with the most fire deaths. All were inner-city, low-income areas. The idea was to see whether the repeated fire safety lessons that most of the children were thought to have had during their elementary school careers were leaving a base of fire safety knowledge.

Five schools each from the west, north, and south sides of Chicago participated. The areas tested 261, 248, and 255 students respectively—764 in all.

Results: A typical profile sheet for one of the schools is shown in

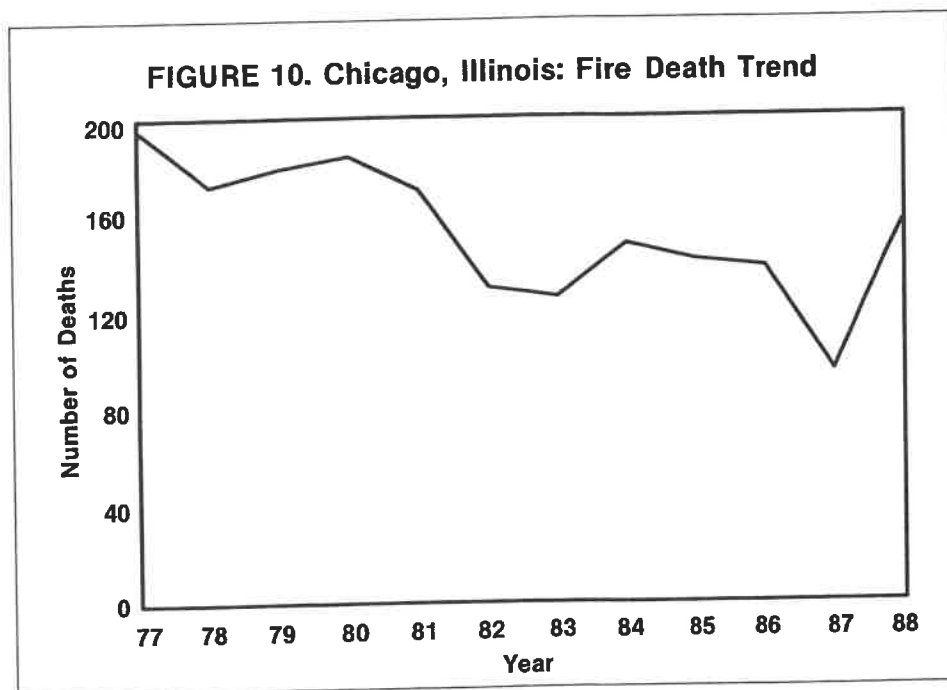


Figure 11.²⁰ There were six items on which 85 percent or more of the students got the correct answers—a very high level for low-income, highest risk areas. These were: stop, drop, and roll; crawl low in smoke; not adding fuel to a hot lawn mower or motor bike; people most in danger when asleep; overloaded electrical outlets; and feeling a door to see if it is warm.

The least known safety points were putting a lid on a grease fire, paying attention to cooking, dangers of false alarms, importance of

home escape plans, and the need to locate exits when in public places.

All of the “best known” safety behaviors had been emphasized over the previous decade by Chicago fire prevention education and by national media. All of the “least known” were deemed to be critical areas needing remedial attention in grades 6-8.

Except for two or three questions, the results from school to school were remarkably similar, with the same strengths and weaknesses. Figure 12 shows the questions, organized by concept, on which more than 70 percent of the students got the right answer (no checks) and the ones for which they scored 70 percent or less (the checks). The one, two, or three checks shows how many of the school areas (Northside, Southside, Westside) had 70 percent or less on that question. These are areas needing improvement. All the un-

²⁰ The *Fire Safety Education Evaluation Survey* was used. It had been developed with a grant from The Tobacco Institute's Fire Safety Education Program. The *Survey* was created under the auspices of the Foundation for Fire Safety by New York State firefighters. It was initially tested in four cities nationally. It is now available from the National Volunteer Fire Council Resource Center, P.O. Box 25215, Alexandria, VA 22313-5215. Ideally, the test would be given before as well as after the program.

FIGURE 11. Fire Safety Education Evaluation Survey Profile Sheet for a Chicago Class

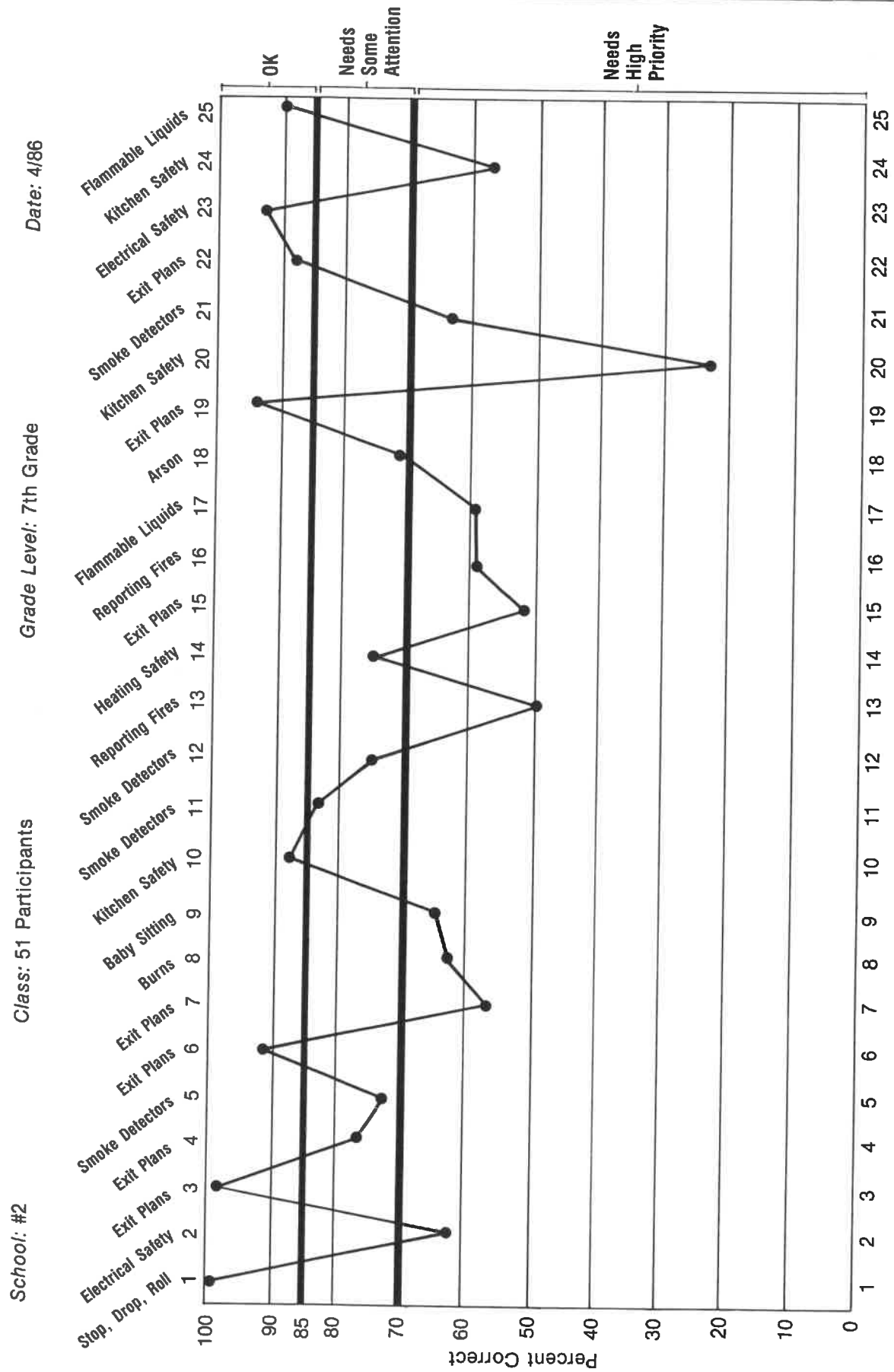


FIGURE 12. Chicago, Illinois, Fire Safety Education Evaluation Survey
Results by Concept and School Area

CONCEPT	QUESTION NUMBER	CONTENT
STOP, DROP, ROLL	1.	IF YOUR CLOTHING CATCHES ON FIRE, YOU SHOULD STOP, DROP AND <u>(B) ROLL</u> TO EXTINGUISH THE FLAMES.
BURNS	✓✓ 8.	THE FIRST THING TO DO IN TREATING A BURN INJURY IS TO APPLY: <u>(C) COOL WATER</u> .
BABY SITTING	✓✓ 9.	A BABYSITTER SHOULD KNOW: <u>(D) ALL OF THE ABOVE</u> (THE HOME ESCAPE PLAN, STOP, DROP AND ROLL, EMERGENCY TELEPHONE NUMBERS - A,B,C.).
HEATING SAFETY	14.	A PORTABLE SPACE HEATER HAS THE GREATEST POTENTIAL FOR CAUSING A FIRE WHEN: <u>(A) IT IS PLACED TOO CLOSE TO THINGS THAT BURN</u> .
ARSON	18.	DELIBERATELY SETTING A FIRE CAN LEAD TO: <u>(D) ALL OF THE ABOVE</u> (ARREST, A FINE, PRISON - A,B,C.).
ELECTRICAL SAFETY	✓✓✓ 2.	ELECTRICITY FOUND IN HOME OUTLETS CAN CAUSE: <u>(D) ALL OF THE ABOVE</u> (DEATH, A FIRE, A SHOCK - A,B,C.).
	23.	TOO MANY APPLIANCES ON ONE LEAD CORD OR ELECTRICAL OUTLET CAN: <u>(B) CAUSE A FIRE</u> .
EXIT PLANS	3.	THE SAFEST WAY TO EXIT A SMOKE FILLED ROOM IS TO: <u>(C) CRAWL</u> .
	✓✓ 4.	THE WORST THING SMOKE FROM A FIRE CAN DO IS: <u>(B) CAUSE DEATH</u> .
	✓✓ 6.	THE FIRST THING TO DO IF YOU DISCOVER A FIRE IN YOUR HOUSE OR APARTMENT IS TO: <u>(B) GET OUT</u> .
EXIT PLANS (CONT'D)	✓✓✓ 7.	THE MOST IMPORTANT THING TO LOCATE WHEN YOU ENTER A THEATER, RESTAURANT, OR HOTEL ARE THE: <u>(C) EXITS</u> .
	✓✓✓ 15.	AN IMPORTANT PART OF A HOME ESCAPE PLAN IS: <u>(D) ALL OF THE ABOVE</u> (AN OUTSIDE MEETING PLACE, A WRITTEN PLAN, HAVING REGULAR DRILLS - A,B,C.).
	19.	IF YOU THINK THERE IS A FIRE ON THE OTHER SIDE OF A DOOR, YOU SHOULD FIRST: <u>(A) FEEL THE DOOR</u> .
	✓✓✓ 22.	IN A FIRE, <u>(C) SMOKE</u> KILLS MOST PEOPLE.

✓ = Priority Teaching Item in one school area; two checks, two areas, etc.

Only the first page of two is shown.

checked questions are ones for which the cumulative public education and life experience led to correct answers.

*For more information contact:
Chief John Schneidwind, Coordinator of Public Education, or
Frank Jacobson, Paramedic Officer,*

*Public Education Unit, Chicago
Fire Department, 1010 South
Clinton, Chicago, IL 60607,
(312) 744-6691.*

21. Evanston Fire Department (Illinois): Middle School Burn Prevention Education

Jurisdiction: Medium-size city
Target Group: Grades 6, 7, and 8
Subject: Burn prevention and escape
Evaluation Measures: Burn admissions

In 1980, Chief Thomas Linkowski and Dr. Charles Drueck, Director of the Grainger Burn Unit at Evanston Hospital, devised a 45-minute burn education program for sixth, seventh, and eighth graders. It covered smoke detectors, prevention, and how to escape a fire. Included were realistic slides of actual burn injuries and local dwellings that had had fires. The program emphasized how the fires and burns could have been prevented. It presented the information in a no-nonsense, no-gimmicks manner.

Getting this program into the middle schools required an average of three meetings and several telephone conversations with each of nine middle school principals. The schools eventually cooperated, and the program now reaches every middle school student in the city. The Fire Department offers the program every other year to all three grades. Half the students thus get it in the sixth grade, with

a refresher in the eighth grade. From 1980 to 1988 the program reached 16,000 students and 900 teachers.

Results: Prior to the program, the burn center admitted about 100 serious burn cases every year, of whom 25 were children under the age of 14. In the first year after the first burn prevention presentations were offered, not a single child in Evanston had to be admitted to the Burn Center. The number of seriously burned children has remained extremely low since then, and the Burn Center has closed down, partly due to the decrease in admissions of Evanston children.

When Linkowski and Drueck first gave the talks, they asked the kids how many had smoke detectors in their homes. Only a few would raise their hands. Now, approximately 95 percent respond affirmatively.

The success of the program has been attributed to three factors:

“First, two highly competent professionals talked of fire and burns from their own different vantage points. Second, they used no childish gimmicks. They gave the information to the students using real examples and slides, always stressing that each case could have been prevented. Finally, they did not talk down to the students. Both spoke directly to the audience in a professional manner, recognizing that the students are intelligent individuals who can understand the problem as presented and react to the lessons taught.”²¹

*For more information contact:
Division Chief Thomas Linkowski,
Evanston Fire Department, 702
Madison Street, Evanston, IL
60202, (708) 866-5918.*

²¹ Ernest Juillerat, “Quenching the Burn Problem,” *Fire Chief*, August 1989. An excellent description of the Evanston program. The same approach was used in Potomac, Maryland. See Case Study #38.

22. Lake Havasu City Fire Department (Arizona): School Programs

Jurisdiction: Small city
Target Group: Schoolchildren; juvenile firesetters
Subject: Smoke detectors; dial for help; others
Evaluation Measures: Change in behavior; anecdotes

The Lake Havasu City Fire Department makes presentations throughout its community of 24,000. The Department is very

active in the five elementary schools, one junior high, and one senior high. Attempts are made to provide 3-5 visits to each elementary

class in the school system each year. Programs include a “Learn to Dial” program in which students in grades K through 3 use a

two-telephone mock-up to learn to call the emergency dispatch center for police, fire, and emergency. The students give their address, name, cross-street, and telephone number and explain the emergency. The Fire Department also uses a combination of materials from the Learn Not To Burn program, the Hartford Insurance Junior Fire Marshal Program, Project Burn Prevention, and others.

A smoke detector survey was started for fifth graders. It is completed at home and includes testing smoke detectors. The surveys are returned to school, where they are collected by the Fire Department. A 12-hour certified-babysitter seminar also is available for fifth and sixth grade students as an after-hours school activity. An average of 100 students go through the program each year.

In junior and senior high school, fire safety is taught in the home economics and shop classes. CPR is taught to the entire seventh grade class and also to the senior high health class.

The Juvenile Firesetter Program is a four-part, one-on-one class given at the Fire Department. The

initial meeting is with the parents, followed by three classes for the juvenile. These three sessions include an interview, fire safety behaviors taught through audio-visual materials, homework, and a station tour including a talk with the firefighters. The program has an average of 33 students a year, with ages ranging from 3 to 16 years old.

Results: The smoke detector survey reported that just over nine percent of the 167 homes responding did not have smoke detectors, and another 8 percent had detectors that were not working. Almost 11 percent of the responses said that the survey had changed household behavior, either in buying a smoke detector, changing batteries, or testing the detector more often.

The "Learn to Dial" classes have resulted in at least five documented cases where the students used the lessons in an emergency. In one case, a 5-year-old girl was home when a kitchen fire broke out. While the adults panicked, she dialed the emergency phone number she had learned, gave her address, and told the dispatcher what was happening. In another incident, two sisters were trapped inside an elevator. The 7-year-old

dialed the emergency number, giving the dispatcher the necessary information. When asked how she knew what to do, she said, "Miss Micca taught us how to dial [the number] and told us all the stuff we had to say."

Two other cases involved fifth grade girls who learned of the proper procedure for dialing the emergency phone number during two separate babysitter's seminars. Both were able to assist family members during medical emergencies. In another case, a 9-year-old boy led his family from their burning home by instructing them to crawl low under the smoke. Even though they didn't know why they should crawl, his insistence helped them to escape.

The Fire Department also has received reports that parents are practicing exit drills and removing window bars, and are getting interested in all aspects of safety around the house, at work, and during recreation activities.

For more information contact: Elizabeth A. Micca, Public Education, Lake Havasu City Fire Department, 145 North Lake Havasu Avenue, Lake Havasu City, AZ 86403-5699, (602) 855-1141.

23. Salina Fire Department (Kansas): Elementary School Program

<i>Jurisdiction:</i>	Small city
<i>Target Group:</i>	Grades 4 through 6
<i>Subject:</i>	Fire emergency skills; fire and burn prevention; burn treatment
<i>Evaluation Measures:</i>	Anecdotes; outreach; behavior change

The Salina Fire Department conducts a fire safety program in all 22 elementary schools in Salina and Saline County. The program is a cooperative venture between the Fire Department and area schools. Fire safety is taught regularly and systematically in the classroom setting, using educationally sound methods appropriate to the particular grade level.

The goal of the program is to

teach children, even the very young, practical lifesaving skills that could save their lives in a fire or burn emergency and to help children and their parents become more aware of fire and burn hazards within the home, resulting in the establishment of good fire and burn prevention habits.

The classroom portion of the program includes students in kindergarten through fourth grade in

all the public and parochial schools in the Salina area. In addition, a simulator is used with fifth and sixth grades for fire escape drills.

The program includes two visits per year to each classroom by the Fire Department's public education specialist who designed the program format and who does the teaching. Through this effort approximately 3,800 children receive fire and burn safety instruction

twice a year during the first formative years of their educational journey. They learn fire safety the same way they learn their ABC's and 1-2-3's—in small systematic steps.

The emphasis for the fall series of classroom lessons is practical lifesaving skills—stop, drop, and roll to extinguish clothing fires; crawling low under smoke to safety; fire escape planning; reporting an emergency.

Burn prevention and treatment is the emphasis for the second semester series—matches are tools for adults; putting cool water on a burn; identifying and correcting home burn hazards; burn treatment.

In both series, activity sheets or workbooks have been designed specifically for use by the children to reinforce the classroom presentation. Take-home pamphlets are directed toward parental use. Approximately 8,000 pieces of printed material are distributed to children and parents each semester.

The structured classroom component has recently been augmented by the addition of the "Fire Safety House" training simulator, which provides fifth and sixth grade students with an opportunity to put



Yvette Loud of Salina, Kansas, rescued her two young sisters from a fire that occurred at night while her parents were away. She said she learned what to do from her school safety program. She received Hartford Insurance's Silver Medal Award.

into practice the fire escape concepts they have learned in the classroom. During April and May the two-story house is taken to the schools where approximately 1,150 students practice fire escape procedures.

A unique factor in the program

is that the public education specialist, Carol Vineyard, was hired to develop and implement the program without any prior experience in the fire service. The criteria for the position focused on credentials as an educator/teacher.

It is also somewhat unusual for one person to be responsible for teaching all of the classes. This arrangement does a great deal to strengthen the continuity of the program. Vineyard knows exactly what was taught in previous grades and how. The approach for the next grade can build on this. In addition, the students have come to think of the "fire safety lady" as a special friend.

The foundation for this program was laid in 1980. Ten years later, the program is not only still in operation but has expanded.

Results: Periodically the teachers are asked to evaluate the educational soundness of the program. In the most recent survey 89 evaluation forms were returned. Responses were extremely positive. To the question "Was the topic of value to your age group?" all 89 respondents marked "very much."

Comments from parents also indicate the value of the program. Typical comments are: "We couldn't do anything else until we had completed our home safety check." "My child bugged me until we made a fire escape plan." "We had to test our smoke alarm because the 'fire safety lady' said to."

The real proof that learning has occurred, however, is demonstrated when a person can recall information and act upon it when the need arises—especially in an emergency situation.

Salina had three separate documented fire incidents of life-threatening proportions between 1981 and 1986 in which young people responded in a manner that saved not only their own life, but the lives of other family members as well—a total of seven lives saved. In each instance both youth



St. Mary's Grade School, Salina, Kansas, May 1989. Education Specialist Carol Vineyard briefs students who will demonstrate fire escape skills using the Fire Safety House Smoke Simulator.

and parents credited the Fire Department's school fire safety education program with providing the necessary skills for survival.

In the first incident, a mother was immobilized by fear when she realized that she and her two children were trapped in the bedroom by a fire that had totally involved the living room. The 11-year-old daughter took command of the situation and led the escape through a bedroom window. The 6-year-old

boy reported getting down on the floor so he could breathe until the window was broken.

In another incident, a sixth grade girl, Yvette Loud, was alone with two young sisters when a fire occurred in the night. For her action in leading her sisters out the window of their smoke-filled, burning apartment in the middle of the night, this 12-year-old was awarded the Hartford Insurance Company's Silver Medal Award.

In a third incident, a fourth grade girl's nightgown caught fire from the fireplace. She explained, "I stopped, dropped, and rolled—just like we learned in kindergarten." She was badly burned, but much less so than if she had panicked.

For more information contact: Carol Vineyard, Public Fire Educator, Salina Fire Department, 222 West Elm Street, Salina, KS 67401, (913) 827-0411.

24. Clark County Fire Department (Nevada): Junior Fire Marshal Program

Jurisdiction: Suburban
Target Group: Fifth grade
Subject: Life safety
Evaluation Measures: Residual knowledge gain; fire and casualty incidence

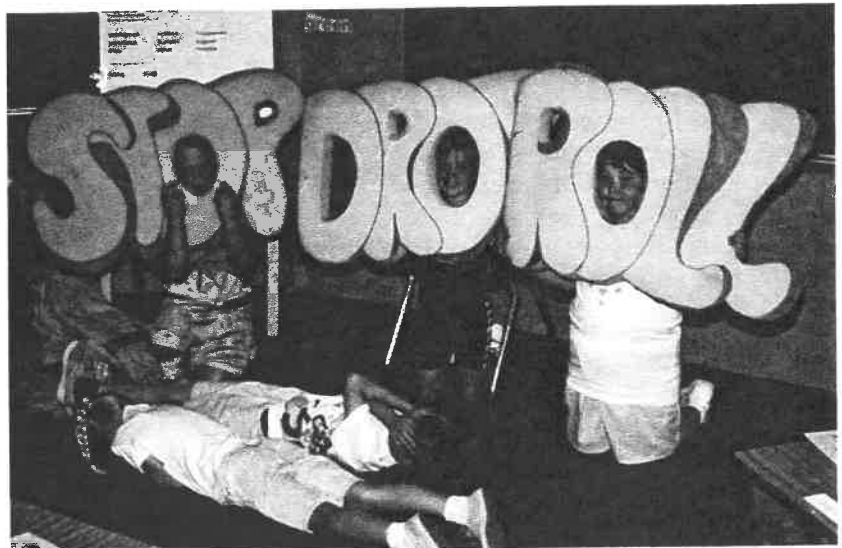
Clark County, Nevada, began a five-part series of fire safety classes for fifth graders in 1983. The concept was to have an impact on as many fifth graders as possible with lifesaving information. A one-time visit with an array of topics would cause more confusion than education, the Department felt. Likewise, one visit per year with one behavioral objective, while effective in that one area of learning, would leave the student lacking in other areas.

Consequently, a five-part series was designed: one hour a week for five weeks, followed by a graduation ceremony for those who qualified. Each graduate would get a certificate, a wallet card, which entitled the recipient to a discount at a local food business, and a visit from a fire captain.

After attending the National Fire Academy's Advanced Fire Education Class, the organizers realized it was important to incorporate a means to evaluate the

program and to tighten program requirements. Students now must pass four written tests and a final exam, conduct a home escape drill with the family, and perform a home safety inspection. They also take 20-question pre- and post-tests. Teachers also fill out a written evaluation that measures each component of the course.

Results: In the pretest, scores of correct answers averaged about 10 out of 20, or 50 percent. The average number of correct post-



The Clark County, Nevada, school fire safety program includes hands-on extinguishment of a pan fire, and practice in stop, drop, and roll.

test answers was 17, or 85 percent. The confidence level that the change was real was computed to be 95 percent.

As the program grew, the Department rewrote the program using four classes instead of five, thus reducing the length of each series but increasing the number of schools reached. The pre- and post-tests showed that the knowledge gain was about the same with the shorter series. The evaluation, in other words, gave the Department confidence that their efficiency could be increased without sacrificing quality.

The Department also measured

the impact of the Junior Fire Marshal program on the number of fires, dollar loss, injuries, etc. Early studies indicate a decrease in fires and dollar loss in the areas where the program was conducted compared to other locations, though rapid growth and changing school zone boundaries made it difficult to keep track of which students attended which schools (and hence whether they had had the prevention series).

The Department more recently measured, on a limited basis, the residual impact of the Junior Fire Marshal program by testing seventh graders two years after they learned

about fire safety as fifth graders. The final exam of the Junior Fire Marshal program was administered to a health class, and the grades of those who had taken the Junior Fire Marshal class in fifth grade were compared to those who had not. The results showed higher scores among the Junior Fire Marshal group, though more testing is needed to determine if the results were significant.

For more information contact: Robert Leinbach, Public Information Officer, Clark County Fire Department, 4425 West Tropicana Avenue, Las Vegas, NV 89109, (702) 455-7700.

25. Clark County Fire Department (Nevada): Poster Contest

<i>Jurisdiction:</i>	Suburban
<i>Target Group:</i>	Grades K through 8
<i>Subject:</i>	Multiple
<i>Evaluation Measures:</i>	Accuracy of posters

Each year, Clark County, in conjunction with all southern Nevada fire departments, holds a poster contest as part of Fire Prevention Week, like thousands of other fire departments. Clark County's program is for grades K through 8. Each grade level is assigned one particular topic with suggestions on how best to illustrate the subject, using positive behaviors.

The winning posters are celebrated with a ceremony, prizes, and photos in the newspaper; the best one is reproduced on a billboard. Winners also are reproduced in a coloring book that is printed by the state's largest newspaper, and 60,000 copies are distributed

each year. The coloring book includes games that require applying safety behaviors and skills.

Results: Most of the 2,000 posters produced have been judged to convey correct messages, indicating that some learning has taken place in the poster activity. The intensive Clark County fifth grade program discussed in the preceding case could have affected knowledge in grades 5 through 8, but not in K through 4, which also produced posters. Analysis of details in the posters can be used to determine areas of confusion in the messages, and the degree to which selected key points are understood. Viewing changes in posters

over time, as prevention course content is sharpened or retargeted, can give some insight into program effectiveness. The county also has found that children and adults are more likely to use the coloring book than other materials because of the localized nature of its content. More straightforward pre- and post-testing and monitoring of fire incidence are used by Clark County for assessing other programs.

For more information contact: Robert Leinbach, Public Information Officer, Clark County Fire Department, 4425 West Tropicana Avenue, Las Vegas, NV 89109, (702) 455-7700.

26. Guilford County Emergency Services (North Carolina): Elementary School Program

Jurisdiction: Rural county
Target Group: First and fifth graders
Subject: Fire safety and escape
Evaluation Measures: Anecdotes

Guilford County has an elementary school program in which approximately 2,500 students in the first and fifth grades and special education classes are taught fire safety on a monthly basis, primarily by one person, Deborah Gregson. The program includes basic fire and life safety information.

Results: Anecdotal information is frequently received by the program in the form of letters from parents relating how their kids knew what to do, or taught their parents what to do, in fire situations. The letters show a change in attitude about fire safety and, in some cases, describe actual "saves" from burns and possible death. Letters and student reports show that smoke detectors and escape ladders were bought and installed as a result of the program, home fire drills were planned and practiced, and stop, drop, and roll techniques were demonstrated at home. Some students have reported that they convinced their parents to alter dangerous practices like using flammable liquids to start fires or as cleaning fluids.

Ms. Gregson also cites instances in which attitudinal or behavior change has extended to teachers as well as students. One fifth grade teacher told Ms. Gregson that she had purchased easier-to-open windows as a result of the program. Another taught her 3-year-old how to escape using a ladder. Several teachers have purchased detectors or ladders for their homes or for friends.

A fifth grade student who had taken the program was able to help a young girl who caught on

fire. He initiated emergency burn treatment and called 911 for help. Several other students have evacuated their homes and initiated 911 calls for chimney or kitchen fires. Other children have called 911 for stroke victims, to report child abuse and possible kidnappings, and for broken legs. One parent called and said he needed information on buying a fire escape ladder. He said, "Keep up the good work; obviously what you're doing pays off. The kids kept at me until I called you."

The program has grown since 1984, when about 50 classes participated, to the current 97 classes, including classes in some schools in a nearby city. The regularity of the program—guaranteed monthly lessons—was the draw.

Finally, the letter below was received by the program. It says it all.

*For more information contact:
Deborah Gregson, Guilford County Emergency Services, P.O. Box 18807, Greensboro, NC 27419, (919) 373-7565.*

March 5, 1987

Dear Sirs:

My name is Everett Lee Cook, Jr. I am twelve years old and my mother is writing this letter for me because I am unable to. I've had an accident I would like to tell you about. Debbie Gregson has been coming to my fifth grade class in Stokesdale Elementary School teaching us what to do in case of fire. She taught us how to drop and roll if we ever caught on fire, but I thought that would never happen to me. I was wrong.

On Sunday March 1st I was helping my mom in our greenhouse and I tried to build a fire in our big wood stove. (We heat the greenhouse with wood.) The fire wouldn't start so I was going to put some kerosene on it like I'd seen my older cousins do. Instead of kerosene I grabbed gas and when I went to light it, it blew up on me and my face and hair caught fire. Instead of running I dropped down and started throwing mud on me. Now I am in Humana Hospital recuperating from first degree burns on my face and both arms but if it wasn't for what Debbie had taught me I could be dead. Thank you for trying to teach us the facts about fire.

Thanks,
Everett Lee Cook, Jr.

P.S. I would also like to thank you all for your school program and also for the fast way the volunteer fire department and ambulance responded Sunday. I feel like what he had learned probably saved my son's life.

Forever in your debt,
Patricia Truitt

27. Huntington Fire Department (West Virginia): "Safety Town" Program

Jurisdiction: Small city
Target Group: 6- to 9-year-olds
Subject: Multiple
Evaluation Measures: Fire incidence

The Huntington Fire Department in conjunction with the Huntington Police Department implemented the Safety Town Program in 1977. Safety Town is an educational program aimed at children ages 6 to 9, with second grade students being the main target. The board of education transports all second graders in Cabell County, and the majority of all second graders in Wayne County, to Safety Town during the academic year for two days of safety training.

The fire prevention phase of Safety Town teaches the students how to call and report a fire, what to do if their clothes catch

on fire, home fire drills and escape plans, and why they should have smoke detectors in their homes. The stop, drop, and roll technique is demonstrated to the class. All of the students practice this procedure to make sure they understand it. They also are requested to make a home fire escape plan with their parents' help, and are taught the dangers of false alarms. The students are given information to take home for further study.

Safety Town is open in the summer. Open enrollment is available to all tri-state area children ages 6 to 9. Enrollment is on a first-

come, first-served basis.

Results: Chief Rickman stated that there have been no reported fires in the homes of these children since the program began. The fire officer who has taught the kids for the last 10 years also monitors all the house fires that occur. His personal knowledge of the community, which Chief Rickman calls "one big family," allows him to make this claim.

For more information contact: Chief C. J. Rickman, Huntington Fire Department, 839 Seventh Avenue, P.O. Box 1659, Huntington, WV 25717, (304) 696-5950.

28. Brea Fire Department (California): School Fire Safety Program

Jurisdiction: Suburban
Target Group: Fifth grade
Subject: Brush fires; extinguishment; escape; detectors; seasonal fire safety
Evaluation Measures: Knowledge gain

Brea, California, (population 34,000) is a relatively affluent community with a moderate number of fire calls. Most calls are for rescue or medical services. The Fire Department conducts a Junior Firefighter Program for fifth graders and has taught this for more than 30 years in all seven elementary schools. Seven segments are taught, one per week over seven weeks. Students learn about fire hazards, how to prevent fire, what to do in the event of a fire, and how to share safety information with family members.

Results: Anna Cave, then Brea's Fire Prevention Specialist, conducted pre- and post-tests of the students' knowledge about fire safety in 1988.

The post-test was given one to two weeks after each class had completed the program. The tests and

scoring were based on those taught at the National Fire Academy's Management of Public Education

Table 16
Brea, California, Fire Safety Test Results
Average Number of Correct Answers
(Out of 25 Questions)

	<u>School #1</u>		<u>School #2</u>		<u>School #3</u>	
	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>	<u>Pre</u>	<u>Post</u>
Mean	14.8	24.1	16.1	23.0	15.7	23.8
Median	15.0	24.0	16.0	24.0	16.5	24.0

course. The mean and median correct answers are shown in Table 16 for three of the schools. There were 25 questions on the test. Each school scored about the same on the pretest and post-test, which suggests homogeneity of the student bodies and the teaching delivered. The large increases show that even the children of affluence have a lot to learn in fire safety.

The bottom-line success of a long-term program such as this is difficult to measure since the community's fire rate is relatively low. Brea Fire Chief Albert "Bud" Moody believes that this program is a contributor to that relatively low rate. Training the children seems to have a direct impact on the awareness of the adult population. Brea plans to continue making this program a priority in the hope that it will remain a fire-conscious and fire-safe community.

For more information contact:
Anna Lee Cave, Emergency Preparedness Coordinator, Civic and Cultural Center, Number One Civic Center Circle, Brea, CA 92621, (714) 990-7622.



The success of Brea, California, in fire safety education is not due to slick materials but rather a long-term commitment to reach every child with a well-targeted message at a receptive age.

29. Charlotte Fire Department (North Carolina): Fourth Grade Fire Safety Curriculum

Jurisdiction:	City
Target Group:	Fourth grade
Subject:	Multiple
Evaluation Measures:	Knowledge change; outreach

In 1977, the Charlotte-Mecklenburg County, North Carolina, School Board adopted a mandatory fire safety curriculum for presentation to fourth grade students. Using fire incident data and information known to be useful in preventing or surviving fires, 10 objectives were developed and a program outline written for three one-hour presentations. However, fire inspectors found themselves unsure of what information was needed most and uncertain of whether students were really learning the information presented.

In 1983-84, the Charlotte Fire Department started evaluating the program by measuring students' knowledge before and after exposure to the fourth grade fire safety program. The results were used to rewrite the program outline, reducing time on items most students answered correctly on the pretest and placing more emphasis on material they did not know.

Each subsequent year, the test results and an instructor evaluation form filled out by the teacher were tabulated for each class and sent to the classroom teacher for

follow-up. The fire inspector for the school also reviewed these results. The program was modified slightly from year to year using the test results in conjunction with fire incident data and trends in public fire education.

In fiscal year 1988, budget cuts caused the fourth grade program to be dropped. To continue meeting the educational needs of the students, the Charlotte Firefighters Association built a portable fire safety house. The house is a replica of an actual house on wheels. It is designed to provide

hands-on experience in teaching the students how to get out of a burning house.

On-duty firefighters are trained to operate the house as well as instruct the students on techniques for getting out of a burning house. The use of the fire safety house is coordinated through the Fire Prevention Bureau. During the 1989-90 school year, approximately 11,000 students went through it.

The Charlotte Fire Department also developed in 1988-89 a fire safety curriculum for presentation to seventh through twelfth grade students using fire incident data and information known to be useful in preventing fires in the kitchen.

Twenty-five objectives were developed and a program outline written for two one-hour presentations.

Results: Scores from the 1984-85 school year proved that students had learned much from the mandatory fire safety program then in effect: The mean score for the pretest was 50, while the mean score after the program was 87. The newer "Fire in the Kitchen Safety Program" has scored even better: For the 1988-89 school year the pretest average was 50 and the post-test 90.

In addition to measuring the increase in knowledge of the students who participate in the program, the evaluations have enabled the

Fire Department to develop a public education program that adaptively targets real fire problems and addresses the needs of the students. Test results serve as a measurement tool for evaluating the program's effectiveness, for revising the program outline, and for improving teaching methods. The results also provide feedback to fire inspectors who otherwise have little opportunity to see a tangible accomplishment from their public safety efforts.

For more information contact:
David Carelock, Charlotte Fire Department, 600 East 4th Street, Charlotte, NC 28202-2851, (704) 336-2101.

30. McCurtain County, Oklahoma: Fire Prevention Programs in Schools

<i>Jurisdiction:</i>	Rural county
<i>Target Group:</i>	Grades K through 8
<i>Subject:</i>	Fire safety
<i>Evaluation Measures:</i>	Knowledge gain

During the 1980-81 school year, the National Fire Protection Association's *Learn Not To Burn (LNTB) Curriculum* for children in grades K through 8 was pilot-tested in three schools in McCurtain County, Oklahoma.

The *LNTB Curriculum* is divided into three levels. Level I is for grades K through 1, Level II for grades 3 through 5, and Level III for grades 6 through 8. Teachers in schools where the *LNTB Curriculum* was introduced were responsible for

incorporating the lessons into their teaching. Teachers chose to teach the LNTB lessons in a wide range of time periods, ranging from an intensive two-week period to the entire school year. Teaching aids included posters, handouts, the practice of fire prevention techniques, and curriculum suggestions for multi-media class projects.

Results: A pretest was given to measure student knowledge prior to instruction. After teaching was complete, a post-test was given to

assess the knowledge gained.

The positive effect of the LNTB instruction was most marked in grades K and 4, where students in all three schools showed significant knowledge increases. In the first and second grades the difference in pre- and post-test exams was positive but not statistically significant.

For more information contact:
Mr. Hugh W. Graham, Route 1, Box 26A, Atoka, OK 74525, (405) 889-2114.

31. California Department of Forestry and Fire Prevention: Team Teaching

Jurisdiction: Statewide
Target Group: Children in grades K through 3
Subject: Match safety
Evaluation Measures: Knowledge gain; number of child-caused fires; proportion of fires due to children

The concept for a team-teaching program in elementary schools was developed by the California Department of Forestry and Fire Prevention (CDF) and a professor at California State University, Chico.²²

The program involves three stages designed to reinforce five fire safety messages centering on matches. The first stage involves small group instruction in the five messages. Second, a slide show reinforces the points. Finally, Smokey the Bear visits the class and asks the children the five questions. The complete presentation lasts about 30 minutes and requires a team of five to eight instructors.

The program has been in use since 1968 and is currently used by all 22 California forest ranger units statewide. The CDF targets grades K through 3 in schools that are in or near wildland areas. The CDF usually reaches more than

100,000 children per year with more than 2,500 presentations.

Results: When the team-teaching program started in 1968, juveniles caused more than 18 percent of wildland fires in California. By 1971, the percentage of juvenile-caused fires fell to 10 percent. The statewide average has remained close to 10 percent since then; in 1988 it was 9.2 percent. Local ranger units report that when the program is not given because of a change in teachers or for other reasons, the local percentage of juvenile-caused fires increases.

Fourteen California State forest ranger units were sent a questionnaire in 1973 on the effectiveness of the program. Fifty-seven percent reported a decrease in children-caused fires in their area, and the rest reported no change. None reported an increase. These were perceptions, and not necessarily based on local statistics. This led to a formal evaluation in San Bernardino, in which a randomly selected set of students from kindergarten through second grade classes were tested. Some were used as experimental controls.

The control classes were tested *before* being given the program. The other classes were tested *after*

being given the program. (This is a variation on the usual before-and-after testing of the same class.) The students were tested on recall of the rules taught and on applications of the knowledge learned. The tests were constructed by education specialists from the University of California.

The experimental group that had already been exposed to the program when tested did markedly better than the control classes. The higher the grade level, the better the students performed. Students from high socioeconomic levels outperformed medium and low socioeconomic-status students. The medium and low socioeconomic groups did not differ significantly in performance.

The key to success here was the ability of the team to keep the young children's attention by changing something or giving the children a reward as soon as attention started to lapse. Repetition of clear simple messages also was used.

For more information contact:
Jim Bliss, Deputy Chief Education Officer, California Department of Forestry and Fire Prevention, 1416 9th Street, Room 1653, P.O. Box 944246, Sacramento, CA 94244-2460, (916) 445-8404.

²² Frank L. Ryan, Frank H. Gladen, and William S. Folkman, "Team Teaching Fire Prevention Program: Evaluation of an Educational Technique." Res. Paper PSW-129, 6p. Pacific Southwest Forest and Range Exp. Sta., Forest Service, U.S. Department of Agriculture, Berkeley, California, 1978. See also the Cottage Grove, Oregon, program in Case Study #54.

32. New York Board of Fire Underwriters: School Fire Safety Program

Jurisdiction: Large city
Target Group: Children in grades 3-7
Subject: Multiple
Evaluation Measures: Knowledge gain

The New York Board of Fire Underwriters provides a fire prevention lecture and demonstration

to any New York City public or private school requesting this service. A uniformed member of the

Fire Patrol delivers the 50-minute presentation that examines many aspects of home fire safety. Dur-



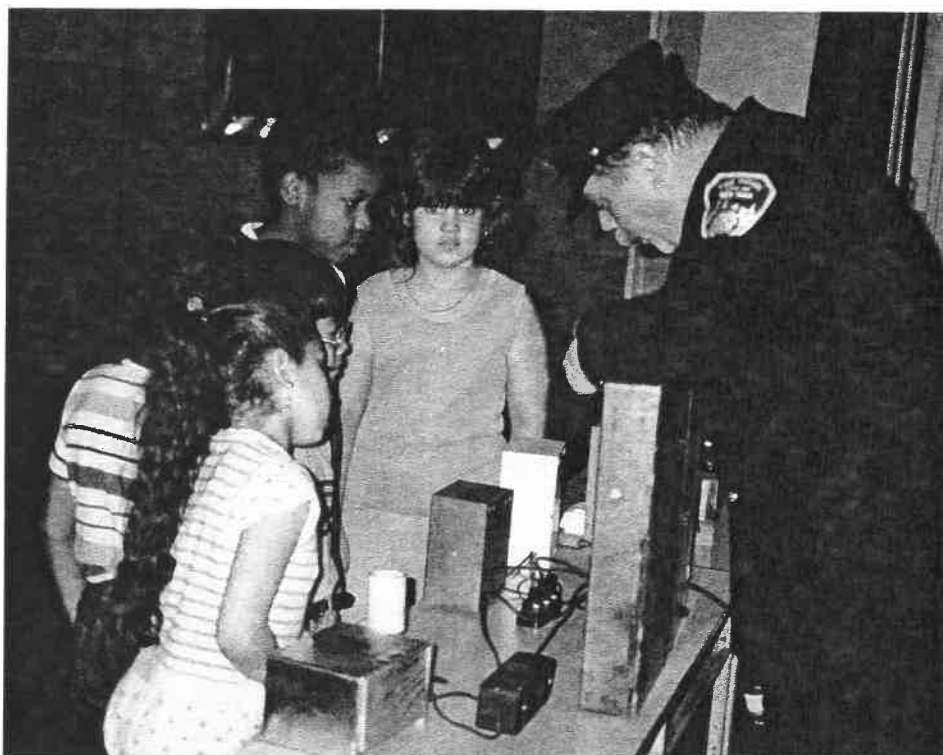
New York City's Board of Fire Underwriters funds a lecture and demonstration for any public or private school requesting it.

ing 1989, more than 56,000 students received this program.

To determine the effectiveness of the program and to pinpoint the subject areas least understood by the students, a 25-question evaluation was used. This test was developed by New York State firefighters and covered topics determined to be most important for fire safety survival.²³

Results: Initially 480 students who represented various economic

²³ *Fire Safety Education Evaluation Survey.*
See footnote 20.



Results show a huge improvement in fire safety test scores among children exposed to the program.

and geographic areas from the city were randomly selected as a control group. These students had not been exposed to the fire prevention lecture/demonstration and provided information on the base level of knowledge in fire safety. Once this base-level group was determined, an additional 370 children were randomly selected, but these students were tested after attending

the fire safety lecture/demonstration.

Comparison of the two groups showed a 72 percent higher level of fire safety knowledge among the students who had attended the lecture/demonstration.

For more information contact:
Art Smith, Secretary, New York Board of Fire Underwriters, 85 John Street, New York, NY 10038, (212) 227-3700.

33. Casa Grande Fire Department (Arizona): Elementary School Programs

Jurisdiction: Small town
Target Group: First and second grades
Subject: Fire safety basics
Evaluation Measures: Anecdotes

The Casa Grande Fire Department provides fire safety instruction from the preschool level through senior citizen groups.

On February 18, 1989, the mother of three children left her home to go talk to the apartment manager about the possibility of getting a larger apartment. Food was left

cooking on the stove, forgotten. The kitchen caught on fire, sending thick smoke from the burning cabinets into the home. Betty Ann James, an 8-year-old second grader from Cottonwood Elementary School, saw the smoke, grabbed her 1-month-old and 2-year-old brothers, and got them out of the

house safely. Her swift action was attributed to the fire safety material she had been taught.

For more information contact:
Sarah Williams, Fire Services Technician, Casa Grande Fire Department, 300 East Fourth Street, Casa Grande, AZ 85222, (602) 421-8600.

34. Sauk Village Fire Department (Illinois): School Fire Safety and Residential Campaign

Jurisdiction: Suburban
Target Group: Schoolchildren and homes
Subject: Multiple fire safety topics
Evaluation Measures: Anecdotes; fire incidence

The Sauk Village Fire Department is a small, paid-on-call organization. Members of the Fire Prevention Bureau make trips to the local schools with a talking, remote-control fire plug. General fire safety messages are taught.

The Department has instituted a "Civilian Recognition Program" to reward those citizens who have used safety measures in an emergency situation. The awards are presented at a public forum featuring the mayor and board of trustees.

Results: Two cases were documented in which messages taught at school presentations were used in actual emergencies. In one case a fifth grader set her cassock on fire while lighting candles for morning mass at her school. The long sleeve had ignited when she reached to relight a candle in the back row. She was not immediately aware she was on fire. When she felt warm and saw the flame moving up her sleeve, she hesitated, trying to remember what she had learned. When someone shouted, "Stop, drop, and roll!" she remembered the presentation, dropped down, and rolled her arm against the floor, extinguishing the flames. She was uninjured.

In the second case, eight children ranging in age from 3 to 18 were home alone when fire broke out. The two oldest children were sleeping. The 15-year-old discovered the fire in a bedroom, alerted the others, and gathered the youngest children. One of his brothers shouted to wake the sleeping children while the others were led out of the house. The two who were sleeping were trapped by the smoke. When one child awoke and opened his door, smoke rushed in and he



Sauk Village, Illinois, is one of many departments using a "Pluggie" speaking robot fire hydrant or similar tool to help in public fire education. Shown here with "Sparky" and "helpers."

closed the door. The other child saw smoke coming into her bedroom from around the door. Rather than pass through the smoke, both left through ground-floor windows. All eight children (plus their pets) were waiting at their assigned meeting place, a large maple tree, when the Fire Department arrived and were still there when their distraught mother arrived. They credited their success in knowing what to do to "Pluggie," the talking fire hydrant robot that visited them at school.

The children involved in both of these programs were given awards. Their actions prevented further injury, and in the second incident, averted a possible multiple-

fatality incident.

Program Intensification—Sauk Village was shocked when on May 19, 1989, a mother and five children died in a home fire where there were no smoke detectors. This tragedy stimulated the community to intensify its prevention program. A "School Distribution Program" was started through which all 2,000 students in grades K through 5 received a copy of a fire safety message to take home and share with their parents. Fire Safety Posters purchased from the National Safety Council were distributed to all businesses, churches, libraries, and school bulletin boards. A "Home Inspection Program" was started in which firefighters visited

homes by invitation to identify hazards and test smoke detectors. Other opportunities also were taken to present safety messages.

Results: For 11 months following the startup of the program, Sauk Village had no significant residential fires. During a comparable previous period the community would have had three or four fires and "dirty furnace" incidents. Department members were "amazed" at the initial results. Long-term data are needed to see if the program continues to work. Small communities with correspondingly small numbers of fires and fire deaths generally need



several years of data to be sure a program's results (or lack of results) are not simply the normal statistical fluctuations you would expect in the absence of a program.

For more information contact: Captain Joe Inorio, Sauk Village Fire Department, 1804 222nd Street, Sauk Village, IL 60411, (708) 758-2226.

Chief W. L. Hawkins and Mayor Ed Paesel of Sauk Village, Illinois, honor Heather Craybeck, recipient of the Civilian Recognition Award—another way to raise awareness and show that the community considers fire safety important.

35. Hamilton County, Tennessee: Fire Prevention Week

<i>Jurisdiction:</i>	Towns and rural
<i>Target Group:</i>	Elementary schoolchildren and their families
<i>Subject:</i>	Home hazard reduction; escape planning
<i>Evaluation Measures:</i>	Participation level; behavior change

In Tennessee, the Tri-County Volunteer Fire Department, the Highway 58 Volunteer Fire Department, the McKee Baking Company, Burger King, and a number of other local businesses have teamed up to sponsor a successful National Fire Prevention Week program that builds excitement into learning about fire safety by offering free hamburgers, snack cakes, and chances to win bicycles and other prizes to schoolchildren in Hamilton County who participate in fire safety-related programs and contests.

This program uses business support to educate families (and employees) by educating the children at school, and bringing behavior modification home to benefit all. In many jurisdictions, the employer is bypassed, and the Fire Department's public education efforts are not adequately funded. This program links the Fire Department, employer, employee, and child into an effective educational force.

It began in 1978, when High-

way 58 Volunteer Fire Chief Roger Parker started planning for National Fire Prevention Week. He outlined a program and presented it to the superintendent of schools for approval. Once approved, the program was explained to the 14 school principals in the area, and the enthusiasm spread. The McKee Baking Company printed home inspection forms and lesson plans, and provided snack cakes. Local businesses provided other food, discount coupons, and money to buy prizes. Burger King supplied a film entitled "Snuffy's Fire Safety Brigade."

The program has been repeated every year during National Fire Prevention Week. It has grown to include the 25 fire departments that are members of the Tri-State Mutual Aid Association in southeast Tennessee and northwest Georgia.

During the week before Fire Prevention Week, the fire chief visits each school to show the film, and tells the children that teachers will be teaching them about fire safety

during the coming week. A letter is sent home to parents, along with a home checklist and instructions for formulating a home fire escape plan. The idea is to have children and their parents complete the inspection and develop a plan for removing the hazards. They also are asked to devise a fire escape plan and practice it. They return one copy of the fire escape plan and checklist to school, and keep the second copy at home for practice each month.

During Fire Prevention Week, the Fire Department returns to each school. Prize recipients are selected from those who have returned a home fire escape plan to their school. Each school holds a fire drill, during which fire trucks come. The children are given an opportunity to inspect them and to have a close look at firefighters dressed in protective clothing and breathing apparatus.

Results: In 1978 when the program began, about 40 percent of the students completed and returned

their home checklist and fire escape plans.

In November 1978, a tragic early-morning fire killed a mother and two children. The father escaped with an infant child. The bodies were recovered in the bathroom. School records indicated that the oldest child had not turned in an

escape plan.

Since then, response to the program has grown steadily. In 1988, 81 percent of the students submitted completed home checklists and reported practicing family fire escape plans. In 1989, one elementary school achieved 100 percent participation for the first time;

the principal rewarded the children by dismissing them early one day.

For more information contact: Assistant Chief Jeff Hartle, Tri-County Volunteer Fire Department, c/o Corporate Fire Safety, McKee Baking Company, P.O. Box 750, Collegedale, TN 37315, (615) 238-7111.

36. State of Connecticut: "Theater on Wheels" Fire Safety Trailer

<i>Jurisdiction:</i>	Statewide
<i>Target Group:</i>	Elementary schoolchildren
<i>Subject:</i>	Multiple
<i>Evaluation Measures:</i>	Knowledge gain; anecdotes

Connecticut's "Theater on Wheels" fire safety trailer is a mobile classroom for teaching fire safety to elementary school children. The educational content of the theater and the supplementary materials for teachers developed to reinforce fire safety messages after the kids return to the classroom have become a primary source for the fire safety curriculum in Connecticut's elementary schools.

In the Theater on Wheels, up to 40 children sit on split log benches in a simulated forest while cartoon and animated woodland creatures come alive. These friendly characters are designed to mitigate the scare factors inherent in fire prevention discussions, but they are used to give serious lessons on the Learn Not To Burn theme of children's fire prevention education. They ensure that children listen carefully and understand the importance of the content.

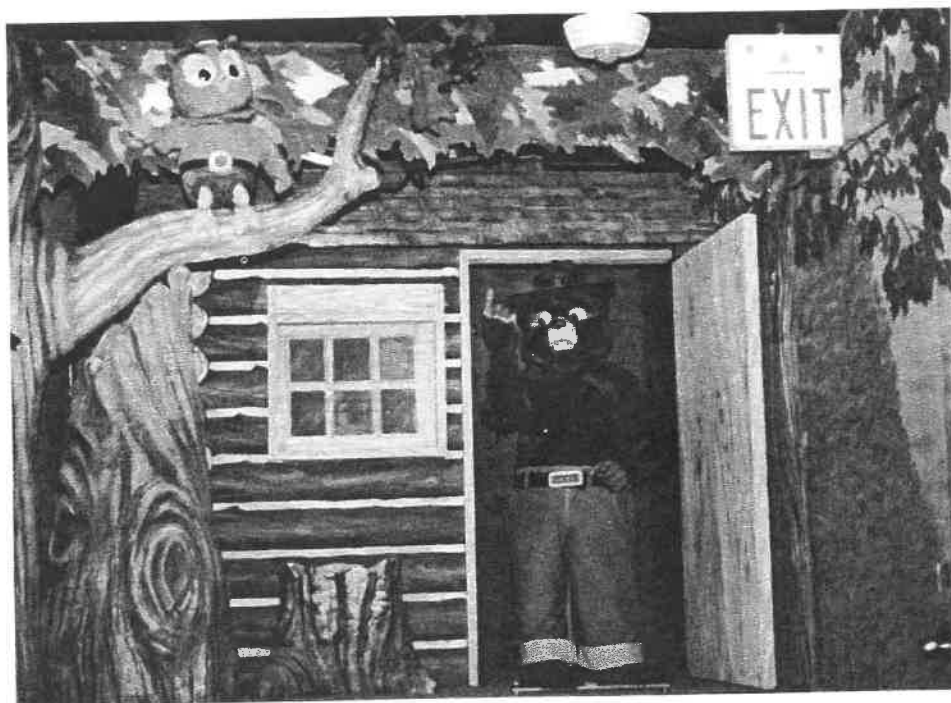
The program uses familiar characters, including Disney's Donald Duck and his nephews Huey, Dewey, and Louie, as well as Hooty the Owl and his friends Smokey the Bear, Sparky the Fire Dog, and Ricky and Rhoda Raccoon. During the entertaining program, the characters talk about Menace the Match, and Donald Duck learns about fire detectors in a dream sequence. Talking exit

signs light up to discuss the importance of planning escape routes, and the children participate in a fire drill during the program.

The Theater on Wheels was developed in 1983 by Naugatuck Fire Marshal Jack Sullivan. The Connecticut Elks contributed \$100,000 and the Connecticut Burn Care Foundation \$35,000 to get the project off the ground. The Connecticut Chevrolet Dealers

Association donated a van-truck to haul the 40-foot trailer. The Connecticut Bureau of the State Fire Marshal and the Connecticut Fire Marshals Association also co-sponsor the program.

Fire Marshal Sullivan, now deceased, worked with his daughter, Regina Birdsell, an elementary school principal, to develop the program based on the idea that children learn better when they



Stage view during performance in Connecticut's Theater on Wheels, with Hooty the Owl and Smokey the Bear (courtesy of Fire Marshal Jack Sullivan, creator of this concept, now deceased).

are entertained. In May 1986, Connecticut Governor William O'Neill officially accepted the Theater on Wheels from the Connecticut Elks. Since then, its program has been approved by the state education commissioner for use in schools throughout the state. The unit travels to various school systems to present its 45-minute program to some or all of the schools within each system. Supplementary material is provided to teachers so they can continue in the classroom the lessons in fire safety begun in the theater. By June 1988, more than 200,000 students had seen the program.

Results: Post-prevention follow-ups with the children have indicated a nearly 100 percent retention of the fire facts presented during the show.

There also are instances in which children in actual fire situations credited the program with teaching them what to do. An 8-year-old New London girl used the fire safety information she learned in the



Interior view of Connecticut's Fire Safety Trailer, which seats up to 40 children (courtesy of Connecticut Bureau of State Fire Marshal).

Theater on Wheels program to help herself and two members of her family escape from a burning three-story house in April 1985. The youngster said that when she

smelled smoke, she touched the door to see if it was hot. She then rolled on the floor until she got out of the house. She told firefighters that she learned what to do after attending the program at school a week earlier. (Score this a success, but also an example of the importance of checking whether the audience is receiving the same message you think you are delivering.)

Ken Millette, Jr., who runs the electronic programming of the show, said that one child was so impressed with the fire safety message she would not go to sleep until her parents put smoke detectors in the house. He also has a number of complimentary letters indicating that children have gone home and told their parents what they learned.

For more information contact: Adam Berluti, Public Information Officer, Bureau of State Fire Marshal, Connecticut Department of Public Safety, 294 Colony Street, Meriden, CT 06450, (203) 238-6295.

37. Redmond Fire Department (Washington): Fire Safety House

<i>Jurisdiction:</i>	Suburban
<i>Target Group:</i>	Schoolchildren
<i>Subject:</i>	Escape and kitchen safety
<i>Evaluation Measures:</i>	Anecdote

The Klahanie Children's fire safety house is a state-of-the-art educational vehicle for teaching young children about fire safety and effective fire escape planning. The house is a fully mobile, scaled-down replica of a typical home equipped with smoke and heat detectors, escape ladders from the second floor, artificial smoke machine and strobe lights to simulate a real fire. So that children can recognize familiar elements from their own home, the house design includes a stairway, upper and lower

floors, three types of windows, porch, balcony, hallway, and even pictures on the wall and scaled-down furniture.

A cooperative effort by educators in the Redmond and Bellevue Fire Departments led to the concept of building the house. The house is shared by 13 Eastside fire departments in the vicinity of Seattle, Washington.

Results: One of the first documented reports that the program was bottom-line effective came with the report from the Shoreline

Fire Department (one of the local users) that a participant in the project, a 6-year-old boy named Sean who had gone through the Fire Safety House training, had climbed out a bedroom window and saved his life when there was a serious fire in his home. He said he recalled the training.

For more information contact: Andrea McCullough, Emergency Services Program Coordinator, Redmond Fire Department, 8450 161st Avenue, N.E., Redmond, WA 98052, (206) 882-6511.

38. Potomac, Maryland: Eighth Grade Science Classes

Jurisdiction: Large suburban community
Target Group: Eighth graders and their homes
Subject: Home fire safety
Evaluation Measures: Detectors maintained; new behaviors; new information learned

Philip Schaenman, an author of this report, taught one-hour classes on the nature of the fire problem and home fire safety to each eighth grade science class at a local junior high school in Montgomery County, Maryland, from fall 1985 to fall 1988. Students learned about the severity of the fire problem in the United States, the fire triangle, how to prevent the most common types of homes fires, how to extinguish fires, and how to escape from a fire in their home. They also were taught about smoke detector maintenance. As homework preceding the class, the students were asked to count and test their detectors.

After the classes were over, the teachers asked every student to write a letter describing what new things they had learned. In 1988, a total of 245 letters were collected and analyzed to determine what lessons the children had learned, and what, if any, actions they might have taken as a result of the information. The students also were surveyed in class to determine the percent of households with detectors and the percent that worked.

Results: The students and their parents were surprised to find that about 10 percent of the detectors checked were not working in this suburb of predominantly affluent, owner-occupied homes. One immediate result was to have virtually all of the detectors found inoperative put back in working order.

Of the 245 letters submitted by the students, 231 (94 percent) documented one or more specific lessons learned or new informa-

Table 17 Potomac, Maryland Information Gained and New Behaviors (245 Students)		
<i>New Information Gained</i>	<i>Number of Students Citing It</i>	<i>Percent of Students Citing It</i>
1. Smoke kills and is dark	111	45
2. Fires grow and move quickly	51	21
3. Major causes of home fires	68	28
4. How to survive/escape from a fire	83	34
5. How to put out a fire	34	14
6. Ways to mitigate a fire (smoke detectors, sprinklers, cleaning chimney)	38	16
7. Types of detectors/why they are important	70	29
8. Fire triangle	20	8
9. Severity of U.S. fire problem and fire facts	113	46
<i>Actions Planned or Taken (New Behavior)</i>		
1. Planned and practiced escape routes	38	16
2. Checked smoke detectors/replaced batteries	48	20
3. Talked to family about fire safety	33	13
4. Checked electrical appliances	3	1
NOTE: Some students cited more than one type of information or behavior. Students were not asked to cite new behaviors, but some spontaneously did.		

tion. Thirty-one percent (75) of the students spontaneously related a new fire safety behavior directly attributable to the lessons, although they were not asked to do so; their response therefore represents a minimum. The total behavior

change probably was greater. For example, it is known that most of the 245 students checked their detectors as part of their homework, although only 48 noted that spontaneously in their letters. The results are presented in Table 17.

They have to be taken somewhat with a grain of salt because students may have been trying to placate the teacher in part.

While neither a formal evalua-

tion nor an objective measure of the gain in prevention knowledge, the results suggest that learning of key points did occur, and provide useful feedback for further instruction.

For more information contact: Philip Schaenman, President, TriData Corporation, 1500 Wilson Boulevard, Arlington, VA 22209, (703) 351-8300.

39. Salt Lake County Fire Department (Utah): Take a Fire to School Program

Jurisdiction: Suburban/rural
Target Group: Elementary schoolchildren
Subject: Home hazard reduction; home fire escape plans
Evaluation Measures: Anecdotes; participation level; behavior change

The Salt Lake County Fire Department presents a comprehensive set of child safety and health programs in 75 elementary schools. Firefighters conduct the fire safety programs, while emergency medical service (EMS) personnel focus on first aid, traffic safety, and even drug abuse prevention presentations.

The fire safety component of the program is the heart of the Department's child safety program. It began in 1987, after two children died in a fire when they ignited clothing in a closet while playing with cigarette lighters. To bring home the danger of this behavior, the Fire Department staff has for several years presented a dramatic demonstration in the schools. They set up a retail display rack with clothing on it and ignite the clothing so the children can see what happens. This experience is followed by a fire safety assembly. All materials for the program have been approved by mental health professionals, and the Department takes extensive safety precautions whenever presenting this demonstration.

The Department also presents a professionally staged fire safety

and basic child safety musical play that was developed with the help of a university.

The kindergarten program brings firefighters and a 911 operator into the classroom to teach stop, drop, and roll; crawl low in smoke; firefighters are your friends; cool the burn; and call 911. The focus is on playing with the children while teaching and allowing the kindergartners to practice what they have learned.

Results: A number of instances have occurred in which children have been saved from injury or death by remembering what they learned in one of the Salt Lake County Fire Department's school presentations. In one case, Mary Beth Chipman, a 5-year-old, smelled fire and went to the kitchen. Someone had left a trail of potato chips near the stove that had ignited, spreading fire to the kitchen counter. Remembering what she had learned in the kindergarten show, she called 911 to report the fire, although she stayed in the kitchen to do so. The operator asked who was there with her and instructed the little girl to take

her brother from the high chair. When the Fire Department arrived, she and her brother were safe in the front yard. Without that key first step of calling 911, this could have become a serious injury or fatal incident.

In another case, two brothers were playing with matches and lighting candles in their living room, when one of the boys ignited his clothing. He had participated in the kindergarten program just a week or two before, immediately remembered to stop, drop, and roll, and was able to put out the fire. The boy suffered only minor, first-degree burns.

These examples show not only the effectiveness of the program, but also where it needs to improve the message and motivation (in the first case, getting out of the house quickly; in the second, not playing with matches).

For more information contact: Jay Miles, Director of Public Education, Salt Lake County Fire Department, 2001 South State Street, South Building 3300, Salt Lake City, UT 84190-4300, (801) 468-3899.

40. University of Georgia: Dormitory Safety Program

Jurisdiction: College campus
Target Group: College students and personnel
Subject: Prevention; vandalism; false alarms; detection of and escape from dormitory fires
Evaluation Measures: Number of fires; number of false alarms

Many college-age students view themselves as immortal. To them, it is entertaining rather than life-threatening to pull false fire alarms, set small fires and vandalize fire protection equipment. At the University of Georgia, this reached the point where students in the mostly freshman male 10-story high-rise dorm, referred to as “the Zoo,” were completely ignoring fire alarms, assuming they were just another prank.

In 1987, an enforcement posture was taken to correct this situa-

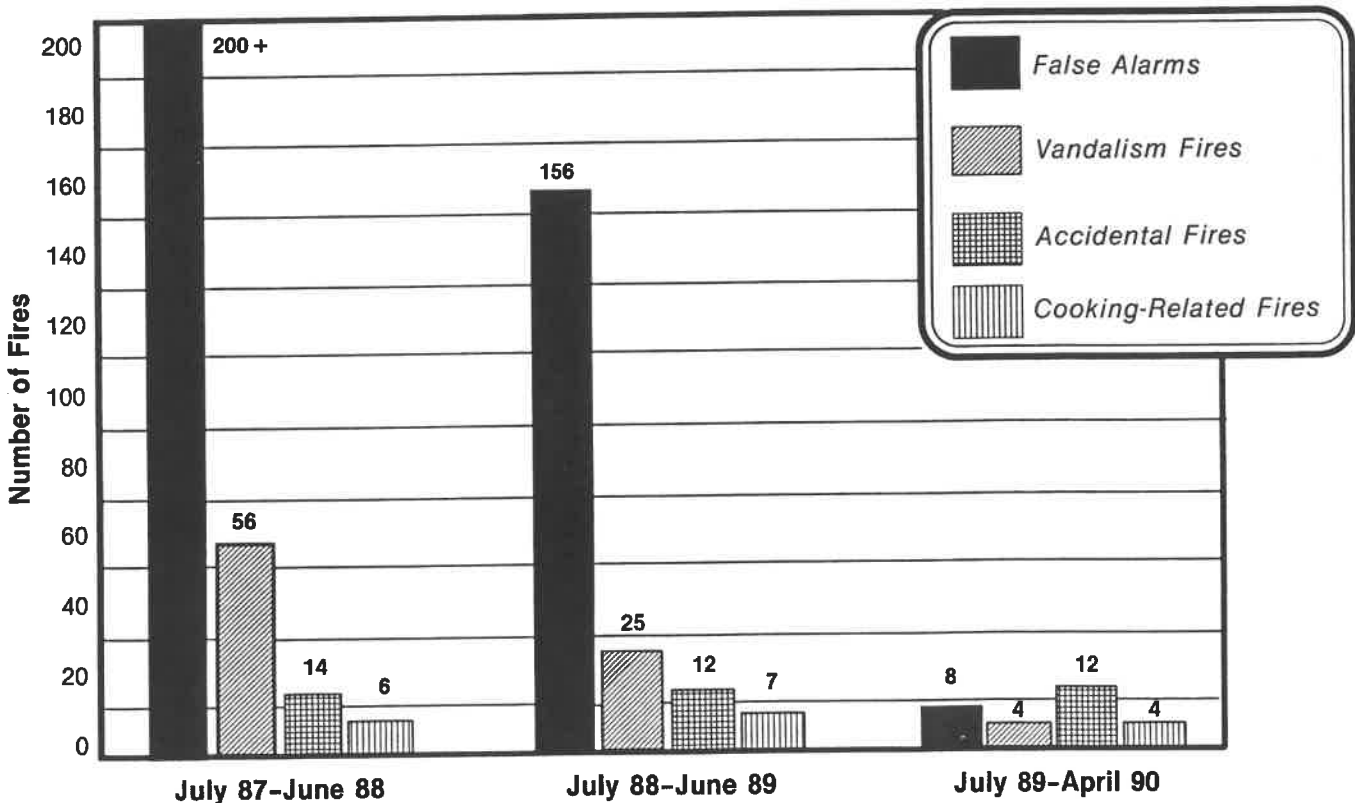
tion, with few results. A dormitory fire safety education program was started, with limited funds, by the fire marshal. Even though resident assistants and maintenance and administrative personnel were trained in the use of fire extinguishers and alarm equipment, more than 200 false alarms and 43 fires occurred in the high-rise dormitory alone during fiscal year 1987-88, with 76 fires campuswide.

Fire Marshal Frank Edwards, frustrated with the prevailing “anything goes” attitude, tried to locate

an education program that would effectively deal with the problem. However, he could not find educational materials that related to this predicament, even though it is common to many college campuses with on-campus housing facilities, as well as off-campus housing complexes serving mostly students.

Local funds were limited for the development of a fire safety education program. A grant was solicited from The Tobacco Institute’s Fire Safety Education Pro-

FIGURE 13. University of Georgia: Drop in False Alarms and Vandalism Fires





A student at the University of Georgia McPhaul Child Development Center is shown "modeling" turnout gear during a preschool fire safety program. Although college-age students are the audience at which the University of Georgia's "How Fast It Burned" video is aimed, repeating fire safety messages to the young through high school can reduce future problems in college.

gram to create "How Fast It Burned." In this 20-minute video program, a mock dormitory room is engulfed in flames within three minutes, reaching flashover and 1500°F from an accidental trash can fire. In a group discussion, the narrator talks with students about what went wrong, how to

correct fire safety problems and why they should be more responsible for their own environment.

Fire Marshal Edwards launched an intensive education campaign at the beginning of the 1988-89 school year. He visited each hall of the dormitories, gave talks to the students, and showed them

the videotape. Dormitory resident assistants were trained to watch for hazards and vandalism. The program continues today.

Results: Heightened fire safety awareness due to the program and training of students and housing personnel has resulted in a dramatic decrease in false alarms, vandalism fires and damaged equipment on campus. Figure 13 shows statistics for three periods from July 1987 to April 1990. False alarms dropped from 200 to 8. Vandalism fires dropped from 56 to 4. Accidental fires, which were already relatively low at 14 in 1987-88 dropped only slightly to 12.

This program was desperately needed and has spread rapidly. It currently is being used by more than 300 colleges and universities in 47 states and five Canadian provinces. Questionnaires were mailed in June 1990 to determine the impact on these campuses. This program was designed to be used as a general fire safety education tool for college-bound high school students and other residential programs, as well as on campus.

For more information contact:
Fire Marshal Frank Edwards,
University of Georgia, Public
Safety Building, Athens, GA
30602, (404) 542-5801.

41. Richmond, Virginia: Live Demonstration "Firehouse Friends Show"

<i>Jurisdiction:</i>	City
<i>Target Group:</i>	Elementary schoolchildren and their families
<i>Subject:</i>	Detectors; hazards; escape
<i>Evaluation Measures:</i>	Anecdotes

Entertaining young children while teaching them is the idea behind Richmond's widely acclaimed "Firehouse Friends Show," which uses a puppet show, a slide presentation, live demonstrations, and a healthy dose of humor to teach valuable fire safety lessons. Squirt, the firehouse mouse, and Smokey Joe, a seasoned firefighter, are the stars of the puppet show focusing

on using smoke detectors, conducting home fire hazard inspections, and devising and practicing fire escape plans. Duke the Dalmatian, a real dog, demonstrates stop, drop, and roll.

This popular presentation began as a fire safety education program in Richmond's Fire Museum, Steamer Company No. 5. After it opened in 1978, the museum at-

tracted increasing numbers of school classes. Tom Robinson, Jr., one of the founders of the museum, saw a need to present more fire safety education to elementary schoolchildren. A certified fire safety educator himself, Robinson arranged to have the state's public fire safety educator course taught to the personnel at Steamer Company No. 5. As the museum's

popularity steadily increased, Robinson looked for another approach.

Aetna Life and Casualty Foundation provided the grant that led to development of the Firehouse Friends Show. Soon demand for the program was so strong that the Richmond School Board asked Steamer Company No. 5 to take the show on the road to visit the city's elementary schools. That year, the Firehouse Friends Show was presented to 36,000 Richmond schoolchildren.

A grant from the Memorial Foundation for Children allowed them to take the Steamer 5 presentation to rural communities throughout Virginia, where small volunteer departments often lack the resources to present their own fire safety education programs. The show is presented only by volun-

teers who have completed training and are certified fire safety instructors. It has traveled throughout the country. Robinson estimates that the program reaches about 100,000 children each year. He hopes that the number will soon climb to 250,000 per year.

The latest and most innovative of Steamer Company No. 5's projects is the "Down and Out" house, a two-story house on wheels designed to teach escape and reporting a fire.

Results: The show has been credited with saving an average of three lives each year among children who remembered what they had learned about fire safety from Squirt, Smokey Joe, and Duke. The program has been especially effective in teaching fire prevention lessons to parents as well as children. Robinson has collected

a number of letters from parents who say their children came home excited to share all the information they learned and insisted that their families implement a number of fire safety lessons.

One parent wrote that his child would not go to bed until he had installed a smoke detector. Others report that their children insisted that they practice stop, drop, and roll or practice fire escape plans. Letters also document that children remembered what they had learned several months after the presentation. The program has been praised by parents and teachers, and by the Virginia Education Association.

For more information contact: Tom Robinson, Director, Steamer Company No. 5, 3740 Charles City Road, Richmond, VA 23231, (804) 644-1849.

SPECIFIC FIRE CAUSES OR TARGET GROUPS

This section discusses programs targeted at fires or burns from a single major cause such as heating, cooking, arson, fireworks, wildfires, or tap water scalds; or a single target population group, such as the elderly or Southeast

Asian immigrants. Many of the programs addressed in other sections include targeting specific causes such as careless smoking, heating, or cooking, but not measuring their impact separately from the combined impact of all

programs. Juvenile firesetter programs are broken out in a separate section that follows this one. Some case studies on specific target groups could have been placed here, but were left in the smoke detector section or elsewhere.

42. Portland, Oregon: Arson/Crime Prevention for Apartment Building Managers

<i>Jurisdiction:</i>	City
<i>Target Group:</i>	Apartment dwellers and apartment managers
<i>Subject:</i>	Anti-arson
<i>Evaluation Measures:</i>	Knowledge change; behavior changes; arson incidence

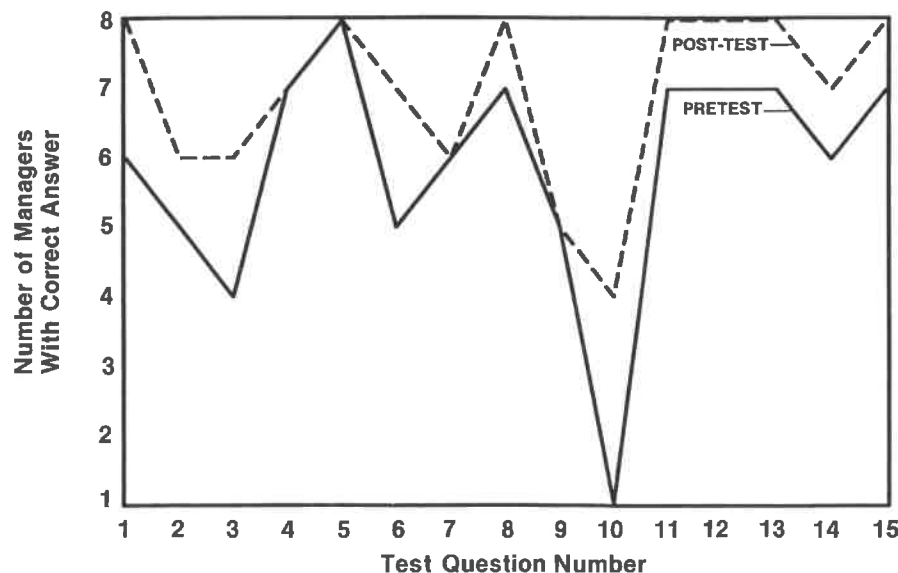
The Northwest District Association (NWDA) represents one of the most urban and oldest neighborhoods in Portland, Oregon. It has 11,400 residents. In this area 87 percent of the housing units are in renter-occupied apartment buildings compared to 57 percent for the city as a whole. Median income also is low—\$8,982 in NWDA compared to \$15,528 city-wide. In 1985, this area had the

highest per-capita rate of arson in the city. Data for 1984 showed that 34 percent of the area's fires were caused by arson, whereas the city average was 22 percent. Over the five-year period of 1981-86, the neighborhood experienced more than 175 set fires, with property loss exceeding \$800,000.

In 1986 a special anti-arson project was initiated to reduce the

number of arson fires in the NWDA area. Since most of these fires were occurring in the large apartment buildings that housed most of the area residents, the project targeted a public education program to the building owners. The NWDA project received funding from a U.S. Fire Administration arson grant for community-based organizations. The Portland Police Bureau for Crime Prevention also

**FIGURE 14. Portland, Oregon: Fire Safety Quiz
Pre- and Post-Test Scores for Apartment Building Managers**



awarded it a grant to increase security in an apartment building located in the heart of the arson corridor.

Project staff worked closely with the owners and managers of arson-prone buildings, assessed their knowledge of arson prevention and fire safety, and developed an education program to improve awareness. The objectives were to assist apartment building managers in developing strategies to deter arson and prevent loss of life in their buildings from set fires. Training was conducted in two 4-hour seminars, given one week apart to allow managers time to complete homework assignments. By 1988, 70 managers and maintenance staff had been trained.

Results: The project staff

evaluated the impact of their training in several ways:

- 1) Pre- and post-knowledge tests administered in 1989
- 2) Questionnaires that reflected behavior changes six months after the seminar
- 3) Increase or decrease in arson fires in apartment buildings

Eight of the initial managers in the program were given a pre- and post-test of 15 fire safety questions. The data, shown in Figure 14, indicate that managers improved their scores in 11 of the 15 questions. Seven managers had perfect post-test scores; only one manager had a perfect score in the pretest.

The behavioral questionnaire has been mailed to the Housing Authority of Portland and was to be administered soon after the time of this writing.

Most impressive was the change in the number of arson fires experienced in the Northwest District. Table 18 shows the immediate results from the anti-arson public education program: While the neighborhood was experiencing a remarkable decrease in arson fires and arson dollar loss, the city as a whole registered an 11 percent increase during fiscal 1987-88.

For more information contact: Joleen P. Classen, Executive Director, or James Hussey, Arson Prevention Coordinator, Arson Prevention Project, 1819 NW Everett, Portland, OR 97209, (503) 223-3331.

**Table 18
Arson Fires in Northwest Portland, Oregon**

	<i>Preprogram (FY 85-86)</i>	<i>Program Start (FY 86-87)</i>	<i>Post-Program (FY 87-88)</i>
Number of Arson Fires	21	32	11
Amount of Loss	\$719,200	\$29,850	\$3,696

43. Portland Fire Department (Maine): Southeast Asian Fire Awareness Program

Jurisdiction: City
Target Group: Southeast Asian immigrants
Subject: Cooking; detectors; escape
Evaluation Measures: Fires

The Portland, Maine, Fire Department was somewhat surprised to find that by the mid-1980s a sizable community of Southeast Asians had settled in a small area of the community, roughly a square mile. The majority were Cambodians, but Vietnamese and others lived there, too. Many were living in crowded or overcrowded apartments, with as many as three families living communally. Though only two percent of the city's population, they were accounting for a disproportionately large share of the fire runs and more than half of the fire deaths.

In partnership with Council #8144 of the Knights of Columbus, Portland obtained a grant from the Community Volunteer Fire Prevention Program of the U.S. Fire Administration. The purpose of the grant was to develop pamphlets, brochures, and videotapes on general fire safety and emergency reporting procedures in native languages for the Southeast Asian community in Portland. An advisory committee was formed, including several Southeast Asians, who provided insight into the many cultural differences in the community.

Two brochures were produced in each of four languages. Three

television public service announcements (PSAs) were produced with native speaking actors recruited from the local population. The PSAs were in Cambodian and Vietnamese, with English subtitles. They emphasized awareness that possessions are destroyed by fire; rapid home escape; crawling low under smoke; cooking safety; use of smoke detectors; and dialing 911.

A fire safety knowledge survey was produced in four languages (Cambodian, Laotian, Vietnamese, and English) and administered to a 400-500 person sample of the target community. In some cases, the test was administered orally to accommodate illiterate people in the sample. The results of the survey were used to refine the messages used in the materials.²⁴

Department members obtained some insight into their citizens' media habits in a clever manner: They asked social workers who were assisting these families in the home to note the TV programs and stations the people were watching. The Portland Fire Department then approached the most popularly watched local TV station with a radical suggestion—to run fire

safety PSAs in the Cambodian language with English subtitles, during the daytime. Ultimately, the PSAs were shown more than 100 times on several stations during the summer, reaching an estimated 1,800 members of the Southeast Asian community in Portland.

Results: The effects of the program were astonishingly good. Fire runs in the Southeast Asian neighborhood dropped from 316 the year before the program started (1987) to 96 runs the year of the program (1988), a decrease of 70 percent. The Department computed that there was a 95 percent confidence level that the drop was not due to chance. The third year (1989) had 111 runs through November—higher than 1988 but still much lower than the pre-program level.

Some members of the Portland Fire Department believe that the true change in fire incidence might have been even more favorable than the reported fires indicate, because more fires were being reported by citizens as a result of the PSAs' encouragement to get out fast and call 911.

For more information contact: Gerald S. DiMillo, Public Education Officer, Portland Fire Department, 380 Congress Street, Portland, ME 04101, (207) 874-8300.

²⁴ These Portland, Maine, fire safety surveys in three Southeast Asian languages are valuable by themselves as evaluation tools.

44. Burlington Fire Department (Vermont): Targeted Public Education Programs

Jurisdiction: Small city
Target Group: School children; elderly
Subject: Hotel safety; fire alarms; senior citizens
Evaluation Measures: Knowledge gain; false alarms by source; fire casualty rates; anecdotes

Burlington, Vermont, has a comprehensive public safety program. Rather than lump everything together in one evaluation, the Burlington Fire Department has separately evaluated a number of components of its program. This is one of the most sophisticated evaluation efforts in the nation, thanks to the director of the Department's public education program, Capt. Armand Bousquet. Selected components he evaluated are presented individually here.

High-Rise Safety—Capt. Bousquet has taught a variety of traditional fire safety topics to schoolchildren, but one of the more unusual classes was on hotel and motel fire safety for third graders. In the spring of 1986 he taught two classes together on this subject and conducted pre- and post-tests. The large hotel fires given high publicity had made the kids curious about safety in hotels and motels. He built on that curiosity and expanded the topic to include all public buildings of more than four or five stories. He found that

90 percent of middle- to upper-income third graders and 75 percent of lower-income third graders had stayed in hotels, so this was a more relevant topic to kids than it seemed on the surface. There also was the hope that the children would carry the messages home to the parents.

Results: The test results showed a pretest mean of 3.28 correct answers and a median of three out of 10 questions; post-test results were a mean of 9.29 and a median of 10, respectively.²⁵ Bousquet used these results to demonstrate that the knowledge gain was just about as good when he combined two classes as when he taught them separately, and this was an efficient way to reach more children. Bousquet also wanted to conduct a post-test several months after the class, but was not able to do that. Unanswered was whether the

²⁵ Bousquet also computed standard deviations and 95 percent confidence limits to determine statistical validity and the potential range of error. The results proved overwhelmingly significant.

retention was as good as for a smaller class—an excellent question raised by Bousquet himself. As noted earlier, evaluations can be used to improve productivity as well as effectiveness by monitoring results with different levels of staff time, or audience size.

False and Malicious Alarms—Capt. Bousquet began teaching children about the seriousness of false fire alarms in 1979 after the Department experienced a growing problem with false and malicious calls. Examining the data on when and where these calls were being registered, the Department determined that the two main causes of the problem were kids in the hours after school and patrons of bars after closing hours. The Department felt it would be next to impossible to change the latter, and so focused on teaching the children.

Results: In 1979, 33 percent of all calls were false and malicious. The percentage dropped slowly and steadily to 12.6 percent in 1988. The remaining malicious/false calls are almost entirely those made during early morning hours by adults.

Senior Citizen High-Rise Fire Safety—Fire safety classes have been taught in high-rise buildings that cater to senior citizens. Based on pretests, seniors' biggest knowledge problem seemed to be in smoke detector maintenance. No one in one group and only 23 percent in a second group were aware that detectors should be vacuumed every six months. Other safety topics with low scores on the pretest included UL ratings on detectors, grease fires, causes of burns to the elderly, and proper hot water temperatures. Remembering the right temperature proved to be

Table 19
Comparison of Burlington, Vermont, to Like Cities
(1986-1988)

	<i>Burlington</i>	<i>Average of 11 NE Cities</i>
Population	52,000	49,700
Deaths (3-yr. average)	0	1.4
Injuries (3-yr. average)	13	40.3
Building Fires	95	439
Fire Prevention Outreach		
# Adults + Children	16,524	1,757
# Schoolchildren Only	6,445	1,638

one of the most difficult points to get across.

Results: After the classes, 82 percent of the first group and 100 percent of the second group got the maintenance question right. In the pretest no one in either elderly group got a perfect 100 percent score. In the post-test, 51 percent of one group and 63 percent of the other got perfect scores. There were sharp improvements in scores on other questions as well.

Comparison With Like Communities—The Burlington Fire Department undertook a statistical comparison of selected community and fire department variables in 1988 to determine how productive the Department was compared to 11 other cities of similar make-up.

The results show that Burlington, with a larger population and a smaller budget than its neighbors, operates at one-half the cost per capita while reaching more citizens with fire safety information and having fewer losses, as shown in Table 19. The fire safety education effort was a factor cited in Burlington's favorable comparison.

Anecdotes—Another means of evaluating overall program results has been anecdotes of saves attributed to Burlington's school program and elderly high-rise program over the last 3-4 years. Five anecdotes are summarized below.

December 1985, 31 East Spring St.

Fire in a five-story senior citizen housing project. Resident wrote to Fire Department saying there would have been more victims if building occupants had not heard a talk from a public fire educator and seen the same person giving safety advice on TV before the fire.

June 1987, 52 North Champlain St.

Arson fire. Three-story apartment house. Family on third floor. Mother told 6-year-old daughter to get out because the house was on fire. The girl immediately went to her 4-year-old sister, who was standing in the bedroom crying. She told her sister that



In addition to traditional fire safety, Burlington, Vermont, teaches schoolchildren about hotel fire safety.

they had to crawl to get out of the house. She then grabbed her sister by the hand, pulled her down to the ground, and brought her to the door. When they got outside, they went to the front of the building and sat on the grass to wait for their mother. The 6-year-old said that she learned what to do from "Fireman Friendly" (what the school safety program is called). The house was totally destroyed, but there were no casualties.

September 1987, 16 St. Louis St.

1-1/2 story two-apartment house. Seven children in family. Smoke detector went off at 0225 hours. Mother and father tried to find source of smoke in house. Eldest daughter, 10 years old, took control. She told everyone they had to get down and get out. Also felt door on the way out of room. Once outside she made sure everyone stayed out of building. She stated she remembered what to do from school.

April 1988, 669 Riverside Ave.

Multifamily low-income housing project. Fire breaks out

in early morning (0615). Fire-fighter was met at the door of apartment house by a 10-year-old girl. She stated, "Everything you said would happen in a fire, did. The smoke went up, I went down. I felt the door and it was cool. There was smoke in the hallway but I was able to crawl below it and get out."

December 1988, Edmund's Middle School

Home economics class. Sixth grade. An 11-year-old girl's clothes caught fire from a burning potholder. She started to panic and ran. Her classmates yelled, "Stop, drop, and roll!" to the girl. She said she heard this and remembered. She dropped to the ground while several students jumped on her to extinguish the flames. She received burns over 20 percent of her body, but without the quick action the burns would have been life-threatening.

Why have all these programs in Burlington been so well evaluated and so successful? Much of the credit must go to their principal

public educator. Like many highly motivated former firefighters-turned-educators such as Don Manno of the National Fire Academy, Don Ethridge of the Georgia Fire Academy, Lonnie Jackson of Mt. Prospect, Illinois, and Tom O'Connell of Chicago, to name a few, Capt. Bousquet had seen

young children killed in fires he had fought in vain. With a background in drama, he felt comfortable in front of an audience. He also credits the National Fire Academy's Introduction to Public Education course, the Academy's management classes, and lessons from noted public fire educator

Jacqueline Sowers as among his formative experiences as an instructor.

For more information contact: Capt. Armand Bousquet, Director, Public Information and Education, Burlington Fire Department, 136 S. Winooski Avenue, Burlington, VT 05401, (802) 864-4554 or 864-5577.

45. State of New York: Burn Injury Prevention Program

<i>Jurisdiction:</i>	Statewide
<i>Target Group:</i>	Low-income population
<i>Subject:</i>	Burn injuries; smoke detection; hot water temperatures
<i>Evaluation Measures:</i>	Hazards removal; detector usage

New York State's Department of Health has an injury prevention program, part of which is targeted at burn injuries in low-income families who requested burn prevention services. One element in the program is a Burn Injury Prevention Survey that has been conducted by telephone or in person in 10 upstate counties during 1989-90. The counties are: Chanango, Clinton, Delaware, Franklin, Livingston, Otsego, Rensselaer, Schoharre, Steuben, and Tomkins.

The burn prevention survey is intended to evaluate the effectiveness of "active" and "passive" intervention approaches. "Passive" approaches include installation of smoke detectors and lowering of hot water heater temperatures. "Active" approaches include a home burn hazard check and recording of hazards room by room. The U.S. Department of Health and Human Services funded the project.

Participating households are given a first survey consisting of both questions and observations, and

then, 4-6 weeks later, a second (post) survey and reinspection. The plan is to return for one-year and two-year internal checks.

The survey has three parts. The first (Part A) collects baseline information on the household, including its fire history. The second (Part B) collects information on each person in the household who was burned and needed treatment during the past five years. The third part of the survey (Part C) focuses on burn injury prevention knowledge (see box at right). For any wrong answers, corrections are suggested. The questions are directed to the head of the household.

The burn prevention knowledge survey includes questions on the various ways that infants or toddlers can be burned around the home; hot water temperature setting; burn first-aid; fire escape plans; extinguishing pan grease fires; stop, drop, and roll; chimney cleaning; inspection; and working smoke detectors.

The room-by-room observation of burn hazards "is intended to help identify potential burn risks

to the family and correct them where possible." It looks for electrical, fire, and scald hazards. Data also are collected on primary and alternate heating sources (Part D of the survey form—see box on page 74).

Electrical hazards on the checklist include overloaded extension cords, frayed cords, and absence of circuit breakers. Fire hazards on the checklist include items such as matches in reach of children, volatile liquids improperly stored, curtains near heat sources, and candles near flammable materials.

Copies of the prevention survey and the hazard observation form are shown on the following pages. This project was under way at the time of this research and had the potential for providing excellent, in-depth evidence on not only bottom-line effectiveness, but how it was achieved.

For more information contact: New York State Health Department, Corning Tower, Room 621, Empire State Plaza, Albany, NY 12237, (518) 473-1143.

New York State Burn Injury Prevention Survey

PART C: Burn Injury Prevention Knowledge

NEW YORK STATE DEPARTMENT OF HEALTH
Burn Injury Prevention Project Survey
CASE NUMBER _____

C1. What do you usually do with infants/toddlers when preparing hot foods? (check all that apply)	<input type="checkbox"/> a. Hold them	<input type="checkbox"/> c. Let them roam in kitchen	<input type="checkbox"/> e. Other _____	<div>Correction</div> <div>g.</div>	
	<input type="checkbox"/> b. Put them in another room	<input type="checkbox"/> d. Secure in kitchen	<input type="checkbox"/> f. Not applicable		
C2. What do you usually do with infants/toddlers when you drink hot liquids? (check all that apply)	<input type="checkbox"/> a. Hold on lap	<input type="checkbox"/> c. Let them roam in kitchen	<input type="checkbox"/> e. Secure in another room	<div>Correction</div> <div>h.</div>	
	<input type="checkbox"/> b. Hold while standing/walking	<input type="checkbox"/> d. Secure in kitchen	<input type="checkbox"/> f. Other _____		
C3. Can the water from your sink or bathtub cause a scald?	<input type="checkbox"/> a. Yes	<input type="checkbox"/> b. No	<input type="checkbox"/> c. Don't Know	<div>Correction</div> <div>d.</div>	
C4. Do you know at what temperature your hot water heater tank is set?	<input type="checkbox"/> a. Yes	<input type="checkbox"/> b. No		<div>Correction</div> <div>e.</div>	
4a. If yes, what is the temperature? _____ degrees					
C5. Can the temperature of your hot water heater tank be turned down?	<input type="checkbox"/> a. Yes	<input type="checkbox"/> b. No	<input type="checkbox"/> c. Don't Know		
C6. What is the best thing to immediately put on a burn? (check only one)	<input type="checkbox"/> a. Ice	<input type="checkbox"/> c. Clean Sheet	<input type="checkbox"/> e. Vaseline	<div>Correction</div> <div>f.</div>	
	<input type="checkbox"/> b. Cold Water	<input type="checkbox"/> d. Butter	<input type="checkbox"/> f. Burn Ointment/Cream		
C7. Some families have made a plan for getting out of the house in case of a fire. Have you?	<input type="checkbox"/> a. Yes	<input type="checkbox"/> b. No		<div>Correction</div> <div>e.</div>	
7a. If yes, how often do you practice it?					
	<input type="checkbox"/> 1. One time/year	<input type="checkbox"/> 2. Two times/year	<input type="checkbox"/> 3. Three/five times/year	<input type="checkbox"/> 4. Don't practice	
C8. If your clothing caught on fire, what action would you take first? (check only one)	<input type="checkbox"/> a. Stop, drop and roll	<input type="checkbox"/> b. Use water	<input type="checkbox"/> c. Run for help	<input type="checkbox"/> d. Use a blanket	<div>Correction</div> <div>g.</div>
	<input type="checkbox"/> e. Don't know	<input type="checkbox"/> f. Other _____			
C9. What would you do if a pan of grease caught on fire? (check only one)	<input type="checkbox"/> a. Throw it in sink	<input type="checkbox"/> b. Put water on it	<input type="checkbox"/> c. Put baking soda on it	<input type="checkbox"/> d. Use pan cover	<div>Correction</div> <div>g.</div>
	<input type="checkbox"/> e. Don't know	<input type="checkbox"/> f. Other _____			
C10. When was the last time your chimney was inspected and/or cleaned?	<input type="checkbox"/> a. Year (____)	<input type="checkbox"/> b. Don't know	<input type="checkbox"/> c. Has never been cleaned	<input type="checkbox"/> d. Not applicable	<div>Correction</div> <div>e.</div>
C11. Do you have a smoke detector?					
	<input type="checkbox"/> a. Yes	<input type="checkbox"/> b. No			<div>Correction</div> <div>c.</div>
7a. If yes, how often do you check your smoke detector batteries?					
	<input type="checkbox"/> 1. Never	<input type="checkbox"/> 2. Once a year	<input type="checkbox"/> 3. Twice a year	<input type="checkbox"/> 4. Three to five times a year	
C12. Time ended _____ A.M. _____ P.M.					

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New York State Burn Risk Observation Form

NEW YORK STATE DEPARTMENT OF HEALTH
Burn Injury Prevention Project Survey
CASE NUMBER _____

PART D: Burn Risk Observation

D1. Time Started _____ A.M. _____ P.M.

Living Area Codes

K Kitchen HU Hallway Up BU Bathroom Up B1 Bedroom
HD Hallway Down BD Bathroom Down BA Basement B2 Bedroom

B3 Bedroom L Living Room A Attic O Other
D Dining Room G Garage OU Outdoors

Burn Hazards

Living Areas Disposition

1 2 3 4 5 6
Cor. Cor. Sug. Other

Electrical

D2. Extension cord(s) overloaded
D3. Outlet(s) overloaded
D4. No cover plate(s)
D5. No circuit breaker(s)
D6. Appliance(s) plugged near water
D7. Appliance cord(s) in reach of children
D8. Electric blanket(s) covered/folded
D9. Other _____

Scalds (continued)

D22. Pot handle(s) hang over stove
D23. Top heavy beverage maker(s)
D24. Coffee cup(s) in reach of children
D25. Other _____

Heating

D26. Portable kerosene heater(s)
D27. Woodstove(s)
D28. Electric space heater(s)
D29. Alternate heating source(s) (describe)
a. _____
b. _____
c. _____

Fire

D10. Matches/lighter(s) in reach of children
D11. Nonfunctional fire extinguisher
D12. Used ashtray(s) near flammable material(s)
D13. Curtain(s)/towel(s) near flammable material(s)
D14. Used candle(s)/oil lamp(s) near flammable material(s)
D15. Volatile liquid(s) improperly stored
D16. Chimney/vent pipe improperly used (describe) _____
D17. No smoke detector(s)

Precautions

D31. Functional smoke detector(s)
D32. Functional fire extinguisher(s)
D33. Emergency fire department phone numbers or 911
D34. Fire escape plan
D35. Burn prevention magnet(s)
D36. Other precautions (describe)
a. _____
b. _____
c. _____

D18. No battery in existing smoke detector(s)

Scalds

D20. Tap water temperature: _____ degrees
D21. Hot water controls in reach of children under age 5

D37. Room(s) not permitted to inspect

D38. Time ended _____ A.M. _____ P.M.

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46. Minnetonka Fire Department (Minnesota): Wood Burning Fire Safety

Jurisdiction: Suburban town
Target Group: Homes
Subject: Wood safety
Evaluation Measures: Chimney fires

The Minnetonka Fire Department has had an aggressive public education program, headed by its Fire Marshal. One topic in the program was chimney fire safety. In December 1987 the Department inserted a short, simple brochure on wood burning fire safety tips into a mailing containing a Homestead Tax Credit Application. It was printed on the same size and color stock as the application to give it an official look, and was distributed to all homes. By cleverly

tying it to a piece of mail dealing with taxes, which was more likely to be looked at than other pieces of direct mail, the Department obtained higher exposure.

Results: Minnetonka had been averaging 10-15 chimney fires during the fall and winter each year. In the 1988-89 heating season, only three chimney fires were reported. The snowfall that season was slightly below normal, which also may have contributed to the decline. The Department planned

to repeat the mailing the following season to see if it helped again, or if the first year was a fluke. (Evaluating results for more than one year after a program starts is a sound evaluation approach.)

For more information contact:
Mary Nachbar, Firefighter,²⁶ Minnetonka Fire Department, 14550 Minnetonka Boulevard, Minnetonka, MN 55345-1597, (612) 643-3080.

²⁶ Mary Nachbar is also Public Fire Safety Educator, Office of the Minnesota State Fire Marshal, St. Paul.

47. Philadelphia Fire Department (Pennsylvania): Inner-City Home Heating Safety Program

Jurisdiction: Large city
Target Group: Inner-city dwellers in one-, two-, and three-family homes and apartments
Subject: Heating safety
Evaluation Measures: Knowledge gain; outreach; anecdote

In 1983, the Philadelphia Fire Department designed and implemented a series of one-and-one-half-hour public education presentations in target areas that were selected based on fire statistics. The target areas were all low-income, inner-city residential neighborhoods. The targeted audiences were people living in one-, two-, or three-family dwellings and people in apartment units. Programs included both demonstrations and lectures.

A questionnaire was distributed to all attendees before the fire presentation program began, to test the knowledge of the participants regarding fire safety and fire prevention practices, especially home heating fire safety.

After this questionnaire was collected, the "Chemistry of Fire" demonstration was conducted,

featuring a table-top fire demonstration illustrating the many causes of fires throughout the home, and the measures that should be taken to avoid these fires. The demonstration also explained ways to keep personal injury and property damage to a minimum, in case of fire. A short slide program then was shown regarding the importance of smoke detectors. The slide show emphasized the purchase, installation, and maintenance of smoke detectors and the importance of home escape planning. Finally, potential fire hazards in the home were discussed room by room, using large visual charts to point out the problem areas of each room and what could be done to correct them.

Each program above emphasized home heating appliance safety, in-

cluding their selection, use, installation, inspection, and maintenance. Wood stoves, fixed room heaters, fireplaces, fireplace inserts, and gas and electric space heaters all were included, but portable electric space heaters and portable quartz heaters were stressed the most, since the statistics indicated they were especially bad problems in the target areas.

In 1990, the Philadelphia Fire Department also conducted a fire safety educational program throughout the city to upgrade awareness of how to purchase, use, and maintain kerosene heaters.

At each program, a packet of fire prevention information was provided to each participant. It included materials from the Consumer Product Safety Commission on home heating safety, smoke detectors, and home fire

safety; fact sheets on wood and coal burning heating stoves and fireplaces; a brochure on gas space heaters; and the Philadelphia Fire Department's own material on smoke detectors, home escape planning, and fire safety tips to eliminate home fire hazards.

Results: At the conclusion of the program, a second test was given to the participants. The results have shown a marked improvement in knowledge about fire safety. Based on their demonstrated success, the programs have been conducted in many areas of Philadel-

phia, with special attention to inner-city low-income neighborhoods. Each educational session has reached 100 or more citizens.

A recent anecdote added evidence to the effectiveness of the program. An 80-year-old woman put a frying pan on her gas stove without realizing that a plastic-handled knife had fallen in the burner. She extinguished the fire that ensued with dry baking powder from her closet, which she had learned to do from a Fire Department presentation at her senior

citizen center. The clinching detail was that she not only knew to use baking soda, but took it from her closet rather than the refrigerator because she had been taught that the baking soda in the refrigerator might have absorbed moisture and not be as effective.

For more information contact: Deputy Chief Matthew McCrory or Firefighter Jim Connell, Fire Prevention Division, Philadelphia Fire Department, 3rd and Spring Garden Streets, Philadelphia, PA 19123-2991, (215) 592-5967.

48. Chesterfield County Fire Department (Virginia): "Fry It Safe" Program

Jurisdiction: Town
Target Group: Middle and high school students and their families
Subject: Cooking safety
Evaluation Measures: Knowledge gain; anecdote

The number-one cause of structure fires in Chesterfield County, Virginia, is cooking. The Fire Department's education section has developed a program for students in the middle schools of the county to create an awareness of the dangers when cooking, especially with oils. Hoping to educate the teenagers and have them take the information home to their parents and other family members, the Department contacted the Institute of Shortening and Edible Oils, Inc., to get a free copy of the video entitled "Fry It Safe," along with 5,000 handout sheets about how to prevent cooking oil burns.²⁷

Armed with the video and handout sheet samples, the Department introduced the program to home economics teachers during an in-service day before the opening of school. The program was then tested in two high schools and two middle schools.

Results: Five-question pre- and

post-tests were administered to 498 students who took the program during the 1988-89 school year. The improvement in knowledge was outstanding. More than half of the students got two of the questions wrong on the pretest. On the post-test, about 95 percent got these questions right. The scores are shown in Table 20. One of those questions, perhaps the most critical one from a life safety viewpoint, asked whether it was okay to move a burning pan

of oil off the stove. Most students incorrectly thought that moving the pan was the right thing to do.

In addition to the tests, there has already been a documented save from the program. On May 1, 1989, a 10-year-old girl named Julie started to heat oil in a pan to make popcorn, and left it unattended to make a telephone call. When she came back to the kitchen, the oil was blazing. She ran outside to get her 13-year-old sister Gabrielle, who had taken the cook-

Table 20
Chesterfield County's "Fry It Safe" Program
School Year 1988-89
(498 Students Tested)

<u>Question</u>	<u>Pretest</u>		<u>Post-Test</u>	
	<u># Right</u>	<u>% Right</u>	<u># Right</u>	<u>% Right</u>
1	427	85%	491	98%
2	436	88	498	100
3	209	41	471	94
4	229	45	483	96
5	431	86	494	99

²⁷ Institute of Shortening and Edible Oils, 1750 New York Ave., N.W., Washington, DC 20006, (202) 783-7960.

ing safety program. After an initial false start using water, which caused the fire to flare, Gabrielle remembered from her class that this type of fire could be extinguished with baking soda, which she proceeded to use. There was minimal damage to their kitchen compared to what would have happened in the next several minutes before the fire service could arrive.²⁸

For more information contact: Mary Parker, Fire Safety Education Officer, Fire Prevention Bureau, Chesterfield County, P.O. Box 40, Chesterfield, VA 23832-0040, (804) 748-1167.

²⁸ Some might feel that they should have called the Fire Department and not gone back in. They still had an exit to their back, did not move the pan, and did successfully extinguish the fire without injury. Whether to fight small fires or attempt to extinguish them remains somewhat controversial.



Fire Safety Education Officer Mary Parker, 13-year-old Gabrielle Cookus, and her 10-year-old sister, Julie, show the best methods of putting out a grease fire as part of the Chesterfield County, Virginia, "Fry It Safe" program.

49. State of Washington: "Firebusters" Contest and Television News Series

<i>Jurisdiction:</i>	State
<i>Target Group:</i>	All households
<i>Subject:</i>	Fire and burn prevention; fire survival
<i>Evaluation Measures:</i>	Anecdotes; viewers reached; viewers responding; student worksheets returned

Washington Public Fire Educators borrowed and expanded the Firebusters program that was originated by fire educators in the State of Oregon. The annual program is based on a five-part television news series independently produced in four television markets in the state and aired during a one-week period. Each nightly report focuses on a specific fire or burn problem and runs three to five minutes—a very generous amount of time for TV news. The four different TV markets may each show a different version of the same theme; for example, fire departments in each market equipped their own local reporters with self-contained breathing apparatus to demonstrate the facts about fire.

Student worksheets and teacher lesson plans corresponding to the

news series plans are distributed by 112 fire departments participating in the program. Completed worksheets are returned to fire departments or program corporate sponsors for an opportunity to win prizes including a family trip to Disneyland, bikes, Nintendo games, and more. Local jurisdictions sponsoring the program offer additional prizes and/or conduct contests among schools within their jurisdiction to increase participation.

Subjects for the nightly news stories have included realistic fire conditions, escape planning, burn prevention, smoke detectors, and emergency calling procedures. One segment focused on cooking safety—how to put a lid on a pan fire on a stove, and the flare-up that could occur if water was

thrown on the fire.

Funding and in-kind services to conduct the program have been provided by the Northwest Burn Foundation, Skipper's Restaurants, Inc., and the Unigard Insurance Group.

Results: Nielsen ratings indicate the statewide nightly viewing audience for the most recent series was 358,000 persons. In the same year, 34,439 student worksheets were completed and returned to a school, fire department, or program corporate sponsor for a chance to win prizes. This represents a 10.4 percent student return rate statewide. In the Seattle market alone, more than 3,000 viewers sent stamped, self-addressed envelopes requesting a special fire safety packet that was offered as part of the program.

Anecdotes document three instances in which fire victims attributed their survival to the Firebusters program. A man working in an automotive repair shop became engulfed in flames when gas vapors ignited. Three days before his accident, he had viewed the Firebusters segment that addressed the stop, drop, and roll procedure. By doing that, he avoided serious burns and was able to be treated without hospitalization.

He attributes his lifesaving actions directly to the program.

Three 7-year-old boys discovered a fire caused by heating equipment. They crawled low through smoke to evacuate the house, and notified an adult on the way out to call the Fire Department.

A man who had a grease fire shortly after watching a segment on kitchen fires wrote to say he did not throw water on the fire as a result of watching the Firebusters

segment. He avoided injury and limited fire damage by putting a lid on the pan to successfully smother the fire.

For more information contact: Washington Public Fire Educators, A Division of the Washington State Association of Fire Chiefs, c/o Diane Shirk, Public Education Supervisor, Seattle Fire Department, 301 Second Avenue South, Seattle, WA 98104, (206) 386-1400.

50. Montgomery County Fire and Rescue Services (Maryland): Fireworks Abatement

Jurisdiction: Large suburban county
Target Group: Children
Subject: Fireworks safety
Evaluation Measures: Injuries from fireworks

"Operation Fireworks" was created in 1986 to counter the increasing number of fireworks-related injuries and the influx of illegal fireworks into Montgomery County, Maryland, during the 4th of July season. The situation was complicated by the fact that two bordering jurisdictions permitted fireworks to be purchased. Many Montgomery County residents simply bought fireworks in the adjacent area and transported them into the county. Children were the primary victims of accidents resulting from fireworks explosions.

The Department of Fire and Rescue Services, along with the State Fire Marshal's office, embarked on a public education campaign combined with strict enforcement of county laws prohibiting the sale and discharge of fireworks. To educate the public, the Department worked closely with the media. They:

- Held a news conference announcing "Operation Fireworks"
- Showed the dangers of fireworks by discharging a device in a prosthetic hand

- Held press briefings on the spot where illegal fireworks were confiscated
- Posted warnings at the borders
- Conducted taped and live radio and television appearances

The enforcement activities included covert operations to watch for people purchasing fireworks at stands in other jurisdictions and bringing the fireworks into the county; confiscating the fireworks and issuing severe criminal or civil penalties; patrolling legal fireworks displays to prevent illegal

fireworks from being discharged in the crowd; and aggressively prosecuting those breaking the law.

Results: "Operation Fireworks" began in 1986. Fireworks confiscations were up and injuries went down sharply after the program began, as shown in Table 21. The majority seized in 1987 were from one raid on a distributor.

For more information contact: Mary Marchone, Fire Education Specialist, Montgomery County Fire and Rescue Services, 101 Monroe Street, 12th Floor, Rockville, MD 20850, (301) 217-2442.

Table 21
Fireworks Activity Report for
4th of July Holiday Period
Montgomery County, Maryland

	<u>1986</u>	<u>1987</u>	<u>1988</u>
Confiscations	231	24	13
Pieces Seized	25,000	125,000	77
Injuries	9	1	0

51. Winnipeg, Manitoba, Canada: Preventive Education Program on Pediatric Tap Water Scald Injuries

Jurisdiction: City
Target Group: Parents with young children
Subject: Burn injuries
Evaluation Measures: Tap water burn injuries

A 1979 survey of hot tap water burn cases admitted to the children's burn unit at the Winnipeg Children's Hospital from 1973 to 1978 provided the impetus for an education campaign to reduce these mishaps. It also provided the baseline data needed for the campaign's evaluation.

The subsequent 1979-81 educational initiative warned of the dangers of hot tap water and encouraged a reduction in its temperature. Instructions on how to do this safely were developed by local utilities before the program. The message was conveyed through multiple channels—national magazine articles, local and regional newspapers, television programs, local and national safety bulletins/pamphlets, utility bill enclosures, posters, and the annual door-to-door firefighters' home inspection program. Health care and consumer groups were informed through their journals and newsletters.

Results: A 1988 survey of the period 1973-88 documented the impact of the preventive education program. The annual number of tap water burns are plotted in Figure 15.

There was a decrease in the average number of hot water tap scalds after the 1979-81 program from an annual average of 4.5 in 1973-78 to an average of 3.5 for 1979-87.²⁹ The extent of burns, the length of hospital stays, and the need for skin grafting did not change significantly. The number

²⁹ The authors of the Canadian study noted that was not a "statistically significant" reduction. However, the small numbers of hot water tap scalds each year make it difficult to obtain statistically significant results at the usual standard of 95 percent confidence. The number of burns dropped from a preprogram peak of 7, down to 5, 3, 3, and 2 in the four years during and immediately after the program. The lack of statistical significance does not mean the study failed, but rather that there was not enough data to prove that the success was due to the prevention program. But fewer kids got burned.

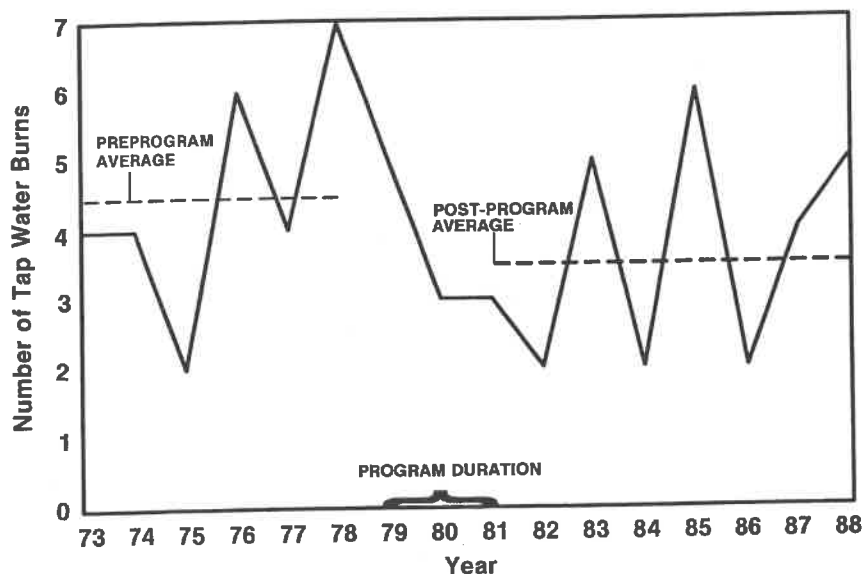
of cases of possible child abuse or neglect investigated increased after the program (from 28 percent to 44 percent). Eight out of the first 16 cases deemed highly suspicious in the 1988 survey were proven to be child abuse.

The authors of the burn survey observed that showing an education increase does not necessarily imply there will be an end impact. (We made this point in Chapter II while arguing for measuring end impacts whenever possible.) Increased knowledge does not necessarily translate into improved outcomes, they noted, because the groups at greatest risk are often the ones least receptive to education.

While parents of young children may have responded to the educational effort during 1980-81, subsequent parents during 1982-88 were not exposed to the message as often and from as many sources, reflecting the need to have an intensive, ongoing effort to achieve optimum results. The authors of the study concluded that given the limited resources available for prevention, efforts may be better directed at the reduction of hot water tank thermostats at the factory to 120-125°F (49-52°C) and the inclusion of scald guards on all water outlets in building codes for multi-family dwellings. This proposed approach also will need to be evaluated.

For more information contact: Glenn Kobussen, Saskatchewan Professional Firefighters Association, Saskatoon, Saskatchewan, Canada, or R. Stanwick, M.D., University of Manitoba, Department of Community Health Sciences, Room S113, 750 Bannatyne Street, Winnipeg, Manitoba, Canada R3E 0W3, (204) 788-6666.

FIGURE 15. Winnipeg, Manitoba: Trend in Tap Water Burns



JUVENILE FIRESETTER PROGRAMS

This section contains evaluations of programs aimed at

juveniles who intentionally set fires, whether for curiosity, fun,

vandalism, or malicious purposes.

52. Upper Arlington Fire Department (Ohio): Long-Term Juvenile Firesetter Program

Jurisdiction: Medium-size suburb
Target Group: Juvenile firesetters
Subject: Juvenile fires
Evaluation Measures: Recidivism rate

Upper Arlington, Ohio, has one of the longer-standing juvenile firesetter programs of its kind in the country. The program uses fire safety education and professional mental health counseling as the primary intervention strategies, as do many other programs.

Upper Arlington keeps a computer listing of its juvenile firesetters, with information on the type of fire set, whether they were referred for counseling, their motivation, and the number of screening and education sessions held for each child. This allows a more detailed evaluation to be made with respect to whether extended counseling

makes a difference, versus types of firesetters.

Children in the program range from 3 to 15 years old, with the exception of one 22-year-old. Most children have one screening session, with a few having two. The number of education sessions following screening ran from none to six; slightly more than half the group had two or more.

Results: During its first 13 years, 1963-76, 360 youths and their parents were treated in the program. Only 11, about 3 percent, of the 360 children continued to set fires. No data are available for 1977-83.

From 1984 to 1988, 74 youths were seen. Of this group, 42 set fires only out of curiosity; they received no mental counseling, but did receive fire safety education lessons. None of these curiosity firesetters repeated firesetting behavior after exposure to the program. Of the remaining 32, who were the more troubled kids, only one became a recidivist.

For more information contact: Daniel Strohl, Fire Safety Inspector, Upper Arlington Fire Department, 3600 Tremont Road, Upper Arlington, OH 43221, (614) 457-5080.

53. Shriners Burns Institute, Cincinnati, Ohio: Comprehensive Firesetter Intervention Program

Jurisdiction: City
Target Group: Parents of juvenile firesetters
Subject: Child fire play
Evaluation Measures: Recidivism rate

In 1974, the Shriners hospital in Cincinnati began a procedure for intervening in the firesetting behavior of young children who experimented with fire out of curiosity. The program is called "A Match Is a Tool," and was developed for parents to use in discouraging fire play. Parents who contact the hospital concerned about their kids' playing with matches are sent a copy of the

program and instructions for its use. As the program matured, the hospital established a referral process with local fire departments, the hospital's burn treatment center, and mental health agencies for the "noncurious" juvenile firesetter, too.

According to the Shriners Institute, "the key point in [the program's] method is the parent/child relationship. The positive aspects

of fire use are taught on a one-on-one basis with one parent/one child. The parent and child establish an agreement which will allow the child to use matches and/or fire but **ONLY UNDER THE SUPERVISION OF A PARENT OR RESPONSIBLE ADULT**. Parents agree that they will take the time to work with the child and the child agrees to use fire only when the parent is present.

“Children should be made aware of the use and function of matches and fire. The match should be presented as a TOOL having a specific function (lighting candles, starting camp fires, lighting a fire in a fireplace, etc.) and the use of a match for purposes other than those for which it was designed should be presented as being improper use of the TOOL.

“The statement ‘Do not play with matches’ gives no positive information and does not explain the functional purpose of a match. Children become so familiar with ‘don’t,’ ‘never,’ and ‘shouldn’t,’ that they do not listen and may consider the specific forbidden activity to be more desirable since it

is now forbidden fruit.”³⁰

In the last 14 years more than 700 families have been counseled with this philosophy. The Shriners Institute experience showed that an effective community firesetter program was feasible, especially given the presence of the Shriners burn treatment facility, which serves as a focal point for the program.

Results: In 1982 the Shriners hospital conducted an evaluation of the effectiveness of “A Match Is a Tool.” Using a random sample of 100 families treated, the

³⁰ Does Awareness and Education Lead to Prevention? in *The Information Exchange*, newsletter of the Shriners Burns Institute, Chicago, IL, July 31, 1989, Vol. II, No. 2, p. 4.

hospital mailed a questionnaire asking whether the child had repeated his or her firesetting behavior or whether the program had stopped it. Sixty-seven of the families contacted responded. Of these, 86 percent reported success in controlling or eliminating the problem. Twelve percent of the children, all boys, were not initially influenced by the program and ultimately required some form of mental health or psychiatric assistance.

For more information contact:
Matthew P. Maley, Shriners
Burns Institute, 202 Goodman
Street, Cincinnati, OH 45219,
(513) 751-3900.

54. South Lane School District/Lane Fire Prevention Cooperative (Oregon): Smokey the Bear Team-Teaching Program

Jurisdiction: Rural town
Target Group: Juvenile firesetters
Subject: Fire prevention; child-caused fires
Evaluation Measures: Fire incident rate

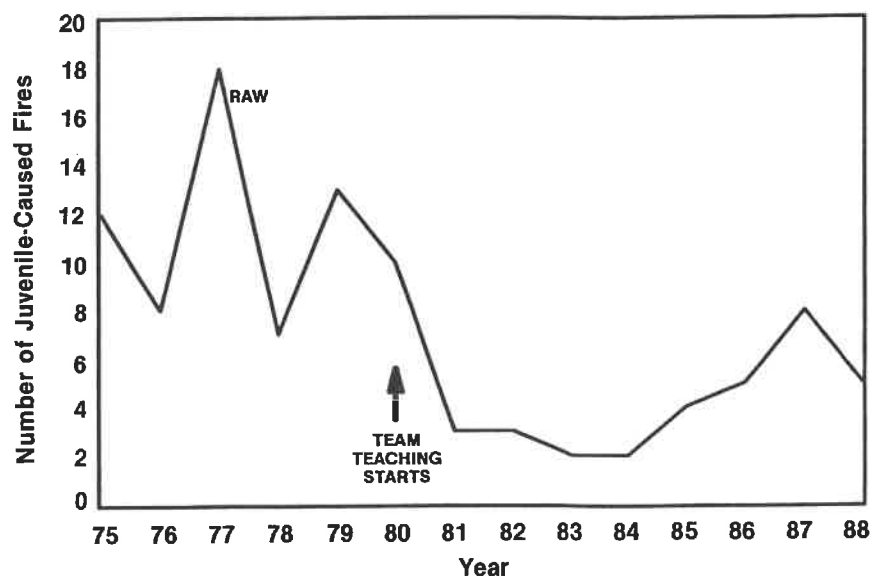
The Lane Fire Prevention Cooperative in Lane County, Oregon, used the U.S. Fire Administration’s Five-Step Planning Process to identify “children playing with matches or lighters” as a target fire problem. The co-op decided to adapt the Smokey the Bear Team-Teaching program developed by the California Department of Forestry³¹ and first implemented it in the South Lane School District, which is protected by the Cottage Grove/South Lane Rural Fire District. From 1982 to 1988 co-op members gave 88 presentations to nearly 2,000 first grade students in the South Lane County area.

The program originally was developed to reduce wildland fires caused by young children. Targeted to first graders, it stresses turning

matches or lighters over to adults. A side benefit is reduction of juvenile firesetting in structures.

The team-teaching process usually involves nine personnel in fire service uniforms. Each person

FIGURE 16. Cottage Grove, Oregon: Juvenile-Caused Fires



³¹ For more, see California Department of Forestry Case Study #31.



The team-teaching approach in Cottage Grove, Oregon, involves Smokey the Bear and 6 to 7 assistants, who meet with the children in small groups.

on the team has a specific assignment. Roles include team leader, Smokey, Smokey's assistant, projectionist, and team teachers. The presentations are given in first grade classes without notice to the students. The 12-minute presentation starts with entry of the team leader, who explains that the children are going to learn to be Smokey's Friends. The team teachers enter and divide the class into equal groups. Each group goes to a corner of the room and sits on the floor. The team teacher goes over five points with the children:

- 1) **What do Smokey's Friends do when they find matches or a lighter?** Give them to an adult.
- 2) **If you find matches at home, what should you do?** Give them to a parent.
- 3) **If you are on your way to school and find matches, what should you do?** Give them to a bus driver or teacher.
- 4) **If you see a younger child with matches, what should you do?** Take them away and give them to an adult.
- 5) **If you see a fire, what**

should you do? Have an adult call the fire department right away.

These points are covered several times, and each child is given a chance to answer. As each child responds correctly, a Smokey the Bear badge is pinned on his or her shirt. When the team teachers are finished, the team leader directs everyone's attention to a slide show. Images of nature are interspersed with pictures of children finding matches or discovering fires. In each case, the children are asked what they would do.

As the slides finish, Smokey the Bear enters the classroom. Smokey asks the children the five questions. He then presents the class with a poster, encourages them to use peer pressure to keep their friends from playing with fire, and leaves the room, followed by the team.

Results: Juvenile-caused fires in the Cottage Grove/South Lane Rural Fire District averaged 11.5 per year for the six years from 1975 to 1980. After the start of the team-teaching program in 1982, the average dropped to 3.9 per year for the period 1982-88, a spectacular two-thirds drop.

An added benefit of the team teaching has been the rapport that developed among the participants, who represented a number of community agencies.

The trend in fires caused by juveniles is shown in Figure 16. After a dramatic drop that held level for several years, the numbers have been creeping up, but still are way below where they were. The population of the school district is 16,200 and has been stable for the last decade. Thus the change in number of fires was not the result of fewer people. (Checking the number of children would have been better, since the whole community may have its age profile change.)

In parallel with this program, juvenile firesetters have been counseled "as needed" since 1974. The result has been no repeat offenders. Because the community is small, the kids tend to be known and watched by the counselor. The counseling program is not thought to account for the drop in fires, since the counseling program started six years earlier than the other program and before the dramatic drop occurred. Because the program is conducted in first grade only, one might ask

why the total number of child-caused fires should drop. Nancy Campbell of the State Fire Marshal's office pointed out that 7-year-old boys were the most common age/sex combination for this type of fire, and that the ef-

fects of the program can carry over to the following grade years.

For more information contact: Steve Allen, Fire Marshal, or Sara Smith, Engineer/Public Education Specialist, Cottage Grove/South

Lane Rural Fire Department, 233 Harrison Avenue, Cottage Grove, OR 97424, (503) 942-4493; or Nancy Campbell, Office of State Fire Marshal, 3000 Market Street Plaza, Suite 534, Salem, OR 97310-0198, (503) 378-2884.

55. Houston Fire Department (Texas): Juvenile Counseling Program

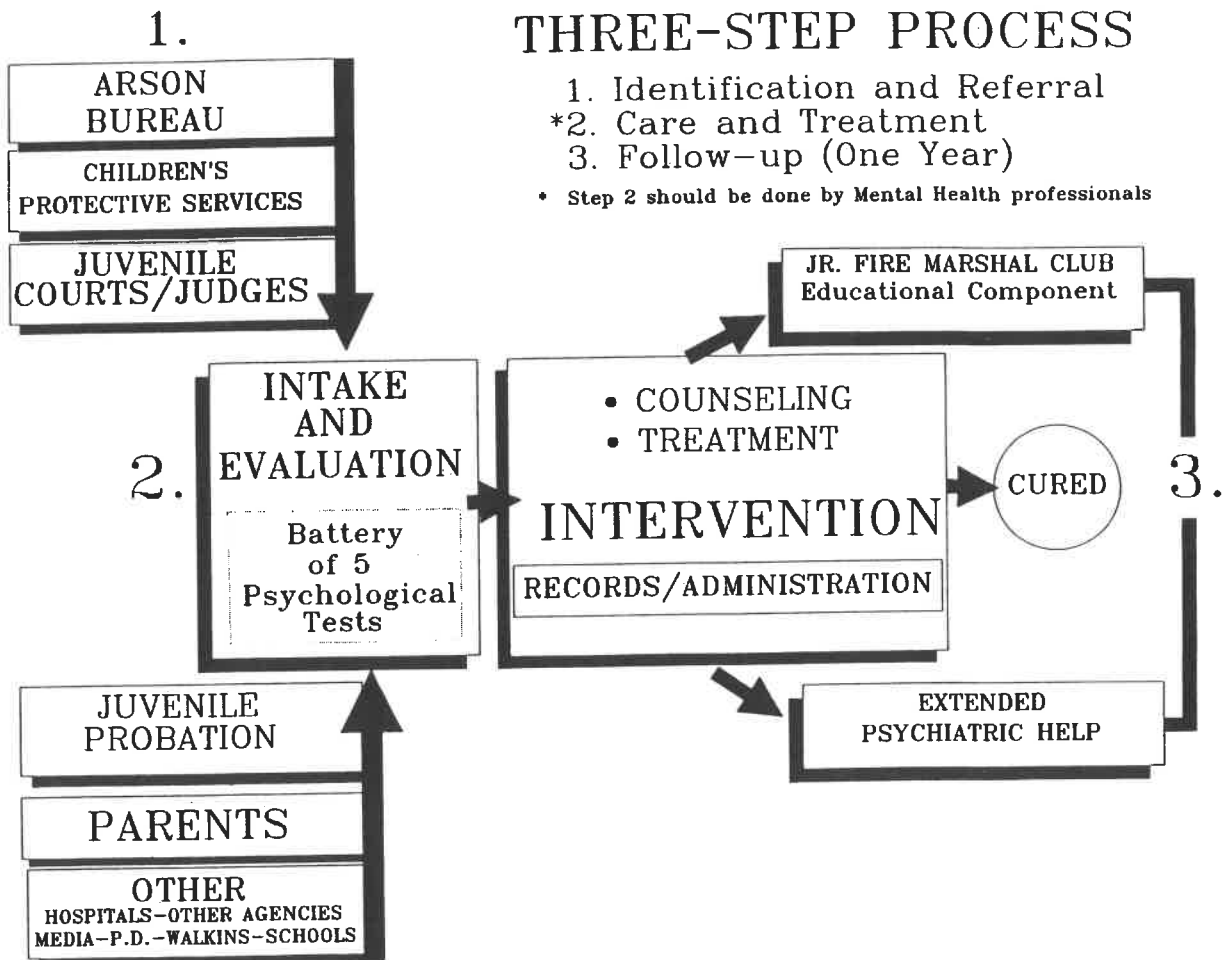
Jurisdiction: Large city
Target Group: Juvenile firesetters
Subject: Juvenile-set fires
Evaluation Measures: Recidivism rate; percent of arson fires caused by juveniles

In the late 1970s and early 1980s, more than 50 percent of Houston's arson fires were thought

to be set by juveniles. Fire Marshal Eddie Corral, then operating with a staff of about 14, estab-

lished the Cease Fire Club, a non-profit community-based organization supported with funding from

FIGURE 17.
The Cease Fire Program
Houston, Texas



local private businesses to supplement his operation. They hired professionals in the field of counseling and youth to operate a juvenile firesetter counseling program. Dr. Don McKinney is the director. (Other aspects of the Club's fire safety program are described in Case Study #10.)

The counseling center has been in operation since 1982. Over the last seven years, 1,500 juveniles and their parents have been counseled in the 12-15 week program.

Youths are referred by the Fire Department's juvenile arson investigators, the city's child protective services, or the courts. After children complete the program, staff call the parents monthly to follow up on any repeat occurrences or other related problems. They also cross-screen all referrals to ascertain whether the youth has been in the program before. Figure 17 shows the overall intake and processing flow.

Results: The recidivism rate, as

monitored by the follow-up calls and screening, is less than one percent. Less than 10 percent of Houston's arson fires now are set by juveniles; it has dropped to as low as 6 percent in one year from the earlier high of more than 50 percent.

For more information contact: E. A. "Eddie" Corral, Fire Marshal, Houston Fire Department, 410 Bagby Street, Houston, TX 77002, (713) 247-5000.

56. Monroe County, New York: Juvenile Firesetter Program

<i>Jurisdiction:</i>	Suburban county
<i>Target Group:</i>	Juvenile firesetters
<i>Subject:</i>	Child-set fires
<i>Evaluation Measures:</i>	Recidivism rate; referral rate

The Monroe County, New York, juvenile firesetter program, started by Lt. John Hall in 1978, initially was designed as a diversion program aimed at curiosity firesetters in the town of Irondequoit, New York. It was proposed to local police and fire agencies for diverting juveniles who set fires and did not have criminal charges pending or obvious dysfunctional problems. Later, the program evolved to include all types of juvenile firesetters, from curiosity fireplay situations to children with dysfunctional problems, as several agencies established links to the program and began making and receiving referrals. The program grew throughout the county. Rochester, the largest city in Monroe County, has a similar although unique program that started a decade ago.

Children referred to the program are interviewed and given fire safety and fire survival information in the home, where the child is more at ease. By going into the home, program staff can also observe the family structure, the family interaction, and the

home environment.

The process begins with an interview involving the parents and the child to gain an understanding of the problem. The child then is shown a book of fire-related information, including news articles and photographs plus props related to the articles. In addition to firesetting, information on false alarms, fireworks, flammable liquids, and burns is presented.

The presentation frequently discusses information on fire survival aspects of the situations discussed. News articles illustrate where proper techniques of survival were not used, resulting in death, injury, or unnecessary fire spread. Techniques such as having two ways out, crawling below smoke, and establishing a meeting point outside are discussed in relation to an incident, and the proper procedures that should have been used in that particular incident are explained to the child.

Following the presentation, the child is given an assignment related to the cause of the incident. This encourages continuing discussion in the home and involves the parents in the child's learning exper-

ience. The program concludes with an exit interview of the parents to discuss the counselor's perception of the child's reason for fireplay and to offer advice (such as keeping ignition materials out of reach) and referral information if further action is necessary. The age range of children counseled is between 20 months and 16 years of age. Follow-up with the family is done at two-week, three-month, six-month, and one-year intervals.

In addition, a countywide juvenile firesetters diversion team has been formed. This group consists of Hall, the county fire coordinator, police juvenile officers, fire investigators, mental health professionals, an education specialist, and fire service personnel from the City of Rochester and Monroe County. The team meets monthly at Hall's office to discuss items of common interest. The team concept has been extremely useful in developing a community network to address the juvenile firesetter problem. To date, the team has developed a brochure on juvenile firesetting, produced a training video for police officers, and developed three public service an-

nouncements on juvenile firesetting.

The program also has evolved into an arson awareness and prevention program. Hall and two police investigators go to the schools to give a 45-minute lecture on vandalism and arson to try to prevent incendiary fires.

This entire program is based on volunteer involvement, using off-duty time for all program-related business.

Results: With more than 700 juveniles counseled to date, the recidivism rate consistently has been less than two percent. There also has been a significant decrease in juvenile firesetting involving youngsters who attend the

schools where the lecture is offered. In 1987, only one out of 91 referrals was from a school where the program was presented; in 1988 it was one out of 107.

While the education program clearly can produce effective results if presented to students in a clear, factual manner without glamor, Hall believes some fire prevention programs may produce negative results when fire is glamorized, "war" stories are told without a clear message, the light and sirens excitement is emphasized, and slogans such as "don't play with matches and lighters" are presented without an explanation of the consequences.

Hall's referrals increase dramatically from mid-October through December in areas where annual Fire Prevention Week school visits of this make-up are presented. Some parents blame the fire service for their child's problem, saying that "this fire play problem started immediately after the fire department visited the school." This sort of boomerang effect must be averted.

*For more information contact:
Fire Marshal John Hall,
Ridge-Culver Volunteer Fire
Department, 2960 Culver Road,
Rochester, NY 14622,
(716) 275-8412.*

57. Montgomery County, Maryland: Operation Extinguish

Jurisdiction: Large suburban county
Target Group: Juveniles
Subject: Juvenile firesetting
Evaluation Measures: Recidivism rates; juvenile-set fire rates

In this approach to juvenile firesetter intervention, police, fire, county Boy's and Girl's Clubs, and a mental health agency work together to refer, process, and treat children who set fires. Family members are included in the treatment. The child is brought to the Police Youth Division, formally booked, and referred to Operation Extinguish. Parents must agree to participate in the program and sign a contract promising cooperation. All family members then attend a 90-minute family evaluation provided by a qualified practitioner. The child also participates in a support group, recreational activities, and fire safety education.

After several years' experience with the project, the Department found that the program was a bit too centralized. Children from all parts of the county had to come to a central club for the recreational component. Transportation arrangements and the time required

to get to the facility were burdensome on the kids. When the Department dropped the recreational requirement, the completion rate (percentage of youths who saw the program through to the end) increased.

Results: In the four years since Operation Extinguish began, more than 200 youths have been treated,

with only one case of recidivism. Table 22 shows how successful this program has been; juvenile-set fires have dropped by 67 percent, much greater than the drops that occurred in total fires, arson fires, or child-set fires. This program won a National Association of Counties award in 1985.

Table 22
Fires in Montgomery County, Maryland

	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>Change</u> <u>'85 to '88</u>
Total Fires	3,720	3,597	3,342	3,483	- 6%
Incendiary Fires	521	493	516	499	- 4%
Suspicious Fires	872	820	728	712	- 18%
Child (Under 7 Yrs.)	35	38	23	28	- 20%
-Set Fires					
Juvenile (7-18 Yrs.)	60	39	37	20	- 67%
-Set Fires					

*For more information contact:
Mary Marchone, Public Educa-
tion Specialist, Bureau of Fire*

*Prevention, Montgomery County
Department of Fire and Rescue,
101 Monroe Street, 12th Floor,*

*Rockville, MD 20850,
(301) 217-2442.*

58. Grand Junction Fire Department (Colorado): Firehawk Program

Jurisdiction: Small city
Target Group: Juvenile firesetters
Subject: Juvenile-set fires
Evaluation Measures: Recidivism rate; dollar loss

Grand Junction operates one of the widespread Firehawk programs that provide big brothers and fire safety education to juvenile fire-setters. In 1986, 34 cases were handled, followed by 34 in 1987, and 29 in 1988. Of the 29, 25 were males. Eleven of the 29 were under 7 years of age, 17 were between 7 and 12 years of age, and one was over 12 years of age.

Of these 29 juveniles, almost two-thirds of those under 7 years old and over half of those between 7 and 12 years old had started more than one fire before they came in-

to the program.

More of the juvenile fires were set outside than anywhere else. Reasons given for setting fires included: "satisfying curiosity" (31 percent), "gaining attention" (12 percent), and "just for fun" (12 percent).

Results: The recidivism rate has been 3 percent. Losses from juvenile fires went from \$32,500 in 1986 to \$75,700 in 1987, but then down to \$11,000 in 1988. Tracking results of juvenile firesetter programs can be tricky in that the program can attract

greater reporting, making dollar loss (or the number of fires) appear to be rising initially. Also, one or two expensive fires can cause damage to shoot up in a given year. Longer-term end results in combination with recidivism rates are needed to show progress more reliably.

*For more information contact:
Don McGuire, Grand Junction
Fire Department, 330 South 6th
Street, Grand Junction, CO
81501, (303) 244-1400.*

59. Lancaster Fire Department (Pennsylvania): Juvenile Firesetter Program

Jurisdiction: Small city
Target Group: Children in grades K-8
Subject: Juvenile-set fires
Evaluation Measures: Juvenile fires; arson fires; recidivism rates

In the early 1970s, a pattern of child-related property destruction by fire was developing in the Lancaster, Pennsylvania, area. By 1979, an average of 35 child-set fires per year were being recorded. The U.S. Fire Administration identified a nationwide trend in intentionally set fires and helped communities begin programs to combat this rising problem.

The Lancaster Fire Department established a program to counsel children and their families involved in these fire incidents. A corps of volunteers comprising professional people—doctors,

nurses, teachers, police, media representatives, and firefighters—was brought together to discuss the idea. By January 1980, the program was in place along with an in-depth school program to educate potential child firesetters. (There are more than 10,000 school-age children in Lancaster city schools.) The primary target groups were grades 5, 6, 7, and 8; however, programs also were developed for grades K through 4.

The school program was designed so that the firesetting behaviors were disguised. The emphasis was placed on burns,

their lasting effects, and constant treatment, as well as the dangers to others.

The first year, 48 percent of the children involved in set fires were given some form of counseling; by 1987, 76 percent of those involved had been contacted. Not all cases were handled by the Fire Department. Some individuals were referred to mental health professionals and their progress monitored by the Fire Department.

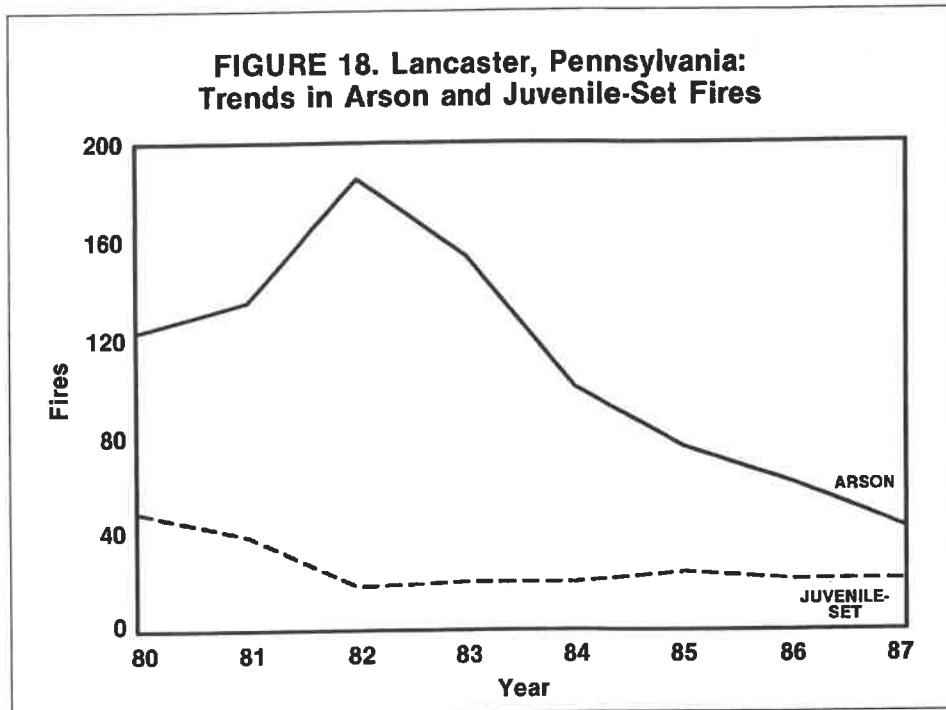
Numerous county personnel had some form of contact with the city's program. In some instances, county fire companies

instituted their own counseling programs with the help of the Lancaster Fire Department. All participation was voluntary.

An additional 117 children who had exhibited adverse firesetting behaviors were enrolled in the program after being referred by concerned parents, even though no fires had resulted yet from their behavior.

Results: The goal of the project was to reduce the number of fires involving children by 50 percent in the first five years. This goal was reached within two years, with a 62.5 percent reduction (see Figure 18). The low level was sustained through at least 1987. The total number of arson fires, many of which are juvenile-set, also went down in this period, after an initial rise.

*For more information contact:
Lt. Edmund G. Knight III, Assistant Fire Marshal, Lancaster Fire*



*Department, 208 North Duke
Street, Lancaster, PA 17602,*

(717) 291-4866.

60. Fire Department of the City of New York (New York): Juvenile Firesetters Program

Jurisdiction: Large city
Target Group: Juvenile firesetters
Subject: Juvenile-set fires
Evaluation Measures: Recidivism rate

As part of planning to develop a new juvenile firesetters program in New York City, the Fire Department undertook a survey of existing programs. Using programs from Baltimore, Maryland, and Rochester, New York, as models, a comprehensive, enhanced New York program was designed. Using a \$75,000 grant obtained in 1985 through the Model Arson Grants program of the New York State Office of Fire Prevention and Control, the city hired a psychiatric social worker and computer programmer, and provided training for the fire marshals selected for the program. The process for selecting the fire marshals was set up with

the assistance of local psychologists. From more than 70 applicants, 26 fire marshals were selected.

The New York City juvenile firesetting program uses a multi-agency network approach to interface with juvenile firesetters and their families. Included are mental health, family courts, probation, social services, police, and fire department field suppression forces. The program was operated for one year in the Bronx as a pilot and then expanded to service Queens the following year.

The thrust of the program was to provide an alternative to the arrest of children over seven years old by providing psychological counseling and educational inter-

vention for them and their families to stop their firesetting behavior. This concept also is used for children under seven who are not criminally culpable for their actions. The program has dealt with children as young as two years of age.

All referrals result in educational intervention by fire marshals. They typically present lessons on general fire safety such as "Exit Drills in the Home," or "Fire Is a Tool." In "Fire Is a Tool," a successive series of photographs are shown to the child starting with depictions of positive uses of fire as a tool, such as a kettle on a stove, food cooking, and candles. The photos

progressively illustrate negative consequences of fire such as a burned-out closet and a burned hand. In extreme cases and with parental consent, a photograph of a 10-year-old fire fatality is shown. The fire marshal discusses the photographs and leaves fire safety literature with the family.

The pilot program identified 121 juvenile firesetters in its first year of operation, which began in November 1986. Of those, 83 children had never set a fire before

the incident that referred them to the program. The 38 others had set a total of 125 fires.

Referrals made by the pilot program were as follows:

— Arrest of the child	6.5%
— Mental health services	52.9
— Educational intervention only	27.5
— Protection services	8.7
— Diversion or other services	4.4
	100%

Results: To date, the program has dealt with 750 children and enjoys a very low recidivism rate. Only five children have started a fire subsequent to intervention by the program.

For more information contact: Fire Marshal James D. McSwigin, Director, Juvenile Firesetters Intervention Program, Fire Department, City of New York, 250 Livingston Street, Brooklyn, NY 11201-5884, (718) 403-1508.

61. Columbus Fire Department (Ohio): Juvenile Firesetter Counseling Program

Jurisdiction: City
Target Group: Juvenile firesetters
Subject: Child firesetting
Evaluation Measures: Recidivism; child-set fires

In 1986, firefighter Kevin Reardon began a juvenile firesetter counseling program in Columbus and then took over as its coordinator on a full-time basis. According to Columbus Fire Department reports, this program is one of the largest in Ohio and has been one of the models in the U.S. Fire Administration's juvenile firesetter project. The program is designed for children who play with lighters and matches, and those with firesetting tendencies.

The Columbus Fire Department interviews the child and parent(s), provides fire safety education to them, and refers "troubled or chronic" cases to professional mental health agencies.

Results: Follow-up letters to parents are one method used to get feedback on the program (see the sample letter on page 89). In

1987 and 1988, Reardon received about a 40 percent response rate from the parents. Of the 74 letters returned, 64 (86 percent) reported no more starting or playing with fire by the child. The remaining 10 children had been found again playing with fire or had started a fire. Seven of these 10 were thought to have problems based on initial screening, and had been referred to mental health agencies, but had not been taken to them by their parents.

The number of child-set fires increased from 110 in 1986 to 119 in 1987 and 127 in 1988. However, the number of kids being referred to the program is increasing faster than that. Since those treated have had a low recidivism, the program has to be considered at least partly successful, and needs to be monitored over the

next few years.

A relatively large portion of the juveniles in the Columbus program, about 20 percent, are classified as "troubled," and as such are much harder to "cure" than curiosity firesetters. The recidivism rate of the program is expected to be higher than for a city with mostly curiosity firesetters.³²

For more information contact: Lonnie Poindexter or Lt. Kevin Reardon,³³ Public Safety Department, Emergency Services Division, 300 N. 4th Street, Columbus, OH 43215, (614) 645-7641.

³² Further details on the program are available from the program's excellent annual reports for 1987 and 1988. They give statistics on the profiles of the juveniles in the program.

³³ Kevin Reardon was formerly the coordinator of the fire division's Juvenile Firesetter Program.

Sample Letter to Parents, Columbus, Ohio

Dear Parent,

Approximately _____, you asked for information and help about your child's firesetting behavior. We are interested in finding out how your child is doing now. This information will help us gain a better understanding of children who set fires. The name of your child and family will be kept confidential.

Would you take a few minutes to answer the following questions and return this letter in the enclosed envelope?

- 1) Has your child set any fires since you first called us?
(Please circle answer.) *Yes No* If yes, how many? _____
- 2) Has your child had any other problems since you first called us? *Yes No*
If yes, what were they? (Please circle answer(s) below:)
—Bad grades in school/failure *Yes No*
—Not behaving *Yes No*
—Fighting *Yes No*
—Sadness *Yes No*
—Problems with friends *Yes No*
—Problems with the law *Yes No*
—Other _____
(Please describe)
- 3) What services did your child receive? (Please circle answer.)
—Education with a firefighter *Yes No*
—Mental health counseling *Yes No*
—None *Yes*
- 4) Were these services helpful? (Please circle answer.)
—Education with firefighter:
Not Helpful Somewhat Helpful Very Helpful
—Mental health counseling:
Not Helpful Somewhat Helpful Very Helpful
- 5) Do you feel that your child will set fires again?
(Please circle answer.)
Yes Maybe No

If you would like further assistance for your child, please contact us at 222-7641.

THANK YOU FOR YOUR HELP.

Sincerely,

*Kevin Reardon, Coordinator
Juvenile Firesetter Program*

SMOKE DETECTOR PROGRAMS

Here are evaluations of programs aimed at increasing use of de-

tectors or improving their maintenance. Many such programs are

part of broader school or community programs described in other sections of this report.

62. Portland Fire Bureau (Oregon): Low-Income Smoke Detector Program

<i>Jurisdiction:</i>	City
<i>Target Group:</i>	Low-income ethnic residents
<i>Subject:</i>	Detector giveaway and prevention education
<i>Evaluation Measures:</i>	Fire deaths; detector usage and maintenance; anecdotes

Portland, Oregon, under the leadership of Fire Chief George Monogue and then Public Education Officer Jim Crawford, received the first national award from the International Association of Fire Chiefs for a prevention program. Portland's program is indeed one of the best, most sophisticated approaches to public fire education in the United States in the last decade. We therefore are providing extra details of its unique features beyond the evaluation of results. Most extraordinary was the Bureau's use of a professional market research approach, and the use of volunteers to reach all households in an area.

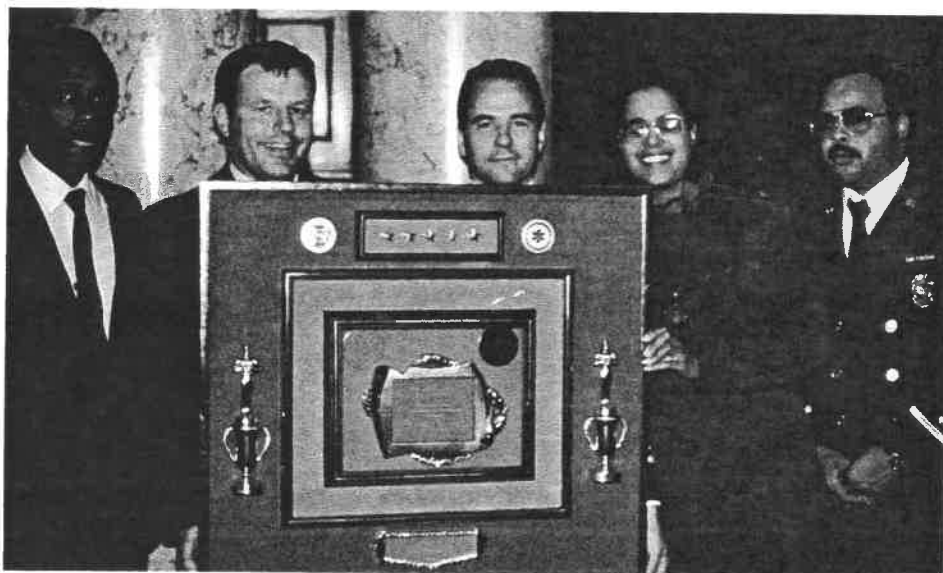
In addition to a comprehensive base program of public education for the entire community, Portland has targeted campaigns for specific, intense problems.³⁴ One of these major targeted programs is a smoke detector and educational program aimed at a low-income area in Portland that experienced 26 percent of all residential fire deaths though having only 5 percent of the population. The area's death rate was 400 percent greater than that of the rest of the city. Almost all of the deaths occurred where there were no smoke detectors or where the detectors were not working.

A number of specific fire causes accounted for the deaths, the largest single category being careless smoking. Because several fire causes accounted for the deaths, and because the careless smoking behaviors were viewed by Portland as difficult to change, a smoke detector campaign was determined to be the best method of reducing the fire death rate.

The demographic profile of the target area was largely low-income ethnic minority residents living in residential property. Market research revealed that the residents there did not have a good relationship with government. The Fire Bureau was no exception. Even if the Bureau were to offer smoke detectors free of charge,

residents would likely view it as a "scam" and refuse to participate. The research also found that residents would not allow Fire Bureau staff to enter their apartment for a free installation. Therefore, the strategy chosen was to place smoke detectors in homes using a "secondary" campaign designed to attract the support of community groups that already had credibility with the target audience.

Further research showed that the residents of the target area would not respond to regular media channels or representatives. Their tastes were significantly different from the mainstream of the city and would require unique approaches to provide any hope of

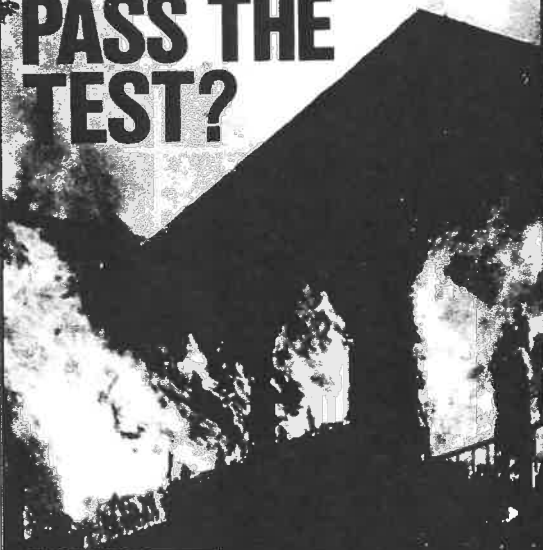


Award won by the outstanding smoke detector program of Portland, Oregon. Jim Crawford, in center, directed the program. The size of the award is commensurate with the achievement in this case.

³⁴ See Jim Crawford, "Public Education Is More Than Kid Stuff," City of Portland, Oregon. This article is a primary source for the description of Portland's program, and gives an outstanding summary of the reasons for evaluating programs. It has appeared in edited form in several fire publications.



CAN YOUR SMOKE DETECTOR PASS THE TEST?



*"Believe it!
Next time,
it could be
your house."*

Edna Robertson
Northeast Neighborhood Resident

**A smoke detector
can save you,
your family
and your home.**

**It makes sense. It's smart.
And you can get one free.**

changing their behavior. Residents would have to be reached in a manner and form that was acceptable to them.

Research identified three distinct key sub-audiences: the elderly, the young (under 10), and single-mother heads of households. While the material was to be made available for all, a decision was made to make certain that the message would appeal to the single mothers and the elderly as the primary decision makers of the community.

A professional market research company was hired to help with additional qualitative research of the target audience, using informal focus group interviews. The research was extended to those who were familiar with and had already worked with the target audience.

This research showed that the target audience was not likely to watch any one particular television show, nor were they partial to the largest newspaper in the area. Two black newspapers were widely read, the *Skanner* and the *Observer*. A black radio station also was identified as having a large following in the target area. The research also showed that almost all of the area's residents frequented one or more of four types of establishments in the area: churches, liquor stores, banks, and supermarkets.

Three community groups were identified by focus groups as being the primary centers for community activity. The first was the various churches, represented by the Albina Ministerial Alliance. The second was the Urban League, a private agency responsible for coordinating programs for the minority members of Portland. The third was the neighborhood association, and especially the northeast office that served the target area.

Doorhanger left on every door in the highest fire death rate neighborhood in Portland, Oregon. Reverse side gave information on how to get a free smoke detector.

The Targeted Program—The program Portland decided upon had three elements. The major element was a smoke detector giveaway program with accompanying printed material focusing on installation and maintenance. A second element was printed material aimed at reducing careless smoking; it emphasized the need to be watchful around smokers who are drowsy, intoxicated, or medicated, and the usefulness of detectors for smoldering fires. The third element of the program was a juvenile firesetter brochure and consulting program.

A key implementation strategy was a door-to-door campaign aimed at reaching all of the households in the target areas. In all, 120 volunteers visited most of the households twice in one fiscal year to leave a "door hanger" message on detectors. Local media reported that the canvassing was going to take place and explained the importance of the program. Each volunteer wore a large button in the shape of a detector for ready identification. Those households wanting detectors were sent a volunteer specially trained as an installer, with a smoke detector. Many detectors also were installed by one black firefighter who was familiar with the area. The installers explained the need for home evacuation plans

and the need to practice them. They also explained how to maintain the detector and tested any other detectors in the home.

In addition to the door-to-door program, flyers were distributed to all area schools, aimed at the parents. Posters were placed where residents of the area congregated (the previously identified churches, liquor stores, banks, and supermarkets).

Results: Close to 1,000 detectors were distributed and installed among the 7,000 households in the target area above what was already there. The percent of households with detectors in the target area rose from 79 percent to 87 percent.

No fire deaths were reported in the target area for at least two years after the program started—a remarkable achievement. That area had had five percent of the population but 26 percent of Portland's residential fire deaths. The city-wide number of fire deaths dropped from 10 to 6 the first year after the program started. That drop moved Portland from the U.S. national average to nearly half the average. Portland now is similar in fire death rate to other cities its size in other industrialized nations for the first time.

Pre- and post-campaign surveys of residents in the area reported a clear educational gain. Based on 131 precampaign interviews during May 1987 and 99 post-campaign

interviews during April 1988, those who knew proper maintenance of a detector rose from 37 percent to 58 percent. Those who could describe how to test a detector rose from 61 percent to 78 percent. Those saying they undertook detector maintenance rose from 45 percent to 79 percent.

The community network developed during the program stayed in place and continued to provide impetus for fire safety in the neighborhood.

Perhaps the perfect comment on the impact of the Portland program came from a target area resident at a news conference honoring partners in the neighborhood campaign:

"I recently had a fire in my home. It happened after your smoke detector program in my neighborhood. I'm certain that the smoke detector saved my life. I want to thank you for your fine efforts."

—Margaret Fisher

If the rest of the United States followed Portland's example, and achieved a similar success, our fire death rate would be about that of other Western industrialized nations instead of being one of the highest in the world.

For more information contact: Jim Crawford, Assistant Fire Marshal, Portland Fire Bureau, 55 Southwest Ash Street, Portland, OR 97204, (503) 248-0203.

63. Louisville Fire Department (Kentucky): Smoke Detector Legislation and Operation FireSafe

<i>Jurisdiction:</i>	City
<i>Target Group:</i>	Owner-occupied homes
<i>Subject:</i>	Detector installation and public education
<i>Evaluation Measures:</i>	Fire death rate; households with detectors; anecdotes

In 1977 the City of Louisville passed legislation requiring the installation of smoke detectors in all residential rental properties. During most of the 1970s, annual fire deaths had ranged from a

high of 35 to a low of 14. In 1979, after the legislation had begun to make an impact, fire deaths dropped to an all-time low of six.

In 1984, a study requisitioned

by City Alderwoman Sharon Hall showed that fatalities had begun to rise again and that the problem had shifted from residential rental property (where there were no fatalities in properties protected

Table 23
Louisville, Kentucky, Fire Deaths

<u>Year</u>	<u># Deaths</u>	
80	14] average = 15
81	13	
82	19	
83	15	
84	13	
Program started →		
85	10] average = 11
86	9	
87	16	
88	8	

by smoke detectors) to privately owned residences that had no detectors. The city's legislative body, working with the Fire Department and with strong support from newly elected Mayor Jerry Abramson, set aside money to provide smoke detectors for each owner-occupied property, supplemented with public education information on fire prevention. The number of such properties was estimated at 55,000.

The goal of the new program was to have at least one smoke detector in every home and to deliver public education on prevention at the same time. Delivery of the detectors and messages was to involve all fire companies.

A local newspaper initially

editorialized against the program, saying the detectors were gifts from the "tooth fairy" at City Hall. But the public and newspapers were ultimately sold on the program, which was implemented under the leadership of then newly appointed Fire Chief Russell Sanders.

By February 1988 the Fire Department had serviced more than 30,000 residential properties. Of the 25,000 remaining, some were vacant, many already had detectors, and a very few refused to participate. The program continues to provide detectors on request to homeowners.

Results: The average number of fatalities for the four years after the program started was significantly lower than the average for

the five previous years. The average dropped from 15 per year to 11 per year, a sharper drop than that in national fire deaths (see Table 23).

All homes that received detectors were recorded in a computerized data base, along with the date of installation. This could be used in the future to remind the homeowners to replace their batteries.

On October 30, 1985, only one month after the smoke detector giveaway program started, the *Louisville Times* ran a banner headline on page one: "Couple alerted to fire by free smoke detector." The article credited the program with saving the life of an elderly couple who had been among the first to receive a free detector. Sgt. Danny Wahl, who helped extinguish the fire, was quoted as saying, "Had [79-year-old Charles Yates] still been in bed, there's no doubt he would have been killed."

The detector giveaway program also had some unexpected beneficial side effects. In the first several months, as firefighters went door-to-door offering detectors, they found 250 rental properties in violation of their smoke detector ordinance. And they received good press about high citizen satisfaction with the program.

For more information contact: Lt. Col. Donald Cummins, Louisville Fire Department, 1135 W. Jefferson Street, Louisville, KY 40203, (502) 625-3731.

64. Rock Island Fire Department (Illinois): Smoke Detector Giveaway and Home Inspections

Jurisdiction: Small city
Target Group: Home
Subject: Detectors; escape
Evaluation Measures: Homes with detectors; fatality rate; outreach

Rock Island, Illinois, (population 47,000) had a program for

several years that included an in-home fire safety inspection, instal-

lation of a smoke detector, and a class on family escape planning.

The objective was to put detectors in as many one- and two-family dwellings as possible. The city council approved funding to buy 650 detectors in fiscal year 1979 to initiate the program. The local media cooperated by focusing the community's attention on the Fire Department's efforts.

The program was an immediate success; rather than the Fire Department's looking for homes to participate, it was getting calls from the public asking to be part of the program.

All the Department's engine companies participated in conducting the visits—initially two each per night, three nights a week. Visits were scheduled on a first-come, first-served basis and target areas of the community were chosen based on the percentage of total home fires in the area.

Each visit started with a 15- to 20-minute presentation about causes of fire and basic evacuation procedures. Then firefighters installed the smoke detector. A signed release was obtained from each family to protect the city

against claims for damages that might result from the installation. The home inspection was the final step. Any problems were explained by firefighters and appropriate solutions were discussed.

Each family was left with a brochure on home escape planning and a questionnaire with a stamped, self-addressed envelope for returning it to the Fire Department. The questionnaire was used to get positive or negative feedback on the concept of the program and on the content of the information provided during the visit.

In 1985, the engine companies contacted 5,100 citizens, and in 1986, 4,700. Each of those years the full complement of prevention programs led to 14,000 citizen contacts—about 30 percent of the population per year. (Some citizens undoubtedly had more than one contact, so the outreach was probably somewhat lower but still excellent.)

Results: This program lasted nearly 10 years. More than 6,000 detectors were distributed for use

among Rock Island's 12,314 homes. The program increased detector usage by almost 50 percent. It ended when the State of Illinois adopted a mandatory smoke detector law.

During the life of the program, the community experienced eight fatalities in residential fires, down 20 percent from the previous 10-year period, and 74 civilian injuries, down 36 percent from the previous period. There was no formal evaluation of the program itself, but the detectors and public education were thought to have contributed to the drop. Rock Island had a full complement of other prevention programs, too, and won first place among prevention programs for the State of Illinois for its population class every year from 1982 to 1986 except 1983, when it finished second.

*For more information contact:
Lt. Dan Deardoff, Public Education,
Rock Island Fire Department,
1313 Fifth Avenue, Rock Island,
IL 61201, (309) 793-3475.*

65. Bremerton Fire Department (Washington): Detector and Public Education Program

Jurisdiction: Small city
Target Group: Homes
Subject: Detectors
Evaluation Measures: Per-capita dollar loss; fire incidence

Bremerton, Washington, (population 38,000) saw its average fire dollar loss per capita shoot up from \$15 for 1981-84 to an alarming peak of almost \$75 for 1985 due to several large commercial property fires and a notable increase in fires in residential properties unequipped with smoke detectors. In response, the chief hired a full-time public educator whose sole job was education, the only one in the county at the time. The public educator was instructed to organize an intense smoke detector campaign

that included surveying the entire city, purchasing detectors and batteries, and having the crews install detectors during shifts. Also, a more intensive inspection program was implemented.

Results: For the two years following the start of the program, the per-capita dollar loss dropped spectacularly, from \$75 in 1985 to \$15 in 1986 and to \$9.70 in 1987, despite a slight increase in the number of fires from 846 in 1986 to 890 in 1987. (Figure 19 shows the trend over a decade.) These reductions in the 1986 and 1987

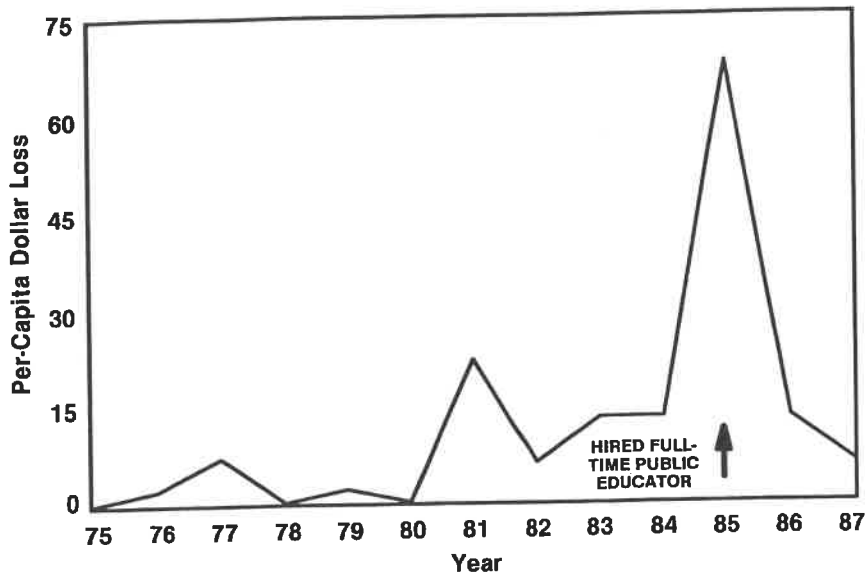
levels are without adjustments for inflation; in terms of constant dollars, the drop would be even sharper.

Chief Chet Meigs attributed the reduction in dollar loss to a combination of the public education effort, inspection program, smoke detectors, fire alarm and sprinkler systems, and new technology.

In 1988, the per-capita dollar loss began to climb again to \$12.25 per capita. Several factors were thought to have contributed to the increase:

— Bremerton annexed large tracts

**FIGURE 19. Bremerton, Washington:
Trend in Per-Capita Fire Loss**



of uninspected, residential, single-family property in 1988.

- Many fires occurred in homes where smoke detectors had not been maintained. The area has a large turnover due to the influence of the Navy and nearby Puget Sound Naval Shipyard. The turnover makes it difficult to educate new rental occupants.
- The Department lost six fire-fighter positions, and was down to two-person engine companies.

Increased losses as a result of reductions in prevention activities are as much proof of program effectiveness as are improvements when efforts are increased.

*For more information contact:
Lori Jones, Fire Prevention Specialist, Bremerton Fire Department,
817 Pacific Avenue, Bremerton,
WA 98310, (206) 478-5393.*



Bremerton, Washington, used its public education van as a moving billboard of fire safety messages.

66. South Carolina State Fire Marshal: "Get Alarmed, South Carolina!"

Jurisdiction: Statewide
Target Group: Homes
Subject: Detectors and fire safety
Evaluation Measures: Fire deaths

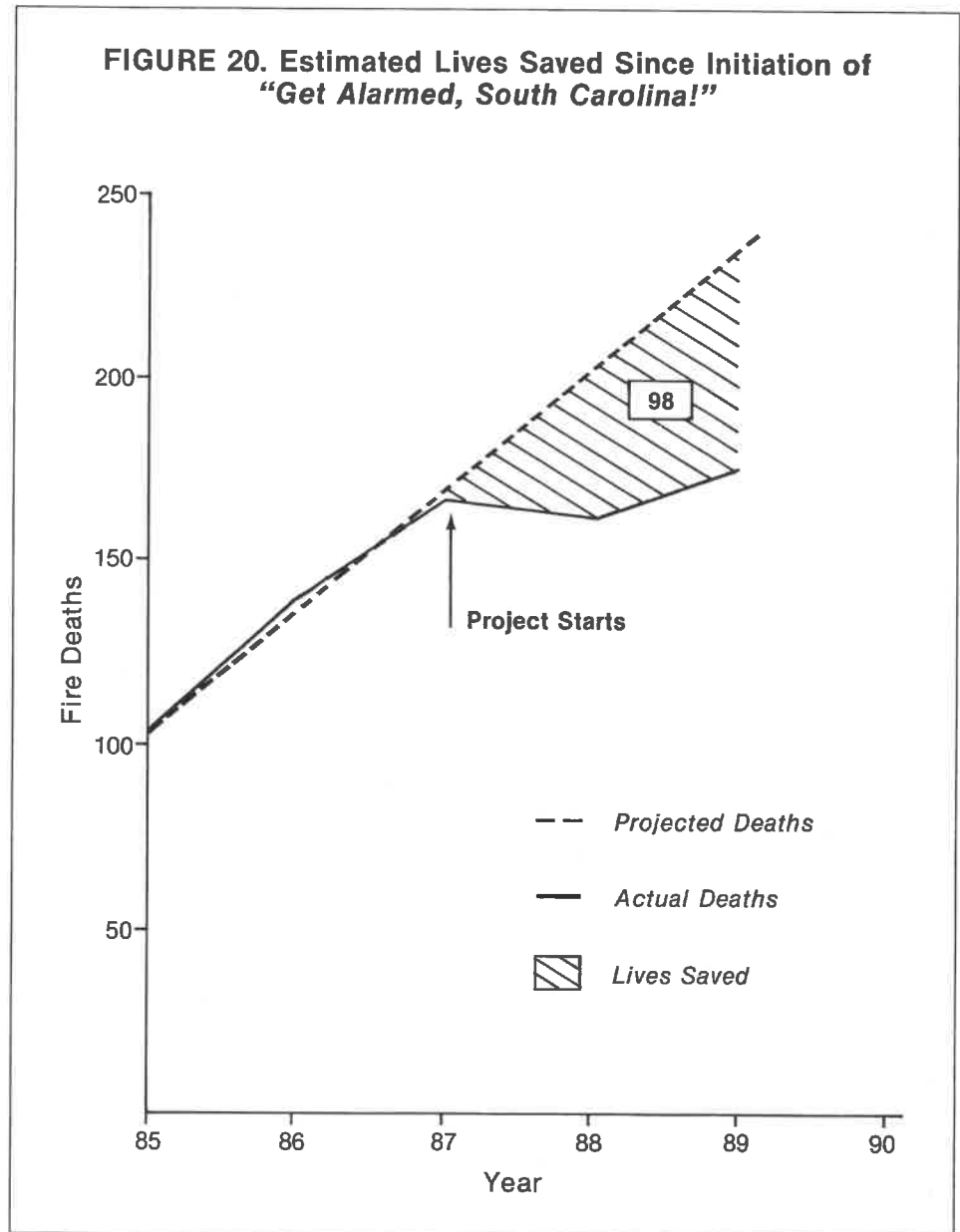
South Carolina, with its large rural and low-income populations, typically has had one of the three highest state fire death rates per capita in the country. From 1985 to 1987 the problem worsened—the state experienced an annual increase of more than 25 percent per year in fire fatalities. To combat the trend, the State Fire Marshal's office launched a statewide fire safety awareness and smoke detector installation campaign. Using \$50,000 received from the state, the Fire Marshal's office gave 100 detectors to each county and offered the state contract price of \$4.50 per detector to any local government interested in pitching in.³⁵ In all, more than 22,000 detectors were provided free to families who needed them.

South Carolina also ran a big public education campaign using the state's "First Lady" in public service announcements (PSAs) and featuring her on billboards and posters. The State Fire Marshal's office worked hard to get the state's mostly volunteer fire departments interested in public education. The office gave the departments packaged programs and materials, and provided training. Local fire service contacts with the media were critical to getting the PSAs on the air.

Results: After three consecutive years of increasing fire fatalities, South Carolina registered its first decrease in 1988. The year 1989 was slightly higher than 1988, but much lower than it would have been if the fire death trend had

³⁵ The state had used a grant from the U.S. Fire Administration as a seed to generate a large number of other donations.

FIGURE 20. Estimated Lives Saved Since Initiation of "Get Alarmed, South Carolina!"



continued (see Figure 20). The State Fire Marshal estimates that 98 more lives would have been lost had the trend prior to the program's start been continued. The first quarter of 1990 had fire deaths down from 71 in 1989 to 46 in 1990, in what is usually the

worst quarter of the year.

For more information contact: Mary Lee Maiden, Public Information Manager, Division of State Fire Marshal, Budget and Control Board, 1201 Main Street, Suite 810, Columbia, SC 29201, (803) 737-0660.

67. Montgomery County, Maryland: Smoke Detector Legislation

Jurisdiction: Suburban
Target Group: Homes
Subject: Detector use and maintenance
Evaluation Measures: Fire death rate; detector usage; percent of detectors working

Montgomery County was one of the first jurisdictions in the country to mandate smoke detectors in every single-family dwelling, old or new. It backed up the legislation with strong public education efforts and enforcement.

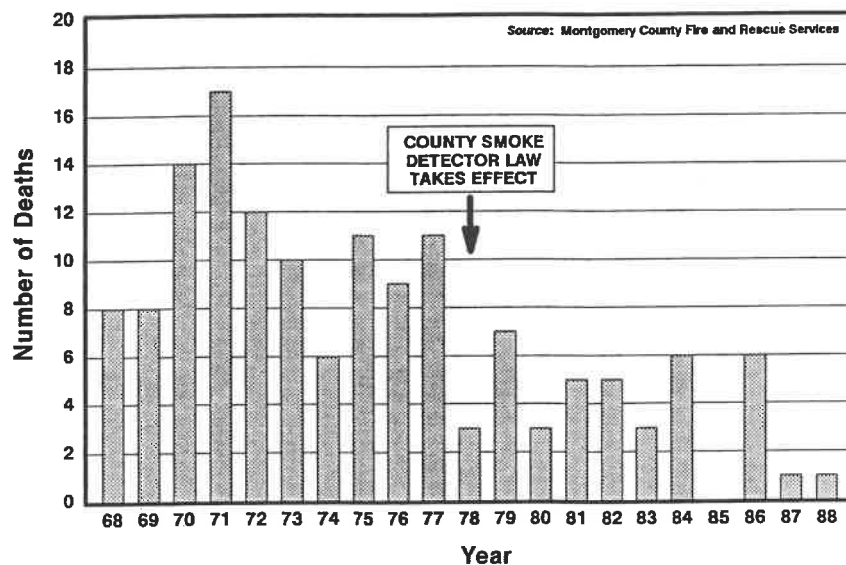
Results: Fire fatalities were reduced by 62 percent in the 10 years following 1978, when the law was passed, as shown in Figure 21.³⁶

Further, based on a study by Dr. Elizabeth McLoughlin, Mary Marchone, and others,³⁷ Montgomery County had a lower percentage of homes with no working detector—only 17 percent—than neighboring counties or the nation overall in 1983. And only 6 percent of the county's homes were without any detector (versus 15-20 percent for the nation). These favorable results have been attributed to a combination of the county's public education efforts, the detector code, and the law-

³⁶ Source: Montgomery County Fire and Rescue Services as printed in the *Montgomery County Journal*, July 5, 1988.

³⁷ Mary Marchone and Arlene O'Donnell, "Harnessing Juvenile Firesetters," *Fire Chief*, March 1988.

FIGURE 21. Montgomery County, Maryland: Smoke Detector Legislation



abiding nature and self-interest of Montgomery County's relatively affluent citizens. (The data in Figure 21 would have shown an even greater drop if deaths per 100,000 population had been plotted instead of the total number of deaths, because Montgomery County

was growing in population throughout the period shown.)

For more information contact: Mary Marchone, Fire Education Specialist, Montgomery County Fire and Rescue Services, 101 Monroe Street, 12th Floor, Rockville, MD 20850, (301) 217-2442.

NATIONAL PROGRAMS

The U.S. Fire Administration (USFA) and the National Fire Protection Association have had national public fire education efforts for decades. Some industry-supported programs also have been nationwide in scope over a multi-year period, such as the Hartford Insurance's Junior Fire Marshal Program, McDonald's Get Out Alive Program, First Alert/USFA

smoke detector awareness program, Eveready's battery detector maintenance campaign, and The Tobacco Institute's Fire Safety Education Program.

In this section, we discuss three major national programs and the data showing that they have had significant impact in multiple locations. Other examples are referenced throughout the report.

These programs would be more difficult to evaluate quantitatively at the national level because they co-exist along with many others. Also, because of their long duration, they exist during periods when the uncontrollable variables of the real world change. It was beyond the scope of this effort to fully evaluate their impacts nationally.

68. U.S. Fire Administration: National Cooking Fire Prevention Program

<i>Jurisdiction:</i>	Multiple cities
<i>Target Group:</i>	Households across nation
<i>Subject:</i>	Cooking fire safety
<i>Evaluation Measures:</i>	Cooking fires; burn injuries; anecdotes; knowledge gain; outreach

A campaign was launched by the U.S. Fire Administration (USFA) in 1979 to demonstrate the effectiveness of using the media to publicize fire safety messages. The topic was grease fires and the proper way to extinguish them; the slogan, "Keep a Lid on Grease Fires."³⁸

A media kit on this theme was produced by the Burn Council of San Francisco under a USFA grant. The kit contained television public service announcements (PSAs), ready-to-use radio PSA scripts, 35mm slides for use in local presentations, and a print "master" for brochures. State fire marshals or other state-level fire service organizations in California, Alaska, North Carolina, and Oregon picked fire departments to participate in the campaign. In addition, Montana and the cities of Atlanta, Boston, and Keene, New Hampshire, participated. Each fire department set up a working committee to coordinate its campaign, which focused on the media but also included

special events or community participation. The campaigns lasted from one to two months. Some were quantitatively evaluated.

Results: Keene, New Hampshire, (population 24,000) got the PSA placed on its local television station and two radio stations. Firefighter Bruce Pollack was the coordinator. The television PSA aired frequently during "prime time" and during Boston Red Sox baseball games.

Cooking-related burns declined by 30 percent at the local hospital. A 10 percent drop in cooking fires also was observed. Public approval of the program was high. Two women told the Fire Department that they were glad they saw the spots because they always had thought to use water if they ever had a grease fire.

In California, the project was coordinated by Ed Seits of the State Fire Marshal's office. With an evaluation module added to the USFA materials, the project was a measurable success in each of the California communities selected.

In Covina, California, (population 34,000) project coordinator Captain Al Grams cooperated

with Jan Gratton of the Covina Women's Club to print 15,000 flyers, which were inserted into water bills. Local newspapers provided coverage of the program. Television contacts were handled by neighboring Huntington Beach. Pre- and post-testing of 200 Covina residents by members of the Women's Club showed an increase in their cooking safety knowledge. Three incidents were reported to the Covina Fire Department in which citizens were alerted by smoke detectors to find grease fires, and in each case, extinguished the fires with pot lids.

The Huntington Beach Fire Department (California) serves a population of 189,000. Project coordinator Larry Marshburn contacted seven television stations, seven newspapers, and 19 radio stations in the area for the Department's cooking safety campaign. Thirty thousand brochures were printed by the city and were distributed by local real estate agents. Pre- and post-testing of 200 randomly sampled residents performed by firefighters and public education specialists found a 13 percent increase in knowledge about grease fire safety. There was

³⁸ Charles F. Smith, Partnerships Against Fire Evaluation Report: "Fire Awareness for the Southeast Asian Settlement of Portland, Maine," December 1988.

a 95 percent confidence level that the change was not random. Cooking fires dropped by 7 percent.

In Kern County, California, (population 366,000) where Captain Dan Clarke was the coordinator, the local television station ran the PSAs 125 times during the one-month campaign. The firefighters union printed 50,000 copies of the brochure, which was distributed through major supermarkets. The Fire Department added a "keep a lid on grease fires" reminder to its daily activity report to the media, which was aired on 20 stations. A pretest and posttest of 200 randomly selected people were conducted. The percentage of people knowing how to "put a lid on grease fires" jumped from 19 percent to 78 percent, an enormous 59 percent increase. The change had a greater than 99 percent confidence level that it was not random, based on the sample size.

In Willows, California, (population 5,000) where Chief Dick Wharton coordinated the project, the local newspaper printed information on cooking fires 14 times during the campaign. Radio stations also were helpful. Copies of the brochures were distributed to local supermarkets. A 39 percent increase in fire safety knowledge was reported from the campaign. The fire chief received a report from a citizen who said that he had a grease fire, started to move the pan, then remembered the program and covered the pan with a lid.

In Fairbanks, Alaska, (population 58,000) the campaign was coordinated with surrounding fire departments. Lectures were offered

throughout the area based on requests from the public. The Fairbanks Fire Department paid for production of its own PSA, as well as for air time on local television and radio stations. The placement of broadcast messages was targeted toward adult women between the hours of 4:00 and 6:00 p.m. More than 69 television spots aired, 10,000 brochures were distributed, and many articles and advertisements appeared in newspapers. A post-campaign survey was conducted among 200 people in the Fairbanks area. Of those, 67.5 percent said they were familiar with the campaign, and almost 60 percent reported that they would put a lid on a grease fire. Only one person said he would use water on a grease fire, which had been a frequent problem in cooking fires in Fairbanks.

The State of Montana's Fire Service Training School used the USFA kit for a statewide campaign. A local television station duplicated the PSAs, which were then sent to all 14 stations in the state. The PSAs were played at least once a day on seven television stations for a three-week period. Grease fires had been the number-one cause of fires, and wood stove fires were number two. Data collected since the campaign showed that grease fires had dropped to number two.

In Eugene, Oregon, (population 107,000) Lt. Tim Burr received front-page newspaper coverage and TV coverage with a press conference on how to control grease fires. All 45,000 children in public schools were reached with handouts and presentations—100 percent outreach for this target

group. Flyers were distributed to the community, and local neighborhood newspapers also ran the message.

The program in North Carolina was coordinated by Cathy Lohr of the state's Department of Insurance. In Winston-Salem (population 130,000) the coordinator was Assistant Fire Marshal Oscar Beal. Winston-Salem used radio and TV PSAs and presentations to the community. One PSA shown in prime time resulted in 118 telephone calls for more information. Part of the program consisted of presentations to fifth grade students in fire stations. Prior to the program, 6 percent got a question correct on grease fires compared with 98 percent after the program. In the community, 18 percent of people queried said that before they learned to do so from the program, they had not been aware that they should turn off the heat under a burning container on the stove.

Overall, this USFA program showed that significant, measurable impacts could be made in many communities across the nation by a high leverage national program. "Spark plugs" in local communities could pick up the materials and concepts, and energetically adopt them to local needs with help of local media and community organizations.

*For more information contact:
James Coyle, Assistant Administrator,
U.S. Fire Administration,
Office of Planning and Education,
16825 S. Seton Avenue, Emmitsburg,
MD 21727, (301) 447-1000.*

69. U.S. Fire Administration: National Smoke Detector Campaigns

<i>Jurisdiction:</i>	Nationwide
<i>Target Group:</i>	All households
<i>Subject:</i>	Smoke detector use and maintenance
<i>Evaluation Measures:</i>	Households with detectors; households with working detectors; deaths per fire with and without detectors; population reached

Smoke detectors were perhaps the greatest public fire education success story of the 1970s and early 1980s.

From a base of less than 5 percent of all U.S. households in 1970, detector use spread to 20 percent of households by 1977 and to 50 percent by 1980. Now 82 to 85 percent of U.S. households have at least one smoke detector, and many homes have several detectors. This was one of the fastest spreading technologies in history. Public education efforts at the national, state, and local levels plus a huge private sector advertising campaign combined synergistically to make this happen.

Several factors underlaid this extraordinary boom in smoke detector use. The smoke detector revolution was made possible by the improved technology and decreased costs of the units themselves.³⁹ The timing of this breakthrough was fortunate; widely available smoke detectors, at a cost consumers were willing to pay, provided the fire service with a ready-made topic for the enhanced public education activities called for by *America Burning*, the landmark report of the National Commission on Fire Prevention and Control in 1973. Smoke detector manufacturers increased public awareness of detectors through intensive prime-time paid advertising. Intensive, prolonged efforts of the fire service to educate the public about the lifesaving benefits of home smoke detectors were not

only another major factor in spreading information about them, but also legitimized their use and the credibility of private advertising. TV was urging you to buy, and the fire service was saying that it was the right thing to do.

The U.S. Fire Administration (USFA) and the National Fire Protection Association (NFPA) each have had sustained national efforts over the years encouraging the use and maintenance of detectors. We discuss the USFA program in detail here, but NFPA and many independent state and local programs also played a major role.

Early Federal Public Education Activities—Pinpointing the “beginning” of smoke detector public education is difficult. Nonetheless, 1977 emerges as a key year. Paid television advertising for smoke detectors began to emerge at about this time. By the spring of 1977, local fire departments were swamped with inquiries on selection and installation of smoke detectors. That interest was to grow throughout the year; in the fall, NFPA’s Fire Prevention Week theme was “Where There’s Smoke, There Should Be a Smoke Alarm.”⁴⁰

Also in 1977 the U.S. Fire Administration (then the National Fire Prevention and Control Administration) identified smoke detectors as a major agencywide focus, with immediate results:

- Publication and distribution to the fire service of a series of five smoke detector manuals: a resource catalog, a manual on “moving the public,” a technical manual, a legislative manual, and a training manual

for use by communities and the fire service.⁴¹

- Publication of a brochure called “Wake Up! Smoke Detectors Can Save Your Life,” in cooperation with the Consumer Product Safety Commission and the National Bureau of Standards (now the National Institute of Standards and Technology).⁴²
- Printing of 3.5 million copies of the smoke detector brochure at no cost to the federal government with the help of Sears, and free distribution through local fire departments.
- Lending of 100 sets of negatives of the brochure for local fire departments to use in printing their own copies, resulting in the distribution of an estimated 6.5 million additional copies of the brochure.

The Fire Administration’s National Fire Academy also carried out major smoke detector training activities for the fire service.⁴³

Two key trainers became “circuit riders” for the USFA: Dennis Ozment of the Minneapolis Fire Department and Burton Clark of the National Fire Academy. During 1977-78, 35 states hosted 93 USFA smoke detector seminars for 9,367 attendees. The objective of the seminars was to “train the trainers.” As part of the seminars, attendees were asked to estimate how many other “trainers” they would subsequently teach and how many members of the public would receive smoke detec-

³⁹ See R. Custer and R. Bright, *Fire Detection: The State of the Art*, National Bureau of Standards Technical Note 839, June 1974, and “Recent Advances in Residential Smoke Detection” (*Fire Journal*, November 1974).

⁴⁰ The NFPA 1984 Fire Almanac, p. 730.

⁴¹ They were updated at least once and are still excellent sources.

⁴² The CPSC still distributes this brochure, more than a decade later.

⁴³ The U.S. Fire Administration, Office of Planning and Education, “Report to Congress,” 1981.

tor information as a result.

Six months later, a sample of participants was contacted to determine how many they actually had reached. As a result of that study, the Fire Administration estimated that the seminar attendees ultimately reached 1,590,000 people with smoke detector information.

Advertising and Fire Service Activities—An advertising campaign by First Alert, a major vendor of smoke detectors, featured actor William Conrad and conveyed the message to millions of prime-time television viewers that smoke detectors can save lives. The National Fire Protection Association's "Learn Not To Burn" television public service announcements with actor Dick Van Dyke reinforced the smoke detector message.

Fire departments played roles of inestimable value in smoke detector education. USFA data showing that fire death rates in dwellings without detectors were double those with detectors were widely publicized. When they faced reporters at the scene of a fire, local fire department officials began to highlight whether the home was protected by detectors. Fire department personnel explained the need for smoke detectors over and over, emphasizing voluntary installations and urging their jurisdictions to enact smoke detector legislation.

In many cases, fire departments were very proactive in their efforts to place detectors in the homes of their citizens. The Philadelphia Fire Department and local broadcast media sponsored a program in which detectors were given away as contest prizes. Fairfax County, Virginia, helped major employers and large civic groups arrange bulk-purchase discounts. Wilmington, Delaware; Kansas City, Missouri; and Baltimore, Maryland, purchased smoke detectors that were given away free to people in fire-prone neighborhoods. Fire departments across the United States began "home safety survey" or "home safety visit" initiatives that included

installing smoke detectors.

Many communities found innovative ways to fund their smoke detector programs. The city council in Louisville, Kentucky, matched monies raised by the Fire Department from industry. Together, these matching funds totaled approximately \$250,000.

Many of these efforts were not "one shot" programs, but have continued to keep the profile of smoke detectors and public fire safety education high.

A Change in Program Focus—The success of efforts to urge smoke detector installation became evident by the steadily growing number of households with smoke detector protection. However, a new challenge emerged: the need for routine testing and maintenance of the millions of home smoke detectors.

As early as 1977, a survey by the Aerospace Corporation for the U.S. Fire Administration revealed that fewer than 10 percent of detector owners had done any maintenance other than battery replacement. A Toledo, Ohio, survey confirmed this finding—and indicated that 88 percent of owners had never cleaned their detectors. More than half tested their detectors less than once a month.

By the mid-1980s, the Fire Administration estimated that one-third to one-half of the smoke detectors in U.S. homes were not in working order. These estimates were based on several small-scale spot surveys on the community level, as well as data on smoke detector operation in fires reported through the National Fire Incident Reporting System (NFIRS). The focus of smoke detector education then was changed from installation to maintenance and testing.

In 1987, the Fire Administration launched a public education program (developed by Powell, Adams & Rinehart [previously Ogilvy & Mather Washington] and TriData Corporation) aimed at the heart of the maintenance problem. "Give Your Smoke

Detector a Birthday Present" was the theme of the campaign, to encourage people to use their birthday as an annual reminder to replace smoke detector batteries.

In 1988, the International Association of Fire Chiefs and the American Burn Association joined the makers of Eveready batteries in a similar campaign. Using the slogan, "Change Your Clock, Change Your Battery," this campaign linked smoke detector maintenance to annual changes to and from Daylight Savings Time. The late October time change follows Fire Prevention Week, a time when public awareness of fire safety issues may be higher than normal.

Formal evaluation has not yet been carried out for the latest campaigns. NFIRS data show that the percent of households that have reported fires and that have smoke detectors is increasing. The households that have fires are a very important group, because they have been far behind the national average in smoke detector usage.

In conclusion, smoke detectors have been the subject of what may be the fire service's most focused and sustained public fire safety education effort. The impact of this effort is seen in several ways, including the numbers of homes protected with detectors and the individual residential fires in which operating smoke detectors made a lifesaving difference. There have been hundreds of anecdotes reporting the success of smoke detectors in preventing injury, death, and dollar loss. Most important, the success of smoke detector campaigns is thought to be one of the major factors in the 35 percent decline in the U.S. fire death rate from the mid-1970s to 1989.

For more information contact: James Coyle, Assistant Administrator, U.S. Fire Administration, Office of Planning and Education, 16825 S. Seton Avenue, Emmitsburg, MD 21727, (301) 447-1000.

70. National Fire Protection Association: Learn Not To Burn Program

Jurisdiction: Nationwide
Target Group: Whole population, especially children
Subject: Multiple
Evaluation Measures: Anecdotes; outreach

The National Fire Protection Association (NFPA) began research for its Learn Not To Burn (LNTB) programs with a 1973 survey to determine how to reach the public with fire safety information in the most effective manner. The resulting programs consist of a national LNTB media campaign, the *Learn Not To Burn Curriculum* for use in elementary school classrooms, and technical assistance to the fire service by regional NFPA field representatives. Beginning with the media campaign, the Learn Not To Burn programs have been in continuous operation since 1975.

The *Learn Not To Burn Curriculum* was first published in 1979, with a second edition in 1981 and a third edition (with substantial revisions) in 1987. The curriculum is intended for use by the individual elementary school teacher in planning classroom activities and can be reused from year to year.

Evaluation of the LNTB program has included:

- Compilation of anecdotal reports of lifesaving incidents credited to the LNTB national media campaign or the curriculum.
- Technical support to encourage the use of evaluation instruments for testing the knowledge of students participating in local school LNTB programs.
- Tracking of reports of on-air time donated to Learn Not To Burn television public service announcements in the United States and Canada.

Since 1975, NFPA has maintained the data base of documented anecdotes describing "saves." To be counted, these case histories of

actual fire or burn incidents have to show that knowledge gained from LNTB directly contributed to saving a life or preventing more serious injury. The information is carefully validated. The count of "saves" is thus a conservative, low-side indication of the program's effectiveness.

The "save" anecdotes collected by NFPA take several forms: letters or telephone calls from the people involved, letters from fire department personnel reporting a "save," and published reports that specifically cite Learn Not To Burn. In some cases, NFPA staff have conducted telephone or

personal interviews of people involved in a "save."

New Directions for NFPA Evaluation—Until now, NFPA's data base of anecdotes has been specifically limited to those that could be directly traced to the Learn Not To Burn national media campaign or the *Learn Not To Burn Curriculum*. The anecdotes have been further limited to those in which a death or more serious injury had been prevented.

NFPA conducted a six-month pilot study from January to June 1990 that takes a substantially wider view of public fire safety education "success stories."



NFPA Fire Safety Education Representatives are among the most talented public educators in the world. In front, Glen Kobussen, John Staley, Roy Knight; in rear, Pat Mieszala, Cathy Lohr, Mary Nachbar, Carol Gross, Peg Carson, Jan Gratton. (Missing from photo: Jerry DiMillo, Art Guidry, Ed Kirtley.)

Through questionnaires completed by the fire service, this study collected anecdotal information on public fire safety education efforts including Learn Not To Burn and other programs. Such "success stories" were not limited to lifesaving incidents. A call placed to 911 or the act of cooling a relatively minor burn, for example, were included.

NFPA also is attempting to track actual implementation of the *Learn Not To Burn Curriculum* through the use of registration cards completed by classroom teachers upon receipt of the manual.

Results: By March 1990, the Learn Not To Burn "save" anecdotes over a 14-year period totaled 143 incidents involving 312 potential victims, or victims for whom more serious injury was averted. The "saves" attributable to the media campaign and to the education curriculum are shown in Table 24. An example of a documented anecdote is shown in the box below.

About 10 to 20 people each year are known to have been saved from deaths or injuries by LNTB. The actual numbers may be much

Table 24
NFPA LNTB Program Saves Over 14-Year Period

	<i>Number of Incidents</i>	<i>Number of People Saved</i>
LNTB Media	77	169
LNTB Curriculum	66	143
Total	143	312

higher because many saves are probably not reported.

Number of People Reached— Since 1974, NFPA has widely distributed 21 different Learn Not To Burn television public service announcements. While television stations are not required to report the specific public service materials they broadcast, some voluntary reporting does occur. Based on these reports, NFPA estimates that 24 million homes have received at least one spot. The number of viewers assumed in an average Nielsen-rated home is 4. Thus, NFPA estimates the number of viewer contacts as close to 100 million.

Approximately 50,000 units of the *LNTB Curriculum* have been distributed worldwide since 1979,

primarily in the United States and Canada. The number of students that have been exposed to the curriculum is unknown exactly, but estimates can be made. According to the U.S. Department of Education, 32,915,000 U.S. children are enrolled in public and private schools for the 1989-90 school year. The number of students per classroom is 23.75. If all units ever distributed were still in use, and they were all used in the United States, those 50,000 units could have reached up to 1,187,000 elementary school students during the 1989-90 school year, or up to 3.6 percent of the total student population.

There is an unknown but probably significant degree of unauthorized secondary distribution of units, that is, "bootleg" copies. Such use increases the effective penetration of the curriculum. However, the proportion of unused units, the number of reused units, and the number of these bootleg copies are all unknown.

Thus the number of students who have received Learn Not To Burn instruction since 1979 is known to be large but not known exactly. For that matter, the percent of students who are exposed to any curriculum of substance like LNTB is also unknown, and one of the major research gaps in fire safety in the United States.

For more information contact:
Meredith K. Appy, Assistant Vice President, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101, (617) 984-7288.

EXAMPLE OF NFPA DOCUMENTED LEARN NOT TO BURN TV SAVE

Incident No. 77

Lives Saved: 4

WENTWORTH, NORTH CAROLINA
(October 15, 1988)

Kindergartner Danielle Broadnax saved herself, her parents, and infant sibling when she remembered Learn Not To Burn television public service announcements in which Dick Van Dyke explains the importance of responding to smoke detectors and crawling low under smoke.

The incident occurred when a fire caused by an electrical short activated the smoke detector in Danielle's apartment. When she heard the detector, Danielle crawled to her parents' bedroom and woke them up. Her parents grabbed the baby and the entire family of four escaped through a sliding glass door to safety.

Danielle had learned her firesafety skills approximately a week earlier, during a Fire Prevention Week class conducted by Rockingham County Deputy Fire Marshal Steven A. Hale. He used the Learn Not To Burn "Detective" spot as part of the class. . . .

SPECIAL TOPICS

This section presents evaluations of prevention programs that did not fit neatly into the preceding categories. These pro-

grams address a variety of important topics including escape; stop, drop, and roll; evaluation of materials; an approach to evaluating

the development of a public education program; rural fire safety; and institutional fire safety.

71. State of Oregon: "The Great Escape"

<i>Jurisdiction:</i>	Statewide
<i>Target Group:</i>	Homes
<i>Subject:</i>	Escape drills
<i>Evaluation Measures:</i>	Change in knowledge; participation in escape drills

"The Great Escape" was a statewide fire safety campaign coordinated by the Oregon Fire Education Association. The goal of the campaign was to have residents practice a home escape plan on a designated day—October 9, 1986. An information kit containing camera-ready art; print, audio, and video public service announcements (PSAs); and other materials were sent to every fire department in the State of Oregon. Two video PSAs were distributed to television stations: one that aired prior to The Great Escape and one that was the signal for the event to start.

The campaign was coordinated so that at a prearranged time on October 9 a television announcement was made and the triggering PSA shown on multiple TV stations. At the same time, fire department members drove through neighborhoods and sounded their sirens. This was to signal that it was the time for families to practice their home escape plan. It is estimated that 80-90 percent of the fire departments in the state participated at some level.

Results: A statewide pre- and post-campaign telephone survey was conducted with the participation of 19 fire departments. A total of 650 households were contacted at random—325 in each phase. The survey was designed to evaluate the effectiveness of the campaign as well as the average resident's knowledge of

home escape plans. The survey was designed by fire educators and reviewed by pollsters at Portland State University to achieve 95 percent confidence in the results.

The percentage of those surveyed who had heard about home fire escape drills increased from 57.4 percent before this campaign to 75.7 percent after. The number who said they had an escape plan went up 7 percentage points, from 61.2 percent to 68.3 percent. More than half of those surveyed, 59.2 percent, said they knew about The Great Escape, and 22 percent said they participated. Encouragement from children was the most

common reason given for participation, especially after the campaign. The percentage who actually practiced an escape plan rose only slightly, from 21.5 percent before the campaign to 23.2 percent after the campaign. Of those who didn't participate, many felt that a home fire escape drill was not necessary.

For more information contact: Nancy Campbell, Office of the State Fire Marshal, Suite 534, 3000 Market Street Plaza, Salem, OR 97310, (503) 378-2884, or Larry Goff, Lake Oswego Fire Department, P.O. Box 369, Lake Oswego, OR 97034, (503) 635-0275.



The State of Oregon's Great Escape drill was advertised in many ways, here in a shopping mall.

72. Clark County Fire Department (Nevada): Stop, Drop, and Roll PSA

Jurisdiction: Suburb
Target Group: Children
Subject: Stop, drop, and roll
Evaluation Measures: Anecdote; outreach

The Clark County Fire Department ran a 30-second TV public service announcement (PSA) on stop, drop, and roll featuring the Department's talking fire hydrant robot. The PSA was shown 1,000 times over several months; in some cases it aired 10 times daily for a month.

Results: An informal survey of the effectiveness of the PSA was conducted in school classrooms as part of the Department's fire prevention presentation discussed in Case Studies #24 and #25. Students were asked, "Have you

seen Deputy Douse on TV?" About 80 percent raised their hands. "What is his message?" "Stop, drop, and roll!" the kids would say. "When do you do you do that?" "If our clothes catch fire!" While not a scientific survey, the results showed that large numbers of students were seeing the TV spots and getting the message.

Clark County also has a documented save attributed to the PSA. A 4-year-old girl and her 6-year-old brother were playing with a lighter, and her dress caught fire.

She panicked and began to run. Her mother rushed out and at first tried to beat out the flames. Then she remembered the PSA and pushed her daughter onto the ground, rolling her over and over. The child suffered second degree burns and spent two weeks in the hospital, but could have been killed.

For more information contact: Robert Leinbach, Public Information Officer, Clark County Fire Department, 4425 West Tropicana Avenue, Las Vegas, NV 89109, (702) 455-7700.

73. The National Smoke, Fire and Burn Institute, Inc: Prevention Materials

Jurisdiction: National
Target Group: Children and adults
Subject: Escape; detectors
Evaluation Measures: Anecdotes

After 26 years as a surgeon specializing in the treatment of burns, Dr. Anne Phillips decided that the best way to treat serious burns was to prevent them. In 1973, she retired and began a second career as founder and executive director of the National Smoke, Fire and Burn Institute, Inc., in Brookline, Massachusetts.

During the past 15 years, this nonprofit institute has produced a number of pamphlets and films, as well as a "teaching dog" to instruct children and adults about fire prevention and protection. One of the Institute's films, "Two Steps to Survival," was named Best Educational Film of the Year in 1975 by the Public Relations Society of America.⁴⁴

Dr. Phillips travels to schools

in the Boston area with her pet, Aunt Samantha, the teaching dog. Children love to watch and learn as the dog "teaches" them six principles of fire safety. When Dr. Phillips tells the dog she smells smoke, Aunt Sam feels the door to see if it is hot. When she tells the dog that the room is filling up with black smoke, Aunt Sam crawls across the floor. If told that her clothing is on fire, the dog shows the children how to stop, drop, and roll. When Dr. Phillips tells Aunt Sam that there is a big fire, the dog crawls out of the room to a telephone, knocks the receiver off the hook, and

barks into the phone to report the fire. If trapped, Aunt Sam shows how to hang a towel out the window to show rescuers her location. And finally, Aunt Sam shows the children how to put a lid on a frying pan that has caught fire.

Results: Dr. Phillips has collected a number of letters and newspaper stories documenting cases where people credit the information in her materials with saving their lives in a fire. Six examples are presented here.

Angela Crayton, a 13-year-old girl from Lexington, Massachusetts, saw the Institute's film "Get Low and Get Out" and participated in a fire and smoke drill at her school. When her home caught fire, Angela remembered what she

⁴⁴ The film is available from Aetna Life and Casualty, Audio Visual Resource Center D.A., 151 Farmington Avenue, Hartford, CT 06156.

learned and crawled through five smoke-filled rooms to safety.

Rusty Kinney of Bucksport, Maine, saw the Institute's film "Two Steps to Survival." He was home alone one day when fire broke out. He traced the fire to the door leading to the garage. He felt the door, found it to be hot, and remembered that the film told him never to open a door that was hot to the touch. He chose another route to exit the house, and once he had escaped, called the Fire Department. Kinney's father was grateful that his son had remembered what he learned from the film. He said that had he been home, he would have opened the garage door.

A young, pregnant woman from Cohasset, Massachusetts, was talking on the telephone in her Boston office. The window was open, and she had covered her other ear with her hand to block out the noise from nearby construction, so she did not hear the fire alarm go off in the building or hear the fire sirens as they approached. Finally, the young woman saw smoke billowing past

her window and knew she had to escape. She remembered what she had read in the Institute's publication "How Safe Are You?" and felt the door before opening it. Although she saw smoke in the hallway, she felt she could make it to the end. She remembered to crawl low beneath the smoke and escaped to safety. The woman credited her survival to the information she had read.

Bruce Odell of Wellesley, Massachusetts, fell asleep in his living room, leaving a Christmas candle burning in the front hall. He was awakened early the next morning by the sound of a smoke detector he had installed after hearing an Institute lecture seven years earlier. He also remembered to get low in the presence of smoke. He did make a mistake by trying to exit through the front door near the fire and singed his face when the fire flashed, but then exited in another way. He credited his survival to what he had learned.

A college student whose mother had years earlier read the Institute's fire safety materials

aloud to him is credited with leading a group of his friends to safety in a fire at his college.

A Pennsylvania man said it was his 6-year-old who taught him to get low in smoke after seeing "Get Low and Get Out" on television. The man knew what to do when a fire occurred and saved the life of a Pennsylvania teacher in a burning house.

The effectiveness of the "teaching dog" approach was demonstrated when a Massachusetts nursery school child saved his entire family in a fire by remembering the six fire safety principles he learned from watching the dog. The child was awakened by a smoke detector. He crawled through smoke to his mother's room, awakened her, and made her crawl low through the smoke to the baby's room. All three escaped to safety. The local fire chief said he expected to find no survivors when they responded to the call.

For more information contact: Dr. Anne Phillips, the National Smoke, Fire and Burn Institute, 90 Sargent Road, Brookline, MA 02146-7571, (617) 426-3161.

74. Pan-Educational Institute: Community Public Education Assessment Package

<i>Jurisdiction:</i>	Any
<i>Target Group:</i>	Community
<i>Subject:</i>	Multiple
<i>Evaluation Measures:</i>	Scaled ratings of program components

The Pan-Educational Institute operates under the direction of Joan Williams, an experienced educator and curriculum specialist. The Institute has developed excellent fire prevention programs, including Project L.I.F.E. (Local Involvement in Fire Education), a preschool curriculum and a kindergarten through sixth grade curriculum. More recently the Institute has developed a "Community Public Fire Education Assessment Instrument," in collaboration with a team of prominent fire and

burn prevention educators. This is not a prevention program per se but rather a package of tools for designing programs and evaluating their design. Although not like the other case studies here, it was thought to be of sufficient interest and relevance to include.

Pan-Educational Institute's approach is to lead a community through a six-step process for assessing public education programs. The first five steps are as follows:

- 1) Develop a "Community Profile," in terms such as school

types, ethnic groups, housing types, and business or industry types.

- 2) Develop a "Needs Assessment," in terms such as the leading types of fires and their causes, amounts of dollar loss by general property type, and numbers of fire deaths and injuries by age group.
- 3) Analyze "Past Fire Education Efforts" by target population, medium used, and the disposition of each proj-

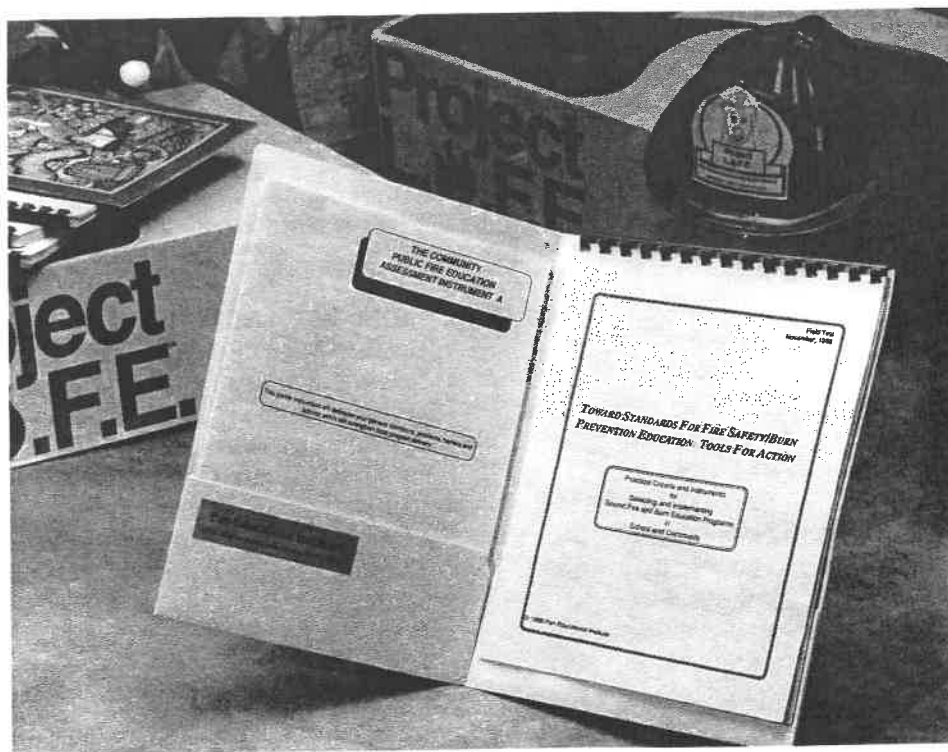
ect—whether continued, modified, or discontinued, and why.

- 4) List "Current Public Fire Education Efforts," including the target population.
- 5) Rate "Perceived Effectiveness" of each current program, in terms of five-level acceptance and implementation scales. The acceptance scale runs from a low of "unacceptable," to a midpoint of "acceptable with reservations," to a high of "endorse completely." The implementation scale ranges from "not implemented" to "fully implemented."

The sixth step is a "force field analysis" of helping and hindering factors related to the overall public education program. This is a precursor to another package, "Community Public Fire Education" strategic planning steps.

The methodology here is important in that it requires a community to recognize explicitly what its fire problem is and which groups it is targeting, as does the U.S. Fire Administration's Five-Step Public Fire Education Planning Process.

The Pan-Educational Institute package also contains instruments for evaluating school-based and community-based programs, and for evaluating materials and media pieces used in public education programs. The evaluations focus on how well goals and objectives are stated, and on the organization, appropriateness, completeness, quality of print and graphics, clarity, skill content, and the motivational techniques of the materials and involvement of pertinent groups in the development of the materials. It also asks whether the program was



Package of tools developed by the Pan-Educational Institute for designing public education programs.

field-tested and what evidence exists to support the effectiveness of the program.

This instrument is excellent for designing a program and "evaluating" whether all the appropriate bases were touched, but it is not intended to evaluate the end results or effectiveness of the program. Following Pan-Educational Institute's guidelines will increase chances of having an effective program and may even be helpful in diagnosing what caused a program not to be effective, if that turns out to be the case.

Winnipeg Test—Winnipeg, Manitoba, Canada, helped test the Pan-Educational Institute evaluation instruments.⁴⁵ In the

course of filling out the evaluation instruments, Winnipeg incidentally discovered proof of the success of one of its prevention programs. Enforcement of fire code regulations in small businesses had been targeted as a special effort. Winnipeg was able to show a reduction in dollar loss and incidents in small business since its program started. Part of the impact was attributed to the large dose of education that is part of inspection programs, especially in small businesses. Inspections also have been a classic way to stimulate more attention to safety on the part of those subject to inspection.

For more information contact: Joan Williams, Pan-Educational Institute, 10922 Winner Road, P.O. Box 520347, Independence, MO 64052, (816) 461-0201.

⁴⁵ The contact for this effort is Bill Burton, Fire Prevention Officer, City of Winnipeg Fire Department, Winnipeg, Manitoba, Canada, R3B 1L1.

75. District of Columbia Fire Department: Institutional Fire Safety

Jurisdiction: City
Target Group: Institutions
Subject: Prevention; extinguishment; escape
Evaluation Measures: Behavior changes; hazard removal

The D.C. Fire Department has conducted an institutional fire safety program since 1985. The program is directed at staff members of D.C.'s community-based residential facilities, nursing homes, correction and detention centers, and similar institutions. It consists of a core "Institutional Fire Safety: Skills Workshop," which includes modules specific to individual occupancy types and training in proper use and care of portable fire extinguishers. The program was being expanded in 1989 to include more in-depth training tailored to specific occupancy types and a course in extricating and evacuating victims.

The workshops are presented in individual institutional facilities

by D.C. Fire Department public education specialists. By 1989 the Department had reached 3,000 institutional workers through workshops, and an additional 1,500 through refresher training in the skills workshop as part of D.C.'s Nursing Home In-Service Training.

Results: Curtis Wolridge, who helped implement the program, said that when he revisited facilities in which workshops had been conducted, he saw an increase in the frequency with which evacuation plans had been made and in physical changes such as replacement of light bulbs in exit lights, repairing of broken or nonfunctional exit doors, and clearing of hallways. This information has not been quantified yet.

Wolridge believes the real test of effectiveness is the long-term statistics. "If, 10 years from now, we haven't had any major incidents in these facilities or lost any lives, then I'll consider that my program really deserves the credit."

For more information contact: Battalion Chief Don Scalise, District of Columbia Fire Department, 4600 Shepherd Parkway, S.W., Washington, DC 20032, (202) 673-3245, or Curtis Wolridge,⁴⁶ P.O. Box 23242, Washington, DC 20026.

⁴⁶ Mr. Wolridge, former Education Specialist with the District of Columbia Fire Department, is now a fire specialist with the U.S. Department of Education, and a private consultant on fire safety.

76. State of Oklahoma Forestry Division: Future Farmers of America Safety Program

Jurisdiction: Rural counties
Target Group: High school students
Subject: Wildland fires; controlled burning
Evaluation Measures: Knowledge increase and retention; wildland fires; number of controlled burns reported

Jody Cooper, when working for the Oklahoma Forestry Division, wrote a 50-minute (one school period) fire safety program targeted to student members of Future Farmers of America clubs. It focused on reducing wildland fires, including basic safety for outdoor fires. It also discussed how students could help the Forestry Division with its fire problem.

The program included a pretest to determine the range of the students' fire safety knowledge and a post-test to measure their level of understanding and retention

after the program. This program was pilot-tested in January 1985 in two high schools, Buffalo Valley and Leflore, in south-

eastern Oklahoma. These schools are in an area considered a "hot spot" for wildland fires.

Based on initial successful

Table 25
Southeast Oklahoma High School Pilot Test Scores

	<i>Pretest</i>	<i>Post-Test</i>
Mean Test Score	69	89
Standard Deviation	13.3	10.3

results, Cooper's local Kiwanis Club applied for and won a grant from the U.S. Fire Administration's National Community Volunteer Fire Prevention Program to update and produce more attractive visuals for the program and to field test it in additional schools, including one from the first pilot study.

Results: The program proved so successful that it now is in use in every high school in a four-county area of southeast Oklahoma.

In the pretest of the pilot study, 30 students in one school and 42 in the second were given 20 questions to answer in five minutes at the beginning of the hour. Thirty days later, the same students were given a five-minute post-test. The results, shown in Table 25, demonstrate that the students retained much of the information they had been taught the month before.

There was also some evidence that the students were sharing information they learned at home; people in the community told local rangers how well their children liked the class.

This program was highly cost-effective. The cost was \$181 for two schools, including prorated pay for nine person-hours of class testing and two person-hours of driving by two rangers at \$16 per hour,

Table 26
Field Test Scores of Revised
Southeast Oklahoma High School Program

Leflore School (31 students tested)

	<u>Pretest</u>	<u>Post-Test</u>
Mean Test Score	70	86
Median	75	85
Standard Deviation	16.6	10.6

Poteau School (64 students tested)

	<u>Pretest</u>	<u>Post-Test</u>
Mean Test Score	68	89
Median	70	90
Standard Deviation	12.8	7.0

plus \$5 to reproduce the test. That amounted to \$2.23 per student reached.

After revising the program, two high schools tested it in February-April 1988, using a larger group of students than the earlier test. The results, shown in Table 26, were quite similar to the first pilot test, and similar between the two schools. There were significant improvements in the knowledge level among students from both schools.

To measure long-term retention,

a group of 16 Leflore seniors who had participated in the pilot test in 1985 were given the pre- and post-tests again in February and March 1988. This time they averaged 89 on the pretest and 91 on the post-test, with even smaller standard deviations than before. The lowest score was a 70; all others were 85 percent or higher. The retention was excellent.

For more information contact:
Jody Cooper, Agent, State Fire Marshal, Route 1, Box 139-B, Poteau, OK 74953, (918) 647-9817.

77. State of Nebraska: Community Wildfire Prevention Programs

<i>Jurisdiction:</i>	Statewide
<i>Target Group:</i>	General population
<i>Subject:</i>	Wildfire prevention
<i>Evaluation Measures:</i>	Wildfire incidence

As Fire Resource Manager for the Department of Forestry, Fisheries, and Wildlife Fire Control, Robert Vogltance serves as a state-level fire prevention specialist offering guidance and support to fire departments that agree to designate a public education person to focus on wildfire prevention. For the

past 10 years, he has provided ideas on how to get started, resources for getting advice and materials, and "a shoulder to cry on" for support and reinforcement.

Vogltance asks participating departments to fill out reporting cards on a regular basis to keep track of efforts in various com-

munities. The data are stored in a computer and are used to help new communities get started or to provide additional ideas to areas already participating. The data also help show which communities are actively pursuing prevention.

The program includes incentives in the form of congratulatory let-

ters, certificates of appreciation, and awards. In addition, a fire prevention course at the state fire school has been revived, and participating communities are highlighted in a "show and tell" segment that is the core of the course. This provides not only needed reinforcement and recognition for good programs, but also peer teaching experience, and enables participants to network with colleagues facing similar challenges.

Vogltance believes the program is effective because it blends national, state, and local prevention efforts. Messages from recognized (and therefore trusted) members of the local community tend to be more effective in Nebraska (and most rural areas) than people from higher levels of government. The Nebraska Forest Service therefore emphasizes showing fire departments how to conduct their own locally tailored prevention programs using state and national information.

Results: In the years when a prevention specialist has been active, the average number of fires per year has been significantly lower: 1,317 with the specialist, compared to 2,306 without, as shown in Table 27.

Taking into account the weather-related factors that affect wildfires, the results are still highly impressive: a 35 percent drop.

To form the indicator to correct for the effects of weather and fuel conditions, Nebraska used the number of wildfires divided by the Cumulative Fire Hazard Index (CFHI). The CFHI is the sum total of all daily fire danger ratings at three locations in Nebraska for the year. Each rating is on a scale of 0-100. It is based on weather and fuel factors such as temperature, relative humidity, cloud cover, wind, precipitation, and vegetation greenness. By dividing fires by this index, a measure was developed that normalizes the effect of weather and fuel factors, which helps remove the most influential external factors.



Smokey the Bear continues to be a key figure in teaching fire safety, here appearing in Nebraska.

Table 27
Impact of State-Level Fire Prevention Specialist on Nebraska Wildfires, With Weather and Fuel Considered

<u>Year</u>	<u>Prevention Specialist</u>	<u>CFHI</u>	<u>Number of Wildfires</u>	<u>Fires ÷ CFHI</u>	
1976	No	38608	2687	0.079596	
1979	No	30718	1579	0.051403	
1980	No	40497	2629	0.064918	
1981	No	34964	2327	0.066554	
Average		36197	2306	0.063118	
1977	Yes	37662	1763	0.046811	
1978	Yes	31477	1658	0.052673	
1982	Yes	31969	1119	0.035002	
1983	Yes	31895	1184	0.037121	
1984	Yes	31486	970	0.030807	
1985	Yes	35962	1038	0.028863	
1986	Yes	26201	1484	0.056639	
Average		32379	1317	0.041131	-34.83%
Overall Average		33767	1676	0.049127	

This is an excellent example of how external factors can be taken into account in an evaluation. Since outdoor fires are significantly affected by the dryness of the season, the dryness can overwhelm

the effect of public education. By comparing the fires relative to a fire danger index for the years with and without a prevention person, the effect of weather and fuel was accounted for.

Another method would have been to consider the wet years alone as a group, and compare the average number of wildfires in the years with and without a prevention specialist. The dry years could be similarly divided.

Note that the state officials could have made the program look better if they had ignored weather and fuel factors, and just presented at the average number of fires without a prevention specialist versus with one, a drop of 43 percent. But they gain a great deal of credibility by taking the external factors into account—and they still look highly effective.

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Nebraska's statewide program uses radio to supplement local prevention efforts. Don Westover, Fire Coordinator, is shown here on the air.

IV. LESSONS LEARNED

One of the purposes for identifying the large group of proven successes in the preceding chapter was to glean lessons for developing and evaluating future public fire education programs.

What the Success Stories Have in Common

Although the public education programs discussed in the previous chapter vary in subject and approach, they seem to have some common elements that increased their chances for success. Not all of these elements are found in each case, but virtually all of the cases exhibited several of the characteristics listed below.

1. "Spark Plugs" or Champions—Most of the programs identified as proven successes had an individual or two who carried the program through to its success and helped implement it. While often it is the old story of the right person in the right place at the right time, we cannot help but get the feeling that the individuals involved would have been successful in other environments. You need someone who is reasonably smart, cares about preventing fires and fire injuries, is willing to work within the bureaucratic constraints, and perseveres. To quote one of Winston Churchill's famous graduation speeches in its entirety: "Never give up. Never give up. Never give up."

2. Magnanimous Chiefs—Many of the chiefs of the departments with successful public education programs also had a striking characteristic. They allowed their public educators room to be innovative, and to find the resources needed to implement the programs if the department itself could not provide the resources. Sometimes

these were brand new chiefs who wanted to try out new ideas, sometimes chiefs who had been around a long time.

Either new or old, the chiefs could be characterized as generous enough to give the public educators room to feel what some psychologists call "self-actualized," and that they were having an impact as individuals. When the program has to be billed as "Chief Ego's" program, it may

example, try to reach students repeatedly in the elementary grades, have special programs for the elderly, take good advantage of Fire Prevention Week, put on displays in malls or county fairs or wherever masses of people gather, and use the major media of the community—radio, TV, and newspapers—to get messages across on a frequent basis. These programs typically reach large percentages of the people in the

What the Success Stories Have in Common

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|--------------------------------------|--|
| 1. "Spark Plugs" or Champions | 6. Good Materials |
| 2. Magnanimous Chiefs | 7. Significant Outreach |
| 3. All-Out Attack or Surgical Strike | 8. Repeated Exposures |
| 4. Market Research | 9. Adaptability to Change |
| 5. Powerful Allies | 10. Testing Programs in a Small Area First |

pay more attention to enhancing public relations than to achieving measurable bottom-line results. Perhaps the ultimate tribute to a fire chief is to be able to say that during his or her term the citizens were safer than ever before. The successful public education program is one way to achieve that goal.

3. All-Out Attack or Surgical Strike—The successful programs tend to be one of two types: Either they attack a multitude of fire problems and safety techniques with force and repetition—a "full-court press" in basketball terms—or they are targeted carefully toward a particularly intense fire problem. In a few cases, there are a series of carefully targeted problems.

The all-out program will, for

community each year and show long-term cumulative success. Mt. Prospect, Illinois, and Norwood, Massachusetts, are two examples. You don't have to be large to be mighty in the prevention business.

The carefully targeted problem often is selected on the basis of local fire data, with follow-up research on the characteristics of the group identified as having the most severe problem, and on further details of the problem. The Portland, Oregon, program aimed at households in the inner city that were without smoke detectors; various cities' juvenile firesetter programs; and programs targeted at careless cooking with oil, chimney fires, maintenance of detectors, or kids playing with matches are examples of the tar-

gets selected. The target can be particular areas of the community, particular population subgroups, or particular fire hazards. Usually they are selected by communities that have adequate data to know what their fire problem is, where it is, and what its major components are. The greatest success is achievable by going after the bigger problems rather than a problem that is already quite small.

4. Market Research—The best and most successful programs often evidence detailed knowledge of their target clientele that has been obtained through formal or informal market research. Market research determines what media the people listen to, who they listen to, what types of messages they are likely to be receptive to, and what they already know, all of which are important for crafting public education programs.

While it is much better to deliver some messages to some people than to do nothing, the effectiveness of a program can be greatly increased by hitting the right people with the right message at the right time. For example, knowing that inner-city households in a city do not trust local government authorities, including the fire department, but will contact local newspapers or church groups for free detectors, can make an enormous difference in whether they act or not. You have to know what the situation is to shape your program into one that will work.

Market research can take various forms. Besides citizen surveys and focus groups, “market research” can include cashing in on a teacher’s knowledge of children’s abilities and behavior in different elementary grades and on what teachers perceive to be their teaching load in the different grades, to help decide which grades to target.

Another form of market research is to pretest your intended audience, which not only gives a baseline from which you can measure change, but also identifies the items the group is weakest in and

the areas they already know. That information can help make the most out of scarce public education time once you are “connected” to the group. For example, you may find that they already know that smoke detectors are good for early detection but do not know how to maintain them, or that they need a plan for what to do when the detectors go off. You would then want to focus on the latter two points and not dwell on the importance of smoke detectors.

5. Powerful Allies—In many cases, the successful public educator was able to find powerful allies in the community—someone in the school system to allow access to the classroom, a local industry to provide financial support, the local media to publicize the program, municipal agencies such as the police and the courts to refer juvenile firesetters, and so on.

The very essence of a public educator’s job is to find ways to reach the public that needs to be educated. Unless you are in one of the very few cities with an enormous public education budget, and can buy your way into the media, you can’t reach much of the public without help.

Probably the most important thing for an outgoing public educator to leave to his or her replacement is the list of key contacts among city businesses, media, and others who are supportive of getting the message out. And if that list doesn’t exist, it is probably a good idea to start one.

6. Good Materials—In some cases the successful public educators had developed their own materials, and in some cases they used off-the-shelf materials. But in all cases they had adequate, accurate materials to use, obtained one way or another. It goes without saying that if the materials do not convey correct, on-target information, people who are trained with them cannot be expected to act properly in an emergency.

The wide variety of materials used in the successful programs

suggest that there are many ways to get the message across; the more important thing is to work on ways to find the right problem to tackle and the way to reach a significant part of the people who have the problem. The particular materials seemed to play less of a role than these factors and the energy and quality of the instruction. Nevertheless, more research would be useful in determining the importance of particular materials.

7. Significant Outreach—A program can have a large impact only if it reaches a large fraction of its target group, preferably the majority. You cannot expect good results in reducing juvenile-set fires if you reach only five of the 100 firesetters in the community. You can’t make a dent in cooking fires if you reach only 500 people out of 200,000 in the community. Even if that program runs 10 years, reaching 5,000 people, and even if only one-third of the population in the community regularly cook, say 65,000 in this case, you still would reach less than 10 percent of the target audience over a 10-year period, and could hardly expect to detect much change in the number of cooking fires except with a very careful analysis over a long period of time. Contrast that with several communities cited in this report that reach 10 to 25 percent of the population each year, or all of the schoolchildren in several grades.

Probably the largest failure in United States fire protection is not reaching a large enough portion of the population with high quality prevention messages frequently enough.

The United States has many wonderful prevention materials, many of the most innovative public educators in the world, and a great deal of technological know-how. Yet, we still manage to have one of the worst fire death rates

of any nation. The largest single problem is outreach. We need to explain to everyone that there is a fire problem, what the nature of that fire problem is, and what people can do about it.

Perhaps the very best way to be sure of reaching the vast majority of the population is to go door to door. While many departments consider that impossible, the fact is that it is feasible, and most of the successful communitywide programs did just that. It can be done with line firefighters, or volunteers, or community relations personnel from several city departments, or people hired to do it. All of these, and various combinations, have been done successfully.

8. Repeated Exposures—Repetition is one of the main ways to increase outreach, and also to increase comprehension of the public safety messages. Virtually none of the programs that were evaluated as successful were based on one-shot miracles of public education. Most relied on repeatedly reaching the public through a variety of media, or repeatedly reaching kids in different grades, with increasingly sophisticated information about the same hazards.

No company ever runs one toothpaste ad and expects that everybody will forever after buy that company's brand of toothpaste. If you are banking change on one spectacular public service announcement (PSA), it had better be a darned good one. There is a lock company that spends virtually its entire advertising budget on one TV commercial each year during the Super Bowl, and that company is very successful. It can be done, but the odds are far better with the multiple-contacts approach.

In most cases it is better to think in terms of the high school cheer, "Hit 'em again, hit 'em again, hit 'em again harder." Depending on people to glance at a once-a-year display that says, "Be fire safe," as they are shopping in a mall means that you are not doing your job.

Repetition helps understanding and retention. It is important that people actually receive public education messages, not just that you transmit them. Many will not be there to hear or see any particular message, even on television. And the message has to sink in when someone is receptive to listening. People sometimes get the wrong point when first hearing a safety message (or any other messages). In one now-classic example, the original version of a PSA in Spanish that talked about using a "great protector" in the middle of the night when it's hot and smoky was taken to be a condom advertisement on first hearing by a test audience, instead of the smoke detector PSA that it was. Repeated exposures to that message obviously would clear up the misunderstanding. Just as in listening to songs, you usually don't get all the words the first time.

There are also common horror stories of kids hearing stop, drop, and roll many times, and not knowing what it applies to. Children in grades K through 2 often have reported stop, drop, and roll as the thing to do when a smoke detector goes off, or if they detect a fire. Thus blind repetition is not the answer either; you have to make sure you are getting the intended message across. One purpose of evaluations is just that—to see if you are getting across accurately. Pre- and post-tests and surveys of the target population to gauge their understanding of fire safety information are important ways to do that.

9. Adaptability to Change—Another feature of some of the good programs was the ability to change over time to keep up with changes in the fire problem and changes in clientele. It is useful to look annually at the leading causes of fire and emerging new problems and to consider retargeting public education programs toward the most important issues that can be affected by public education. Less successful efforts just keep repeat-

ing the same program each year. Sometimes lack of change is due to lack of funding for new public education materials or lack of time to rethink programs. Many fire departments in the United States still show prevention films that pre-date the era of smoke detectors. Some of these films are still valid, others have aged poorly. Try to keep programs up-to-date.

10. Testing Programs in a Small Area First—The first trial run of a program yields important information on how to improve it, and also on how to measure its effectiveness. It often is advisable to try out a new program on one part of the population, look at the results and problems incurred, revise the program, and then apply it to the full population. The danger of not doing this is that if the program was not well developed to start with, it may prove to be a disappointment, and get thrown out without an opportunity to adjust it. The downside of using a small group to try the program is that unless the impact of the program is very large, it may be hard to measure the effectiveness on a small group. Nevertheless, it is often preferable to make your mistakes on the small scale rather than on the large scale.

Pitfalls to Avoid in Evaluation

Based on the case studies in Chapter III and discussions with many public educators, there seem to be some common mistakes being made in evaluations. Most are relatively easy to remedy.

1. Lack of a Control Group—A number of public education programs point to reductions in fires or fire deaths after the program starts, but it is not clear whether the programs caused the changes.

Favorable changes could have occurred without a public education program. And sometimes the opposite happens, and the bottom-line statistics get worse even though the public education program is doing well. It is hard to

tell whether the program worked unless there are control groups that have done worse without the program.

In junior high or high school most people get exposed to the idea of the need for a control group in a scientific experiment. When you introduce a public education program to a community and things change, you would ideally like to know what would have happened if the program had not existed, as a basis for comparison. In the real world, you obviously cannot go backward in time and repeat the exact same situation. The best you can do is compare a number of similar groups, such as similar areas within your community, or other communities similar to yours, and see what happens when a prevention program is supplied to one and not to the others during the same time frame. If other communities or parts of your community without the program did not change in a favorable way, but the area with the program did, you have much more basis for arguing that it was indeed the program that caused the change and not a random fluctuation.

Even better evidence of success can be obtained by linking specific changes in behavior or environment caused by the program to the change in outcomes. The measures discussed in Chapter II on changes in knowledge levels, changes in behaviors, changes in the environment (such as the presence of detectors), and the use of anecdotes all can help link a program to the measured bottom-line results.

2. Insufficient Data or Observations—You have a much better chance of showing whether a change has occurred if you have several points of data for the period before a program is introduced, and several points of data after the program is introduced, than just the immediate before-and-after points. Many enthusiastic evaluators start collecting data the year the program starts and then look at what

happens one year later. Especially for small communities, it is very difficult to get definitive results when the number of fires, deaths or injuries being measured are relatively few—for example, fewer than 50 injuries over a period of two years. Ideally, you should try to collect data so that more than 100 instances are being measured in the total data collected—100 fires, 100 injuries, 100 deaths. For a small department, that means collecting data for a longer period than that which a large department needs to show that a change has been significant.

should look at child-set fires per 1,000 children rather than just the total number of fires (although the total is of interest, too).

In doing pre- and post-tests, the tests should cover the material in the program. Some evaluations in this report used standardized before-and-after tests, but the program content did not cover all of the material on the test, and vice versa.

4. Lack of Appropriate Statistical Analysis—It is a rare program, indeed, that has any statistical tests applied to it. And when the tests are applied, it is often in cookbook fashion, and they may

Pitfalls to Avoid in Evaluation

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|---|---|
| 1. Lack of a Control Group | 6. Inadequate Baseline |
| 2. Insufficient Data or Observations | 7. Ignoring Successes in the Face of Increases |
| 3. Off-Target Measures | 8. Invalid Anecdotes |
| 4. Lack of Appropriate Statistical Analysis | 9. Using "Numbers Reached" versus "Percent Reached" |
| 5. Lack of Per-Capita Analysis | |

In general, it is highly desirable to look at the four or five years before a change, and then at least two years after the change to get a good feel for whether your program made an impact. Of course, the external factors that can affect the program have to be relatively stable during this period. It takes some judgment and a background in statistical analysis to know for sure whether the amount of data you have is adequate; it is very difficult to give general guidelines here. Nevertheless, try to look at several years before your change as a baseline, and at least a couple after. Appendix A addresses this issue in detail.

3. Off-Target Measures—As discussed in Chapter II, the measures of effectiveness of a program should correspond to what it was you were trying to change. A program targeted at child-set fires

be interpreted incorrectly by those with only a superficial knowledge of statistics.

One of the most common errors is to think that when a statistical test is applied, and the change made by the program fails to come out statistically significant at the 95 percent confidence level, then the program didn't work. What usually is the case in such situations is that there were not enough data to form a conclusion. Also, the rigor of the statistical test may be too tough—while you might not be 95 percent sure that you caused the change, many people would be quite pleased with being told that there was an 85 percent chance that they caused a change. Computing the confidence that a true change occurred is more difficult than just comparing the results to the standard 95 percent level of confidence test. (Appen-

dix A discusses this in more detail.) Try to get some knowledgeable statistical assistance for analyzing your fire data and undertaking evaluations.

5. Lack of Per-Capita Analysis—

One of the most basic omissions is to forget that the number of people in your community may be changing, and not to look at the change in fires or deaths on a per-capita basis if the population has changed more than one or two percent either up or down. A wonderful public education program might be keeping fire deaths constant while population doubles. That is equivalent to cutting the death rate in half, but you will not see that unless you divide fire deaths by population to get deaths per thousand population. Many programs are sold short because they do not take this into account. Also, if population drops over the period of a program, an ineffective program may appear good unless the per-capita statistics are considered. Many of the evaluations discussed in this report did not look at the data on a per-capita basis.⁴⁷

6. Inadequate Baseline—Some types of data always can be looked up retroactively, such as numbers of fires or fire deaths in your community. If your community participates in the National Fire Incident Reporting System via your state system, you can be assured that you can look up many sub-categories of data, such as cooking fires or fires involving children playing.

However, some types of data will not be available as a baseline unless it is collected before a program starts. Many times public educators are wrapped up in developing a program, getting it sold and getting it in place, and figure that after it is working they will then evaluate it. But they sometimes

forget that you cannot tell how much knowledge gain there has been unless you do a pretest to get the baseline before the program. Likewise, if you are doing a smoke detector program, you cannot wait and just measure the percent of homes with detectors at the end of the program; you need to know how many there were at the beginning of the program if you care about measuring change.

Sometimes you can fall back on comparing your community to other similar communities in the area, but it will be better to compare communities both before and after your program started, to separate differences in outcomes due to variations in the characteristics of communities from the differences due to the public education program. The point here is to think about collecting the data for a baseline at the beginning or even before beginning a new public education program.

7. Ignoring Success in the Face of Increases—A public education program may be a success even if the number of fires or fire deaths go up. The program may have reduced the amount of increase that would otherwise have occurred. A particularly cold winter that causes greater usage of space heaters will increase the number of heating fires, but the results may be less severe if people had been educated on the dangers of space heaters and had detectors in their homes. While the department might see an increase in the number of heating fires, the prevention effort can still be judged a great success compared to what would have happened without it.

In order to measure this type of success, you need to compare your community to others that do not have similar programs, or compare what happened in your community to statewide or national averages, or to your trend. Also, anecdotes about the fires that have occurred can be useful; for example, fire victims might relate that they got

out quickly because of prevention messages and having a detector, though they made a mistake in using the space heater.

8. Invalid Anecdotes—The fact that people escaped from a fire does not necessarily mean that the public education worked. They may have done the right thing from instinct or from hearing safety information from other sources. When using anecdotes as proof, you need to establish whether the person learned the useful information from your program or from other sources. (It is good that they would learn it from any source, but that would not help validate your program.) Because care is not always taken to ensure that anecdotes are valid, they tend to be discredited, whereas in fact they may be very useful indicators of success.

9. Using “Numbers Reached” versus “Percent Reached”—One of the most common weaknesses in evaluating public education programs is to look at the number of people who were contacted by the program, but not the percentage of the population reached. You cannot help but feel good about teaching anyone to be more safe, but you cannot affect the fire problem of a community without reaching a significant percentage of the population that is experiencing it. Just stating the numbers of people reached is not enough; you need to put it in terms of the percent of the target group you wanted to reach. Also, the “percent not reached” can be a powerful argument for greater resources if it is large.

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Some Final Observations

Based on the research for this report, and discussions with hundreds of fire departments on this subject, we offer the following conclusions and observations:

Public education programs need to be evaluated. That is not a task to be left to academics, but one that every fire department

⁴⁷ When we speak of data per capita, that is essentially the same as per hundred thousand persons or per million, except for scaling factors. A town of 10,000 people can compute results per capita or per million.

needs to consider. If you can't show that they work, sooner or later public education programs—and public educators—are going to be cut out of the budget. That would be tragic, because public education is probably the most productive, biggest-bang-for-the-buck part of a fire department's budget.

Public educators need to evaluate their programs to better target them, to show successes, and to get insights into what it takes to make an impact.

Fire chiefs should encourage their public educators to evaluate their programs for these reasons and to help make strategic decisions on how best to allocate resources between prevention and suppression, including prevention tasks assigned to line firefighters.

Public education programs can be the most productive part of a fire department. When you consider the enormous changes in the numbers of fires, deaths, injuries, and dollar loss that programs in

this report have demonstrated, often at the expense of only one public educator per year, it is hard to imagine how a comparable personnel expenditure in suppression could ever achieve anywhere near the same results. In fact, in many cases it is hard to imagine how an additional company devoted to suppression could improve life safety results as much as could one public educator, since many and possibly most people who die in fires die before the fire is reported.⁴⁸ That is not to diminish in any way the bravery of firefighters, or the need for a fast response with a well-trained, well-equipped crew to avert further casualties and losses. But there is a limit on what can be done after a fire starts.

Public education merits more support. Fire departments with

⁴⁸ In the Happyland Social Club arson fire in New York City in March 1990, fire crews arrived in less than three minutes, quickly knocked down the fire, and found 87 dead. There was nothing they could do at that point.

more than two engine companies need to consider whether they would have lower losses in their community if some of the personnel of the suppression forces were reassigned to public education. St. Petersburg, Florida, is one department that bravely did something close to that. The Europeans and Japanese have in effect been doing that for years. The challenge is out for other departments in the United States to dare to do this, too. If instead of an average of three percent of a department being assigned full-time to prevention, including public education, it were to move up to six or nine percent, we just might move closer to the norm of the rest of the world in fire deaths per capita.

Public fire education does, indeed, work—when done well. There is no question about that anymore. This report provides a wealth of examples to prove that, and gives you many of the tools for undertaking your own evaluations. It is up to you to bring it home.

Appendix A

STATISTICAL METHODOLOGY APPLIED TO EVALUATING PUBLIC EDUCATION

by Paul Gunther, TriData Corporation Statistical Consultant

This appendix discusses statistical confidence limits on evaluation results. It is intended for the more technically minded readers with some background in mathematical statistics. It also is intended for consultants or student interns who are brought in by the fire service to assist in evaluations. The general reader may be interested in the first half of the appendix, to get some notion of the concept of confidence limits. Perhaps the most important point in the detailed discussion below is that, in general, **YOU NEED TO HAVE MORE THAN ONE YEAR'S DATA AFTER THE START OF A PREVENTION PROGRAM TO BE REASONABLY SURE THE RESULTS WERE NOT A FLUKE.**

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When trying to measure the impact of a public education program, you may wish to compute the probability that the changes observed after the program was implemented were not due to chance or normal year-to-year fluctuations, but rather were true changes. With a limited amount of data it may be difficult to tell, and the numerical computation of probability can be a valuable aid.

Table A-1 presents probability values computed for different amounts of data on fires (or injuries or deaths) before and after a public education program was implemented. The number of fires can refer to all fires or to any subcategory of fire, such as single-family dwellings only, or cooking fires, or fires in low-income areas, etc.

The following example shows how to use the table. Brief explanations also are given of the

statistical quantities computed. More detailed discussion of statistical concepts is provided later in this appendix.

Example

Suppose your fire data show that you had an average of 20 cooking fires per year for the past 2 years before a public education program was implemented. (In the table, then, \bar{n}_1 is 20, and N_1 is 2.) Suppose also that during the year after the public education program was implemented, 16 cooking fires were reported. (In the table, then, \bar{n}_2 is 16 and N_2 is 1.) The percent change (Δ) is then 20% ($= (\bar{n}_1 - \bar{n}_2) / \bar{n}_1$). This change can be interpreted as an estimate of the "true" effect of the program, as determined in principle from years and years of "before" and "after" data, with nothing else changing. The statistical accuracy of this estimate, which is affected by the normal year-to-year variability in the occurrence of fires and by the amount of available data, can be described in terms of "confidence limits." These limits can be looked up in the table, upon entering the data of the example: the values $\bar{n}_1 = 20$, $\Delta = 20\%$ (or $\bar{n}_2 = 16$), $N_1 = 2$, $N_2 = 1$.

The lower confidence limit for the change (Δ_L) is shown to be -5.8% and the upper confidence limit (Δ_U) is $+41.8\%$. These limits were computed assuming a confidence (probability) level of 68%. This means that you would be willing to give (or take) approximately 2:1 odds (68:32) that the true change as determined from having many years of data would be between -5.8% and 41.8% . That is, the true change in fires as a result of the program would be

somewhere between a 5.8% rise and a 41.8% drop. This is a very wide range because of the small amount of "before" and "after" data available in the example. (We will discuss more about the need for adequate "after" data below.)

The confidence limits also can be interpreted as the statistical "error" of the estimate associated with the observed change of 20%. The more data you have, the closer you get to the true change, and the smaller the error and the narrower the confidence limits. The negative value of -5.8% for the lower confidence limit does not mean that the public education program had negligible effect or did harm, but rather that more data are needed. With the available data, the observed change very well could have occurred by chance due to the normal fluctuation in fires from year to year.

A more precise measure of the possibility that the change is a fluke is given for this example by the last entry in the table, $P_o = 22\%$, which is the probability that the change—the 20% observed drop in the example—would occur by chance alone. If this probability is very low (it can never get down to exactly zero) then you can be "fairly sure" that the observed change was due to the public education program. If it is high, the change could well have been due simply to chance alone.

To interpret a change in fire data, we recommend using "significance levels" for P_o of 5% (which corresponds to a 90% confidence level) and 16% (which corresponds to a 68% confidence level) as decision values. If the value of P_o in the table is less than 5%, then the change can be

TABLE A-1. Confidence Limits and Statistical Significance for a Given Percent Change in the Average Number of Fires as a Result of a Prevention Program

		$\Delta = 10\%$				$\Delta = 20\%$				$\Delta = 30\%$			
		$N_1 = N_2 = 1$	$N_1 = 2, N_2 = 1$	$N_1 = 5, N_2 = 1$	$N_1 = N_2 = 2$	$N_1 = N_2 = 1$	$N_1 = 2, N_2 = 1$	$N_1 = 5, N_2 = 1$	$N_1 = N_2 = 2$	$N_1 = N_2 = 1$	$N_1 = 2, N_2 = 1$	$N_1 = 5, N_2 = 1$	$N_1 = N_2 = 2$
$\bar{n}_1 = 20$	Δ_L	-24.6%	-18.0%	-14.0%	-13.2%	-11.5%	-5.8%	-2.4%	-1.2%	1.5%	6.4%	9.3%	10.8%
	Δ_U	35.3%	33.5%	32.2%	28.6%	43.4%	41.8%	40.8%	37.2%	51.3%	50.1%	48.3%	45.7%
	K_p	.324	.371	.412	.459	.667	.756	.830	.943	1.03	1.15	1.26	1.45
	P_o	38%	36%	34%	32%	25%	22%	20%	17%	16%*	12.5%	10%	7%
		$\bar{n}_2 = 18$				$\bar{n}_2 = 16$				$\bar{n}_2 = 14$			
$\bar{n}_1 = 50$	Δ_L	-10.5%	-7.1%	-4.9%	-4.0%	1.3%	4.2%	6.0%	7.1%	13.0%	15.5%	17.1%	18.3%
	Δ_U	26.9%	25.3%	24.2%	22.2%	35.5%	34.2%	33.3%	31.3%	44.1%	43.1%	42.4%	40.3%
	K_p	.513	.587	.651	.725	1.05	1.19	1.31	1.49	1.63	1.83	1.99	2.30
	P_o	30%	28%	26%	23.5%	15%*	12%	9.5%	7%	5.2%	3.4%**	2.4%	1.1%
		$\bar{n}_2 = 45$				$\bar{n}_2 = 40$				$\bar{n}_2 = 35$			
$\bar{n}_1 = 100$	Δ_L	-4.0%	-1.9%	-.5%	2.8%	7.1%	9.0%	10.2%	11.1%	18.3%	19.9%	20.9%	21.9%
	Δ_U	22.2%	21.0%	20.1%	18.8%	31.3%	30.2%	29.5%	28.1%	40.3%	39.4%	38.8%	37.4%
	K_p	.725	.830	.921	1.03	1.49	1.69	1.86	2.11	2.30	2.58	2.81	3.25
	P_o	23%	20%	18%	16%*	7%	4.5%**	3.1%	1.8%	1.1%	.5%	.25%	.06%
		$\bar{n}_2 = 90$				$\bar{n}_2 = 80$				$\bar{n}_2 = 70$			
$\bar{n}_1 = 200$	Δ_L	.3%	1.8%	2.7%	3.2%	11.1%	12.4%	13.3%	13.8%	21.9%	23.1%	24.0%	24.4%
	Δ_U	18.8%	17.8%	17.1%	16.5%	28.1%	27.3%	26.5%	25.8%	37.4%	36.5%	35.9%	35.3%
	K_p	1.03	1.17	1.30	1.45	2.11	2.39	2.62	2.98	3.26	3.64	3.98	4.58
	P_o	15%*	12%	10%	7.3%	1.7%**	.84%	.44%	.14%	.06%	.01%	0	0
		$\bar{n}_2 = 180$				$\bar{n}_2 = 160$				$\bar{n}_2 = 140$			
$\bar{n}_1 = 500$	Δ_L	4.0%	4.8%	5.4%	5.8%	14.5%	15.3%	15.8%	16.1%	25.0%	25.7%	26.2%	26.5%
	Δ_U	15.7%	15.0%	14.5%	14.1%	25.2%	24.6%	24.1%	23.8%	34.7%	34.2%	33.8%	33.4%
	K_p	1.62	1.86	2.06	2.29	3.32	3.76	4.14	4.71	5.15	5.79	6.29	7.27
	P_o	5.3%*	3.1%**	2.0%	1.1%	.05%	.01%	0	0	0	0	0	0
		$\bar{n}_2 = 450$				$\bar{n}_2 = 400$				$\bar{n}_2 = 350$			

\bar{n}_1 = average number of annual fires in a given category before published program starts; N_1 = number of years of data available before program starts

\bar{n}_2 = average number of annual fires in a given category after published program starts; N_2 = number of years of data available after program starts

$$\Delta = \text{percent change} = \frac{\bar{n}_1 - \bar{n}_2}{\bar{n}_1} \times 100\%$$

Δ_L and Δ_U are upper and lower 68% confidence limits for Δ

K_p = number of standard errors corresponding to change Δ , computed from $K_p = (\bar{n}_1 - \bar{n}_2) / \sqrt{\frac{\bar{n}_1}{N_1} + \frac{\bar{n}_2}{N_2}}$

P_o = degree of statistical significance = probability that change Δ could have occurred by chance (from normal distribution tables of P_o vs. K_p). $K_p < 1$ ($P_o > 16\%$) implies not significant; $K_p > 1.645$ ($P_o < 5\%$) implies significant change; and $1 < K_p < 1.645$ ($16\% > P_o > 5\%$) implies possibly significant change

*Denotes beginning of moderate 16% significance

**Denotes beginning of definite 5% significance

considered as “definitely significant”; if P_o is between 5% and 16%, the change is considered to be “moderately significant”; and if P_o is greater than 16%, as in the example (where it is 22%), the change is “not significant.” As noted above, even if the change is not statistically significant, it does not mean that the public education program had no effect, but rather that there are just not enough data to determine the true change with sufficient accuracy.

You can verify from the table that whenever the 68% lower confidence limit is negative (meaning there could have been an increase rather than a decrease in fires), then P_o is greater than 16%, and the situation is “not significant.”

Finally, the table shows a value of K_o (= .756 in the example). This quantity is an alternative and useful measure of the degree of statistical significance; it represents the number of “standard deviations” or “standard errors” that the change is from zero (that is, from no change). The standard deviation is a measure of the spread in the data. If K_o is less than 1 (standard deviation), then P_o is greater than 16% and the change is not significant; if K_o is greater than 1.645, the change is definitely significant; and if K_o is between 1 and 1.645, the change is moderately significant. In practice, P_o is determined from K_o using tabulations presented in many statistical textbooks. Even without such tables, K_o can be used directly, in the manner just described, to determine the statistical significance of a change. Moreover, K_o is simple to compute with a hand calculator.

An examination of Table A-1 shows how the degree of statistical significance varies as the number of years of data increases. For example, if you have 2 years of data after the public education program is implemented rather than 1 year, along with 2 years of data from before the program, then P_o = 17%. This is better than in the first example, but still not signifi-

cant. A change from before to after of 21% rather than 20% would be needed to reach the threshold of a 16% significance level. But even a change of 30%, which leads to P_o = 7%, still would not yield a definitely significant result. If you have only a single year's data from after a public education program starts, then no matter how many years of data you have from before the program, the confidence in the results will not be as good as having two years of data before and after. THAT IS, YOU NEED TO HAVE MORE THAN ONE YEAR OF DATA AFTER A PROGRAM IS IMPLEMENTED TO BE REASONABLY SURE THE RESULT IS NOT A FLUKE.

Table A-1 also shows that when you have a “before” average of 50 fires (= \bar{n}_1), with only one year of data before and after ($N_1 = N_2 = 1$), moderate significance (15%) is reached with a 20% observed change, while even a 30% change is not quite enough (P_o = 5.2%) for definite significance. With a “before” average of 100 fires, definite significance is obtained with a 20% change and 2 years of “before” data. Thus, larger communities—which have more fires—have an easier time showing when a program is effective than smaller communities do.

The above examples suggest that it would be useful to know the precise (or critical) change (Δ_c) needed to barely obtain either moderate (16%) or definite (5%) significance. The curves shown in Figure A-1 give this information for various values of \bar{n}_1 , and for one and two years of data. For the above example, the critical change required is 26.2% for moderate significance and 41.8% for definite significance. This set of curves can be useful for judging how detailed you can categorize the type of fire when studying the impact of the public education program. For example, do you have enough data on the change in cooking fires involving oil to get significance in

determining whether a “put the lid on grease fires” campaign worked?

If you wish to pursue further the statistical ideas briefly discussed above, there are many excellent introductory textbooks available. One is *Statistics: A New Approach* by W. A. Wallis and H. V. Roberts, The Free Press, 1960. Another, more recent textbook is *Introductory Statistics* by N. A. Weiss and M. J. Hassett, 2nd edition, Addison-Wesley, 1987.

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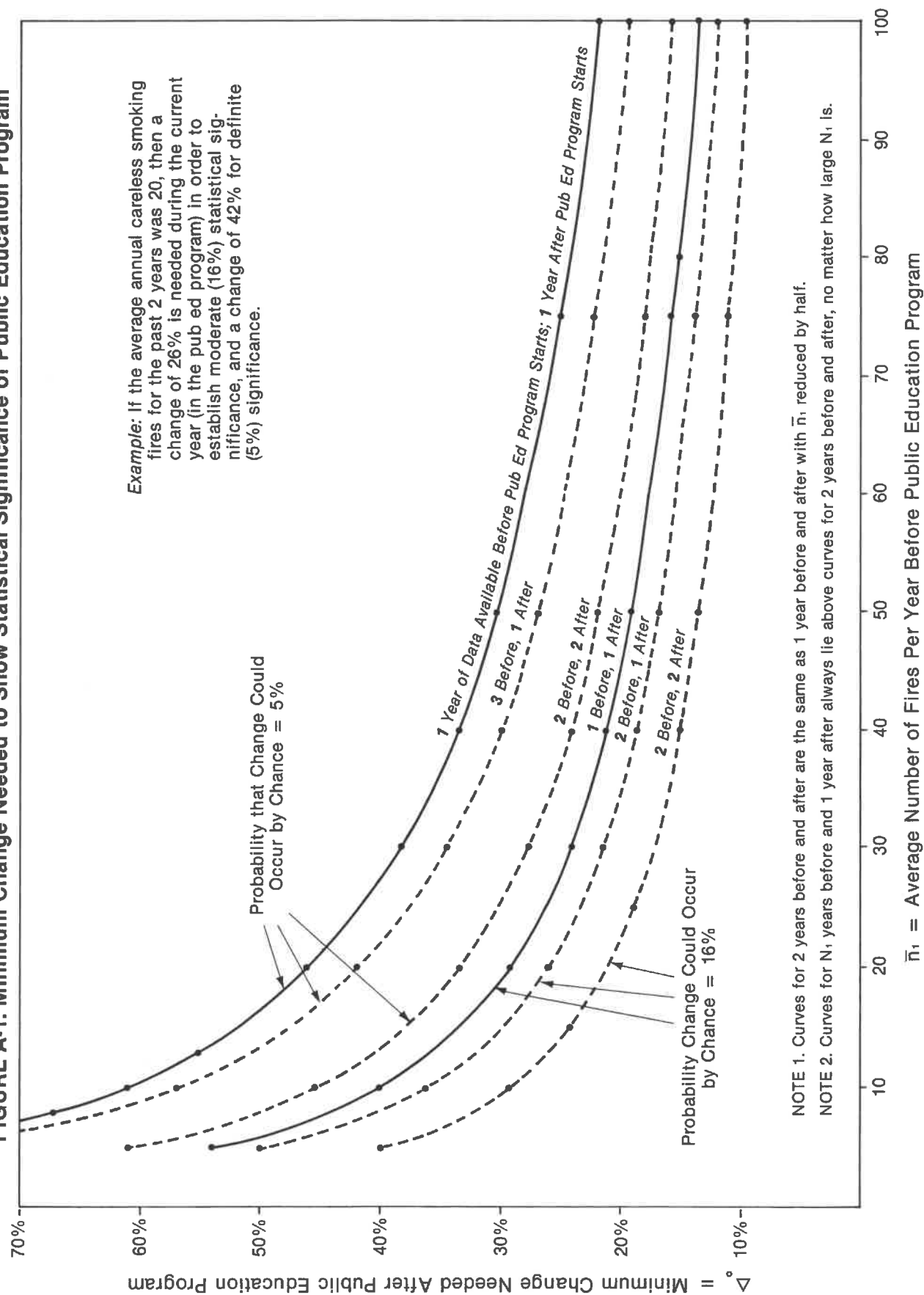
In analyzing fire data, circumstances often arise that require special analyses and simplifying assumptions. Some of these are noted in the discussion below. But getting outside professional help often may be the best course if the data call for such things as determining how many former years' data it is statistically valid to use, how to adjust for preprogram trends, and how to analyze results when a public education program is implemented gradually.

Quite likely, the entry values appearing in Table A-1 will not cover all of your applications—the table is intended to provide merely an indication of what results you can expect to obtain. A summary of the specific formulas used in the computations is presented at the end of this appendix.

Discussion of Statistical Concepts

The remainder of this appendix discusses in more detail the statistical concepts introduced in the above synopsis. The goal is to explain the statistical ideas underlying the notions of confidence limits for, and significance of, the change in fire rates following the introduction of a public education program. First, we discuss the nature and measurement of fire data variability; second, why the relative variability is relevant; third, the meaning and measurement of confidence limits for a simple average and for a percent

FIGURE A-1. Minimum Change Needed to Show Statistical Significance of Public Education Program

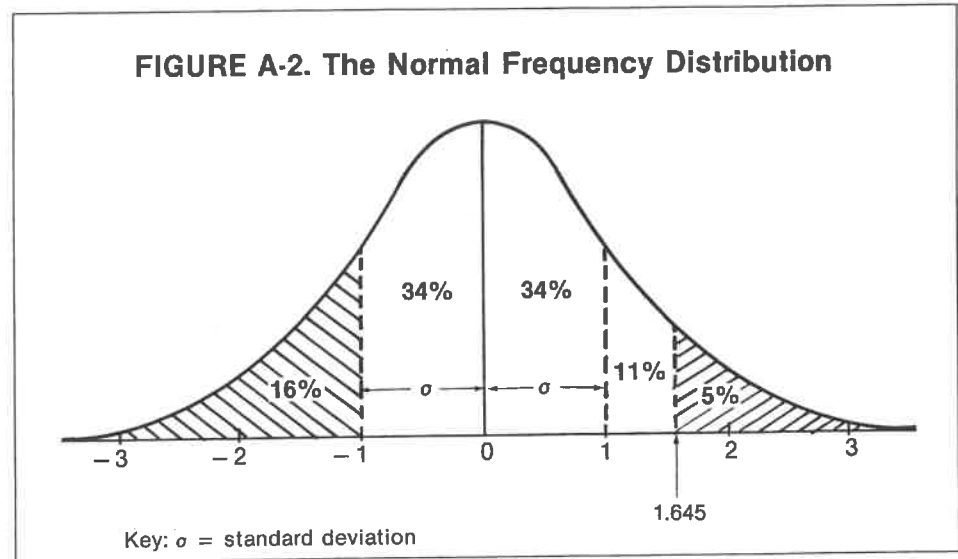


change in the average; and finally, the notion of a statistically significant change.

Why There Is Fluctuation

The essential rationale underlying statistical analysis of fire data is that fires are accidental in nature, depending only on individuals' propensities (behavior patterns) and on the random effects of related physical phenomena contributing to an ignition. A person may or may not toss a match into the garbage on a particular day, and if he or she does, the garbage may or may not ignite. A person may or may not decide to add more electrical appliances to a socket, and doing so may or may not start a fire. A cigarette may or may not be dropped, and it may or may not ignite the material it falls on, etc. Arson fires, on the other hand, are perhaps an exception—these are willful rather than accidental in nature, but still may have random aspects to them: The youth may or may not decide to vandalize a property on a whim, the lovers quarrel may or may not lead to arson for revenge, and so on.

Suppose you have data on the number of annual occurrences of a particular type of fire, such as cooking fires, for several previous years. And let us assume that the nature of the fire experience—of the cooking fires—for these years is essentially the same. The year-to-year variability (or fluctuation) of accident data, then, typically will follow the well-known bell-shaped curve called the “normal” frequency distribution (see Figure A-2). Variation in heights, weights, IQs, school grades, and many other characteristics of the general population all have been found to follow the pattern of this “normal” distribution. The variability (or spread) of the distribution is called the “standard deviation” and is usually denoted by the symbol σ (the Greek letter *sigma*). Figure A-2 shows that this spread is a way to express how wide the bell-shaped curve is for a particu-



lar situation. The formula for computing the magnitude of this variability depends on the type of measurement being studied. For fire and other accident data, the variability σ is surprisingly simple to compute: It is the square root of the average (or mean) number of fires. If, for example, there were an average of 36 cooking fires per year over the past 12 years, then the variability σ would be equal to 6 ($= \sqrt{36}$).

Knowing this standard deviation of the normal distribution is important, because it enables you to make a variety of probability statements. In particular, 68 percent (or approximately 2/3) of the data—or of the so-called population—will probably be within one standard deviation of the mean. In the above example, approximately 8 ($= \frac{2}{3} \times 12$) of the years would have had between 30 and 42 cooking fires ($= 36 \pm 6$), 2 of the years would have had less than 30 fires, and 2 years more than 42 fires. Moreover, if the current year follows the pattern of the past, the odds are 2:1 that there will be between 30 and 42 fires. Similarly, for the normal distribution, 90 percent of the data will be within 1.645 standard deviations of the mean. Hence, if the average of 36 fires was for a 10-year period, you can expect that in all but one of the years

the number of fires would be between 26 and 46 ($= 36 \pm 1.645 \times \sqrt{36}$), and the odds are 9:1 that the current year will fall between these same limits.⁴⁹ Statistical tables of the normal distribution, which are presented in most statistical textbooks, provide the correspondence between the number of standard deviations about the mean versus the amount of probability included.⁵⁰

⁴⁹A value of 95 percent, corresponding approximately to 2 standard deviations, is frequently used in statistical studies. This, however, appears to be too stringent for fire data applications, though many people have used it in fire-related papers.

⁵⁰A more precise statement of the statistical assumptions is that the probability distribution for accidental events, known as the Poisson distribution, is well approximated by the normal distribution with $\sigma = \sqrt{\bar{n}}$ where \bar{n} is the mean (or average) number of annual fires. (If \bar{n} is too small, say less than 5, the approximation is not too satisfactory.) A good check is to compare this formula for σ with the more general statistical formula for standard deviation, namely

$$\sigma = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (n_i - \bar{n})^2}$$

where n_i is the number of fires in the i th of N years; one should get $\sigma = \sqrt{\bar{n}}$. You might wish to examine your historical fire data (in various categories) to verify this equivalence and also the number of years for which the data fall within various *sigma* limits. Such an exercise may serve not only to build confidence in the formula, but also to provide an intuitive feeling for the statistical fluctuations that occur. If substantially the same general conditions are not present in each of the years, $\sqrt{\bar{n}}$ would underestimate the degree of fluctuation.

The variability, σ , of the fire data can actually be computed from the fires in only a single year or even for only a portion of one year, after correcting for seasonal effects. In principle, the square root formula is applicable also to fire deaths, although multiple deaths occurring in a single fire create statistical complications. Multiple (that is, exposure) fires in several buildings arising from a single ignition fall into this same category, but these ordinarily represent only a small fraction of the total fires. For injuries, an additional problem relates to consistent reporting of minor injuries.

Why "Relative" Fluctuation Is a More Relevant Measure

Relative fluctuation or variability is the standard deviation expressed as a percentage of the sample mean. Compare the variabilities in the following two cases: In one case there was an average of 25 fires and hence a variability (σ) of 5. In the second case there was an average of 400 fires and hence a variability of 20. Which case appears to have the greater fluctuation? Most people would select the former despite the fact that a σ of 5 is much less than a σ of 20. In the first case the relative fluctuation (that is, relative to the mean) is 20% ($= 5/25 \times 100\%$). In the second it is 5% ($= 20/400 \times 100\%$). This example should show why the *relative* variability, expressed as a percentage of the mean, rather than the *absolute* variability is the more relevant measure.

Relative variability can be computed as the *inverse* of the square root of the average number of fires—in the examples, $100\% / \sqrt{25}$ and $100\% / \sqrt{400}$. It increases as the number of fires decreases, and vice versa: When the number of fires increases, the relative variability decreases. For a fire category that has only one-fourth as many fires as a second category, the relative fluctuation is doubled.

In many statistical analyses, it is necessary to combine categories or to consider biennial rather than annual data in order to reduce the relative fluctuation to an acceptable level.

The Concept of Confidence Intervals

A statistical estimate of the average fire rate has by itself only limited usefulness unless you specify also the statistical error associated with the estimate. Confidence intervals are a precise way of specifying this error, the way now almost universally accepted. Moreover, they show clearly the positive impact of using several years of data.

A confidence interval is by definition a plus or minus range about a statistical estimate (that has been derived from a sample of data) which reflects the error associated with that estimate. You could be estimating the average weight of firefighters, or the proportion of persons who say they would vote for the Republican candidate, or the overall average number of annual fires based upon previous years' data, or the percent change in average annual fires due to a public education program.

The narrower the interval, the smaller is the statistical error and the better the estimate. But you can never guarantee 100 percent that the "true" value (that is, the value obtained from an infinite amount of data) will be within a specified interval derived from a finite sample of data. It is necessary to associate a degree of confidence, which can best be expressed in terms of a probability, with the interval. This is the reason for including the word "confidence" along with the word "interval."

By convention, confidence (or probability) levels of 68%, 90%, 95%, and/or 99% have been adopted as standard benchmarks. For fire data, where in practice you are severely limited in the ability to obtain many years of comparable data, the confidence levels of 68% and 90% are usually most appropriate. The 68% con-

fidence limits may be said to provide "moderate" confidence—you are willing to give or take 2:1 odds that the true mean would turn out to be within the confidence limits if there were unlimited years of data—while the 90% confidence limits provide "strong" confidence (9:1 odds).

For a given data set, you get a smaller confidence interval by reducing the associated confidence (probability), and vice versa. But for a given confidence level the smaller the interval, the more accurate the estimate. The benefit of using several years of data will be reflected in a smaller confidence interval for the estimate.

Calculation of Confidence Intervals for Mean Annual Fires

The confidence interval is calculated in terms of multiples of the so-called statistical *standard error* of the estimate. Quantitatively, the standard error of an estimate varies inversely with the square root of the number of years of data, and directly with the square root of the average annual fire rate. If you have four years of data rather than one year, the standard error is cut in half. For two years of data, the error is reduced by 30% ($1 / \sqrt{2} \times 100\% \cong 70\%$). The multiple of the standard error that is used to obtain the actual confidence interval itself depends upon the confidence level you are using: 1.645 for 90% confidence and 1.0 (that is, the standard error itself) for 68% confidence.⁵¹

We will illustrate first how to determine confidence intervals for the mean, or average, fire rate for

⁵¹For any type of statistical data, not just fire data, the standard error (SE) is proportional to the standard deviation σ of the data and inversely proportional to the square root of the number of years of data. Algebraically, for N years of fire data with average annual rate \bar{n} ,

$$SE = \sigma / \sqrt{N} = \sqrt{\bar{n}} / \sqrt{N} = \sqrt{\bar{n} / N}$$

The formula for confidence limits is: mean $\pm K_p$ SE, where the factor K_p is 1 or 1.645, depending on whether a confidence

past years, before the introduction of a public education program. In the next section we discuss application to the somewhat more difficult case of percent change in fire rate after introducing the public education program.

Assuming that the data show there was an average of 64 fires annually, the following are examples of the types of confidence interval statements that can be made. Which one is most appropriate depends on the particular application at hand.

- i) With 2 years of data, the (confidence) probability is 68% that the "true" average number of fires is between the confidence limits of 58.3 and 69.7 ($= 64 \pm \sqrt{64} / \sqrt{2}$), and
- ii) the probability is 90% that the true average number of fires is between 54.7 and 72.2 ($= 64 \pm 1.645 \times \sqrt{64} / \sqrt{2}$).
- iii) With 4 years of data the probability is 68% that the true average is between 60 and 68 ($= 64 \pm \sqrt{64} / \sqrt{4}$), and
- iv) the probability is 90% that the true average will be between 57.4 and 70.6 ($= 64 \pm 1.645 \times \sqrt{64} / \sqrt{4}$).

Confidence Intervals for Percent Change

The above discussion about confidence limits for the average annual fire rate of past years applies pretty much also to the percent change after introducing a public education program. Although the concepts are basically the same, the precise procedure is somewhat involved and we will

discuss only rough approximations. One complication is that there is variability in both the "before" mean and the "after" mean. The effect of this is to increase the standard error in the estimate of the change in fire rate from before to after by about 40% ($\sqrt{2} \cong 1.4$) of the standard error of the estimate of the "before" rate.⁵²

A second complication is that the number of "before" years may differ from the number of "after" years. But when the number of years is the same before and after, the situation is the same as discussed above for the estimate of annual fires. That is, if there are two years each before and after, rather than one year, the standard error and resulting confidence limits are reduced by 30% ($1 / \sqrt{2} = .70$).⁵³

Finally, since the percent change is relative to the "before" annual fires, we must consider the relative fluctuation, discussed previously, rather than the absolute fluctuation used in connection with the standard error for estimating the mean. Again, if the average number of annual "before" fires is doubled, the relative standard error and relative confidence limits are reduced by 30%. Putting these three effects together yields the

⁵²An intuitive explanation of how the $\sqrt{2}$ arises is as follows. First, the fluctuation in the difference between two rates is the same as the fluctuation in the sum. The normal distribution does not really distinguish between positive and negative values—it treats both in the same way—and it is more convenient to consider the sum. In particular, let $\bar{n}_1 + \bar{n}_2 = 2\bar{n}$ be the two-year sum (or biennial fire rate) of each of the two previous years' fire rates. The former biennial rate is twice the latter average annual fire rate, that is, $2\bar{n}$ vs. \bar{n} . As previously noted, the σ of the former is $\sqrt{2\bar{n}}$ whereas the σ of the latter is $\sqrt{\bar{n}}$; that is, the σ of the two-year sum or difference is $\sqrt{2}$ ($\cong 1.4$) times as large as the one-year (or "before") rate.

⁵³When the number of "before" years differs from the number of "after" years, you cannot use a simple arithmetic average. The correct average is the so-called harmonic mean, which is always smaller than the arithmetic mean. This is the reason that two years both before and after yield better statistical accuracy than any large number of "before" years' data when compared with only a single "after" year's data.

approximate standard error for percent change, and thus the approximate confidence interval.⁵⁴

As an example, when the average number of "before" fires is 20 and there are two years each before and after, the standard error is 22% ($= \sqrt{2} / \sqrt{2} / \sqrt{20} \times 100\%$). You can then obtain confidence limits in the usual way. If, for example, the change is 20% (corresponding to average annual fires of 16 for the two "after" years), the approximate 68% confidence limits are 42% and -2% ($= 20\% \pm 22\%$). Similarly, the 90% confidence limits are 57% and -17% ($= 20\% \pm 1.645 \times 22\%$).⁵⁵

Is the Change Statistically Significant?

Although confidence limits in essence sum up the statistical analysis of the data, in the case of public education programs—and for a very large variety of essentially similar investigations—you want to translate the result into a definitive answer (or conclusion) to the question: Was the public education program effective? Equivalently, but in more precise terms, could the observed change have occurred by chance alone if the public education program had truly been ineffective?

The answer is implicit in the confidence limits with only a change in emphasis (perhaps mostly, if not solely, in the terminology ordinarily used). A lower confi-

⁵⁴The algebraic formula for the approximate SE is

$$(\sqrt{2} / \sqrt{N}) / \sqrt{\bar{n}_1} = \sqrt{\frac{2}{N \bar{n}_1}}$$

where N is the (same) number of "before" and "after" years. The "before" average \bar{n}_1 actually should be replaced by a more complicated function of \bar{n}_1 and the "after" average fires (\bar{n}_2). The exact correction factors to the SE are given by formula (5a) in the Summary of Formulas.

⁵⁵For the numerical example used, the correction factors discussed in footnote 54 turn out to be .77 for the lower 68% confidence limit and .95 for the upper 68% confidence limit; and .72 and 1.03 for the 90% lower and upper confidence limits. The approximate 68% confidence limits of .424 and -.024 agree roughly with the exact limits, shown in Table A-1, of .372 and -.012.

level of 68% or 90% is used. Using the above formula, this becomes:

$$\begin{aligned} \text{Confidence limits} &= \text{mean} \pm K_p \cdot \sigma / \sqrt{N} \\ &= \bar{n} \pm K_p \sqrt{\bar{n} / N}. \end{aligned}$$

Note the similarity of this procedure and the types of statements being made with those discussed on page 123. The previous relation between probability P and multiples K_p of the standard deviation σ is like the relationship between the confidence P and the same multiples K_p of the SE.

dence limit that is negative, as in the above example, actually implies a negative conclusion, that the observed change is not statistically significant and could indeed have occurred by chance. If the 68% confidence interval was used, this implies that an observed change of 20% or more (using the value in the example) would occur by chance at least 16% of the time even if the public education program had no effect; similarly, it would occur at least 5% of the time with a negative lower 90% confidence limit.⁵⁶ Sixteen percent is considered to be a “moderate significance level,” and if the lower 68% confidence limit is positive, then the change can be con-

sidered to be moderately significant; similarly, if the lower 90% interval is still positive, then the change is considered definitely significant. If the lower confidence limit is negative, then the converse is true. In the above example, the 20% change is definitely not statistically significant.

There is an alternative way to view the question of significance. Rather than considering predefined moderate and definite significance levels, it is simpler—and actually more precise—to reverse the procedure. You first compute the number of standard errors (say K_{p_o}) represented by the observed change, and then look up, in tables of the normal distribution, what

probability (say P_o) this corresponds to.⁵⁷ If P_o is judged to be too high, then the change is considered to be not statistically significant.

More often than not with fire data, “not significant” is the most common situation. But the most appropriate practical conclusion in most cases is that more years of data are needed in order to really establish whether or not the public education program is effective. Although such additional data improve the accuracy (that is, shrink the width of the confidence interval), this must be balanced against the fact that more years ordinarily lead to less homogeneity of the data.

⁵⁶16% corresponds to the probability that is below the moderate 68% lower confidence limit; the probability that is above the upper confidence limit, also 16%, is not of interest in the present context. Similarly, 5% corresponds to the probability below the 90% lower confidence limit. Figure A-2 may be helpful in this regard. Confidence limits exclude both “tails” of the normal distribution, whereas a significant change concerns only the one tail beyond the lower confidence limit.

⁵⁷For this calculation you use a SE formula similar to the one in footnote 54, but with \bar{n}_1 replaced by its corrected value corresponding to a zero lower confidence value. The result is the simple formula shown as equation (1a) in the Summary of Formulas. Using the previous example ($\bar{n}_1 = 20$, $\bar{n}_2 = 16$, $N = 2$) this equation gives a value for K_{p_o} of .94 (shown in Table A-1), that is, slightly less than one SE. The corresponding probability P_o , from tables of the normal distribution, is 17% (also shown in Table A-1) or slightly more than the moderate 16% significance level (which corresponds to exactly one SE). Thus the observed 20% change is not statistically significant.

You can reverse the process and for a specified value of P_o (that is, 16% or 5%) determine the critical change Δ_o needed to give exactly a zero lower confidence limit. This change thus becomes the borderline value separating a significant change from a not-significant change. Inverting equation (1a) leads to equation (2a) in the Summary of Formulas. Equation (2) for unequal N 's was used to plot the curves in Figure A-1.

Summary of Formulas

The following definitions are used:

N_1 = number of years of data before public education program

N_2 = number of years of data after public education program

\bar{n}_1 = average number of fires before public education program

\bar{n}_2 = average number of fires after public education program

K_{Po} = normal distribution deviation computed on the assumption that the public education program had no real effect

K_p = normal distribution deviation corresponding to preassigned two-sided P% confidence or one-sided significance level

Δ = relative change = $(\bar{n}_1 - \bar{n}_2) / \bar{n}_1$

Δ_o = change required in order to lead to significant change at level P_o

Δ_u, Δ_L = upper and lower P% confidence limits for Δ

1. Probability that change is due to chance

$$(1) \quad K_{Po} = (\bar{n}_1 - \bar{n}_2) / \sqrt{\frac{\bar{n}_1}{N_2} + \frac{\bar{n}_2}{N_1}}$$

P_o is then determined from normal distribution tables. When $N_1 = N_2 = N$, (1) becomes

$$(1a) \quad K_{Po} = (\bar{n}_1 - \bar{n}_2) \sqrt{\frac{N}{\bar{n}_1 + \bar{n}_2}}$$

2. Relative change required to achieve significance at level P_o . Solving (1) for \bar{n}_2 yields after simplification the formula

$$(2) \quad \Delta_o = K_{Po} \cdot \sqrt{\frac{1}{N_1} + \frac{1}{N_2} \cdot \frac{1}{\sqrt{\bar{n}_1}}} \sqrt{1 + \frac{K_{Po}^2}{4N_1 \left(1 + \frac{N_1}{N_2}\right) \bar{n}_1}} - \frac{K_{Po}^2}{2N_1 \bar{n}_1}$$

A rough approximation to (2) is

$$(3) \quad \Delta_o \cong K_{Po} \sqrt{\frac{1}{N_1} + \frac{1}{N_2} \cdot \frac{1}{\sqrt{\bar{n}_1}}}$$

When $N_1 = N_2 = N$, (2) and (3) become

$$(2a) \quad \Delta_o = K_{Po} \sqrt{\frac{2}{N \bar{n}_1}} \cdot \sqrt{1 + \frac{K_{Po}^2}{8N \bar{n}_1}} - \frac{K_{Po}^2}{2N \bar{n}_1}$$

$$(3a) \quad \Delta_o \cong K_{Po} \sqrt{\frac{2}{N \bar{n}_1}}$$

3. Confidence limits for the change

Using the normal approximation to the binomial distribution for a given total number of fires for all years, you can derive the following formula

$$(4) \quad \Delta_{U,L} = \Delta \pm \frac{K_p}{\sqrt{\bar{n}_1}} \sqrt{\frac{1}{N_1} + \frac{1}{N_2}} \cdot C$$

where, writing \bar{n} for the overall mean, i.e.,

$\bar{n} = (N_1 \bar{n}_1 + N_2 \bar{n}_2) / (N_1 + N_2)$, the correction term C is given by

$$(5) \quad C = \frac{\sqrt{\bar{n} \bar{n}_2 / \bar{n}_1}}{1 \pm \frac{K_p}{\sqrt{\bar{n}_1}} \cdot \frac{1}{N_1 \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}} \cdot \sqrt{\bar{n}_2 / \bar{n}}}$$

In (4) and (5), the term $+K_p$ goes with Δ_U and the term $-K_p$ goes with Δ_L . A fairly good approximation is

$$(6) \quad \Delta_{U,L} \cong \Delta \pm \frac{K_p}{\sqrt{\bar{n}_1}} \cdot \sqrt{\frac{1}{N_1} + \frac{1}{N_2}} \cdot \left(\sqrt{\bar{n} \bar{n}_2 / \bar{n}_1} \right) - \frac{K_p^2}{\bar{n}_1 N_1} \cdot \frac{\bar{n}_2}{\bar{n}_1}$$

When $N_1 = N_2 = N$, you get

$$(4a) \quad \Delta_{U,L} = \Delta \pm K_p \sqrt{\frac{2}{\bar{n}_1 N}} \cdot C$$

$$(5a) \quad C = \frac{\sqrt{\bar{n}_2 (\bar{n}_1 + \bar{n}_2) / 2 / \bar{n}_1}}{1 \pm \frac{K_p}{\sqrt{\bar{n}_1 N}} \sqrt{\bar{n}_2 / (\bar{n}_1 + \bar{n}_2)}}$$

$$(6a) \quad \Delta_{U,L} \cong \Delta \pm K_p \sqrt{\frac{2}{\bar{n}_1 N}} \cdot \sqrt{\frac{\bar{n}_2 (\bar{n}_1 + \bar{n}_2) / 2}{\bar{n}_1}} - \frac{K_p^2}{\bar{n}_1 N} \cdot \frac{\bar{n}_2}{\bar{n}_1}$$

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