Fire Fighter Fatality Investigation and Prevention Program: Findings from a National Evaluation

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"The findings and conclusions in this report are those of the authors, and do not necessarily represent the views of the National Institute for Occupational Safety and Heatlh."

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ABSTRACT

Firefighters are called on to rescue people and protect property under serious and hazardous conditions. Some 100 firefighters die each year on duty, and another 80,000 are injured. Recommendations developed through the National Institute for Occupational Safety and Health's (NIOSH's) Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) point to a number of safety practices that could improve the health and safety of the nation's firefighters.

The purpose of this document is to summarize the findings of an evaluation of the FFFIPP. The goals of the evaluation were to assess the effects of FFFIPP recommendations on fire department policies and procedures and to identify possible strategies for improving the impact of the FFFIPP. The evaluation is based on a national survey of fire departments together with a series of focus groups with frontline firefighters.

Key findings from the evaluation are that (1) small, volunteer departments have the greatest challenges to following safety guidelines; (2) existing resources limit safety practices; (3) gaps in knowledge and attitudes limit safety; (4) FFFIPP reports provide useful information but fire departments need additional information and in additional formats; (5) FFFIPP materials need to be better marketed and distributed; and (6) increasing awareness of FFFIPP investigations likely will improve safety practices.

Key Terms

firefighter; fire department; evaluation; establishment survey; focus groups; occupational safety and health; dissemination; research to practice

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INTRODUCTION

The purpose of this document is to summarize the findings of the evaluation of the Fire Fighter Fatality Investigation and Prevention Program (FFFIPP). The FFFIPP is a program of the National Institute for Occupational Safety and Health (NIOSH) that conducts investigations of firefighter line-of-duty deaths and formulates recommendations for preventing future deaths and injuries. NIOSH also conducts some research for prevention of nonfatal injuries. The goals of the program are to

- better define the magnitude and characteristics of line-of-duty deaths among firefighters,
- develop recommendations for the prevention of deaths and injuries, and
- disseminate prevention strategies to the fire service (Centers for Disease Control and Prevention [CDC], 2006).

NIOSH communicates the findings from FFFIPP investigations via publications and presentations and through collaborative research and policy activities with partner organizations in the fire service. Publications include Line of Duty Death reports, NIOSH Alerts, Health Hazard Evaluation reports, and special documents such as NIOSH Workplace Solutions.

The publications are disseminated to fire departments through the mail, e-mail, conferences, and other venues and are available on the Internet through the NIOSH home page (http://www.cdc.gov/niosh/fire). The NIOSH reports are produced in both hard copy and electronic formats. Periodically, NIOSH sends a packet of five or six reports to all 30,000 fire departments in the United States. There have been 21 mailings, at least one each year of the program, beginning with one in 1998 to five in 1999 and two, most recently, in 2007. Summaries of the NIOSH reports are also published in fire service trade journals.

FFFIPP does not enforce compliance with safety and health standards and does not determine fault or blame. As a research and dissemination program, its aim is to learn from the events and prevent future similar events (CDC, 2006).

The purpose of this evaluation was to

1. assess the effects of FFFIPP recommendations and information products on fire department policies and procedures to improve firefighter safety and health;
2. gain insight into the impact of FFFIPP recommendations and information products on the safety knowledge, attitudes, and behavior of the nation's firefighters; and

3. identify possible strategies for improving the impact of the FFFIPP, including improvements in the approaches used by NIOSH to disseminate the findings from FFFIPP investigations.

The evaluation is based on data from two sources: (1) a national survey of fire departments and (2) a series of focus groups with frontline firefighters. Broadly speaking, these two components address the following five questions:

- Are firefighters aware of the NIOSH FFFIPP program and reports?
- To what extent are FFFIPP recommendations being implemented in the nation's fire departments and how are FFFIPP recommendations being implemented?
- What factors, if any, hinder fire departments' ability to implement FFFIPP recommendations?
- What characteristics of fire departments facilitate their adherence to FFFIPP recommendations?
- What changes are appropriate, if any, in the content or format of recommendations developed by NIOSH?

NIOSH has issued several hundred recommendations. Although circumstances of investigations are varied, similar recommendations may often apply in multiple investigations. For this evaluation, NIOSH identified 31 "key" recommendations, 22 involving traumatic injury fatalities and 9 involving cardiovascular disease (CVD) fatalities (NIOSH, 2004). From this list, 17 recommendations were selected to serve as sentinel recommendations for the evaluation. The selections were based on frequency of mention in FFFIPP reports, specificity of the recommendation, and overall balance among the categories of safety recommendations. The sentinel recommendations are listed in ***Appendix A***. The evaluation focused on the impacts of these recommendations in firefighter training, standard operating procedures (SOPs), safety practices, and the safety environment of the fire departments.

These elements of the evaluation methodology were developed in consultation with NIOSH and a number of stakeholders from the fire service. Stakeholder organizations that provided advice and consultation during the evaluation include the National Fire Protection Association (NFPA), the National Volunteer Fire Council (NVFC), the United States Fire Administration (USFA), the International Association of Fire Chiefs (IAFC), and the Fire Department Safety Officers Association (FDSOA).[1]

The following sections provide details about the methodology used to collect data for this evaluation. Common acronyms used in this report are defined in Table 1.

[1] The International Association of Fire Fighters (IAFF) was also invited to provide input.

Table 1. Acronyms Used in the Report

Acronym	Definition
AED	automated external defibrillators
CDC	Centers for Disease Control and Prevention
CVD	cardiovascular disease
FFFIPP	Fire Fighter Fatality Investigation and Prevention Program
ISO	incident safety officer
IC	Incident Command System
LODD	Line of Duty Death Report
NIOSH	National Institute for Occupational Safety and Health
PASS devices	personal alert safety system devices
PPE	personal protective equipment
RIC	rapid intervention crew
RIT	rapid intervention team
SCBA	self-contained breathing apparatus
SOG	standard operating guideline
SOP	standard operating procedure

FIRE DEPARTMENT SURVEY

Sample Design

The Fire Department Survey used a cross-sectional design with stratified random sampling. We selected a probability sample of 3,000 fire departments representing 10 percent of the approximately 30,000 fire departments in the United States. The sampling frame came from a database maintained by NFPA,[2] supplemented with information from NIOSH's Division of Safety Research. The sample includes

- all 208 fire departments that had experienced a FFFIPP investigation as of December 31, 2003;
- a random sample of 215 additional fire departments where a firefighter fatality had occurred but no FFFIPP investigation had been conducted;
- the 10 largest fire departments, based on the size of the population served in the jurisdiction, because of their unique status; and

[2] There were 30,611 departments on the NFPA list, of which 30,308 are involved with fire suppression.

- a stratified random sample of 2,575 fire departments where there had not been a fatality as of December 31, 2003. (This sample includes representative subpopulations defined by geographic location, department type [career and volunteer], jurisdiction size, and population density.)

The goal of the sampling design was to help determine factors that influence the extent to which FFFIPP recommendations are implemented by the departments. In particular, the sample is designed to determine the impact of firefighter fatality investigations and previous firefighter fatalities on fire department implementation of NIOSH recommendations. Four of the five high-priority strata were selected with certainty for the sample selection. These are (1) previous firefighter fatality investigation following a traumatic injury fatality, (2) previous firefighter fatality investigation following a Cardiovascular Disease(CVD) fatality, (3) traumatic injury fatality but no firefighter fatality investigation, and (4) the 10 largest fire departments.[3] All fire departments on the sample frame that are categorized into one of these four groups were selected for the Fire Department Survey sample.

The fifth high priority stratum consists of those fire departments that had a CVD fatality but no FFFIPP investigation. It was considered a noncertainty stratum because some fire departments on the sample frame that fall within this stratum were not selected. There are 189 fire departments in this stratum on the sample frame. We selected 95 (50 percent) of these departments to provide a stratum sample size commensurate with the other high-priority strata. Because three of the high-priority strata are certainty strata and the fifth high-priority stratum had a sample selected at a rate of 50 percent; the resulting variance of any comparison estimates was expected to be small enough for credible data analyses.

Factors that previous studies have shown to influence fire department practices include geographic location, department type (career and volunteer), department size, and population density.[4] A representative sample of subpopulations defined by each of these is included as additional strata in the sample design. The additional strata were defined by the interaction of the following variables:

- Census region (Northeast, South, Midwest, and West)
- department type (volunteer, career, or combination)

[3] The 10 departments are the California Department of Forestry, Los Angeles City Fire Department, Los Angeles County Fire Department, Miami-Dade Fire-Rescue, Houston Fire Department, Chicago Fire Department, New York City Fire Department, Arkansas Forestry Commission, San Bernardino County Fire Department, and Philadelphia Fire Department.

[4] See, for example, Fahy, 2005, 2006; Karter, 2005; and Fahy and LeBlanc, 2006.

- jurisdiction size (size of population served: large, medium, or small)
- jurisdiction type (population density: rural versus urban)

The definitions of these variables are provided in ***Appendix B***. Within each of these noncertainty strata, the sample of fire departments was selected randomly and with equal probability.

The final sample for the survey is described in ***Appendix C***.

Development of the Questionnaire

Items for the Fire Department Survey questionnaire address the key questions about the impact of the FFFIPP as related to the sentinel FFFIPP recommendations. Performance indicators for the impact of FFFIPP recommendations concern changes in the knowledge, behavior, attitudes, and safety practices at the management level. Questionnaire items related to safety practices focus on

- SOPs (or standard operating guidelines [SOGs]),
- standard performance requirements,
- content and timing of training offered to firefighters,
- communication of safety practices and standards, and
- investment in and maintenance of firefighter safety equipment.

The questionnaire is provided in ***Appendix D***.

Implementation and Analysis Approach

The Fire Department Survey was mailed to the Fire Chiefs of the 3,000 sample fire departments during spring 2006. The overall response rate for the survey was 54.9 percent. Statistical analysis weights were developed to enable the estimation of population parameters. A nonresponse follow-up analysis was conducted to assess any nonresponse bias. The results suggest that nonresponse bias may exist for at least some of the response options in the Fire Department Survey.

The analytic approach to the survey data was developed in collaboration with NIOSH. The analysis is primarily descriptive and exploratory. First, we examined the findings about the key evaluation questions across all fire departments. For each question, we then conducted bivariate analyses to investigate whether there are systematic differences that can be attributed to specific fire department characteristics (region, type of jurisdiction, size of department, and type of department), experience with FFFIPP investigations, and

firefighter fatalities. The overall differences between types of fire departments were tested for statistical significance (using a standard *t*-test). Details about the statistical methodology are provided in ***Appendix E***. The null hypothesis for these tests is that the difference between population estimates among two groups of fire departments is zero. All population estimates generated from the Fire Department Survey data also have accompanying estimates of standard errors and confidence intervals. The complete statistical tables are available upon request to NIOSH.

Because most fire departments are small, volunteer departments, we also estimated responses to these same questions at the firefighter level of analysis using information supplied in the questionnaire on the number of firefighters in each department.

To examine the combined explanatory effects of region, jurisdiction type, jurisdiction size, department type, and experience with a FFFIPP investigation and fatality, multivariate logistic regression models are also examined using the fire department–level data.

Throughout the analysis, information from the Fire Department Survey is supplemented with available information derived from the focus groups. The methodology used to collect focus group data is discussed below.

FIREFIGHTER FOCUS GROUPS

A series of six focus groups was conducted with frontline firefighters in order to collect additional information. The focus groups with frontline firefighters captured aspects of the FFFIPP's influence that could not be fully assessed in a survey of fire department officers; information collected through the focus groups thus contributed to a greater understanding of how the FFFIPP influences fire departments and their officers and firefighters. The primary objectives of the focus groups were to

- identify the impact of the FFFIPP on the knowledge of firefighters,
- identify the impact of the FFFIPP on fire department operations (on, for example, the content of training, SOPs, and SOGs),
- identify the impact of the FFFIPP on fire safety practices, and
- explore how the organizational climate of fire departments contributes to the overall safety environment in which firefighters work.

The focus groups also contributed information about the barriers and facilitators that influence the impact of FFFIPP recommendations.

The focus groups took place during March and April 2006 and included participants from both career and volunteer fire departments and from departments in both rural and urban jurisdictions.

Participants for the focus groups were selected using a targeted, convenience sampling approach. The composition of these focus groups was designed to reflect the primary groupings represented in the Fire Department Survey design. Every effort was made to recruit participants who represented the various kinds of fire department characteristics, including size (small, medium, large), type of department (career, volunteer), and type of jurisdiction (urban, rural). Although the participants represented a wide cross section of firefighters, they are not a random probability sample of all firefighters.

The six groups included one focus group consisting of all volunteer firefighters, one focus group consisting of all career firefighters, and four focus groups consisting of a mix of career and volunteer firefighters. Details on the characteristics of the focus group participants are provided in ***Appendix F***.

The focus groups yielded a rich store of qualitative data on the problems and safety concerns of firefighters. Using simple thematic analysis techniques (Miles & Huberman, 1994), we compiled a list of the major themes in the focus group participant responses to questions about the safety climate, dissemination of safety recommendations, and impact of the FFFIPP on firefighter safety.

The following section summarizes the principal findings from the evaluation.

FINDINGS: AWARENESS OF THE FFFIPP

Summary

The picture that emerges from the evaluation suggests that the FFFIPP is only moderately known within the fire service. Although most fire department officers (67.4 percent) are familiar with NIOSH, only about half (53.3 percent) have seen and read a FFFIPP report in the prior 12 months. Slightly more than half (54.3 percent) are not familiar with the FFFIPP suggesting that more officers are familiar with the reports than the FFFIPP itself. Fire department officers learn about FFFIPP recommendations primarily through NIOSH mailings, trade publications, Web sites, and other firefighters and fire departments.

NIOSH recommendations have been used by fire departments to

- update the content of their training programs (40.2 percent of all study-eligible fire departments in the country, or about 11,000 departments),
- update their SOPs/SOGs (34.9 percent of the fire departments),
- develop new SOPs/SOGs (26.3 percent), and
- justify grant applications (15.5 percent).

For example, fire departments report using NIOSH recommendations to train firefighters on personal protective equipment (PPE), Self-contained Breathing Apparatus (SCBA), Personal Alert Safety System (PASS) devices, the Incident Command System, traffic hazards, radio communications, and other topics. NIOSH recommendations have also been used to justify current budget/staffing, and to make new budget requests (5.0 percent and 5.5 percent of fire departments, respectively).

To raise awareness of the NIOSH recommendations, fire departments—in addition to training their firefighters—also post information from NIOSH on fire station bulletin boards and brief firefighters about the recommendations during regular staff meetings. About two-fifths (38.9 percent) of fire departments, however, say they do not disseminate information from NIOSH to frontline firefighters.

Multivariate analyses show that the size of the jurisdiction is the most consistent predictor of dissemination activities. When all other factors in the model are controlled, size of jurisdiction remains a significant explanatory factor: The larger the jurisdiction, the more likely it is that FFFIPP recommendations are disseminated throughout the fire department. The type of department (career, volunteer, or combination) and region of the country are seldom or never significant factors in the dissemination process once size of jurisdiction is taken into account. However, jurisdiction type (urban, rural) remains a significant factor for determining whether the fire chief is familiar with NIOSH reports, has read the Line of Duty Death (LODD) reports, or has read the Pocket Guide, and whether firefighters are trained on NIOSH recommendations. Officers in urban fire departments are more likely to be aware of and to make use of FFFIPP recommendations than other departments. A fire chief in a department that had a FFFIPP investigation is more likely to have read LODD reports, even after controlling for other factors in a multivariate analysis.

Details

An overview of the response patterns related to firefighters' awareness of the FFFIPP recommendations is provided below. Results are presented for each question in the survey

that addressed the level of awareness of the FFFIPP. The source of the information is indicated in parentheses in each subject heading.

Awareness of NIOSH (Q8)[5]

Most fire department officers (67.4 percent) are somewhat or very familiar with NIOSH.[6] The percentage of officers who are somewhat or very familiar with NIOSH tends to be lowest in the Midwest (61.1 percent) or West (64.0 percent), in small jurisdictions (60.6 percent), and in departments with a mixture of career and volunteer staff (64.7 percent).

Awareness of the FFFIPP (Q9)

Over half (54.3 percent) of all fire department officers are not at all or not very familiar with the FFFIPP. The highest percentage of officers who are not at all or not very familiar with the FFIPP are found in the Midwest (59.3 percent) and West (49.8 percent), in rural areas (56.5 percent), and in volunteer (54.0 percent) and mixed volunteer-career fire departments (51.3 percent).

Among fire departments with a prior fatality, most (81.6 percent) of the officers in departments that had a FFFIPP investigation are "somewhat familiar" or "very familiar" with the FFFIPP (***Figure 1***). Note that the small percentage (6.8 percent) of the officers in fire departments with a prior fatality who were "not familiar" with the FFFIPP may not have been working at the fire department at the time a FFFIPP investigation took place.

How Do Fire Department Officers Learn about FFFIPP Recommendations? (Q10)

Fire departments learn about FFFIPP recommendations through a variety of sources. In order of frequency, these are NIOSH mailings (67.8 percent of all fire departments), trade publications (47.2 percent), links from Web sites such as NFPA and Firehouse (28.2 percent), the NIOSH Web site (24.3 percent), other firefighters or fire departments (22.9 percent), seminars or other training opportunities (16.4 percent), media reports (14.9 percent), state conferences (11.5 percent), national conferences (3.6 percent), and other (1.1 percent).

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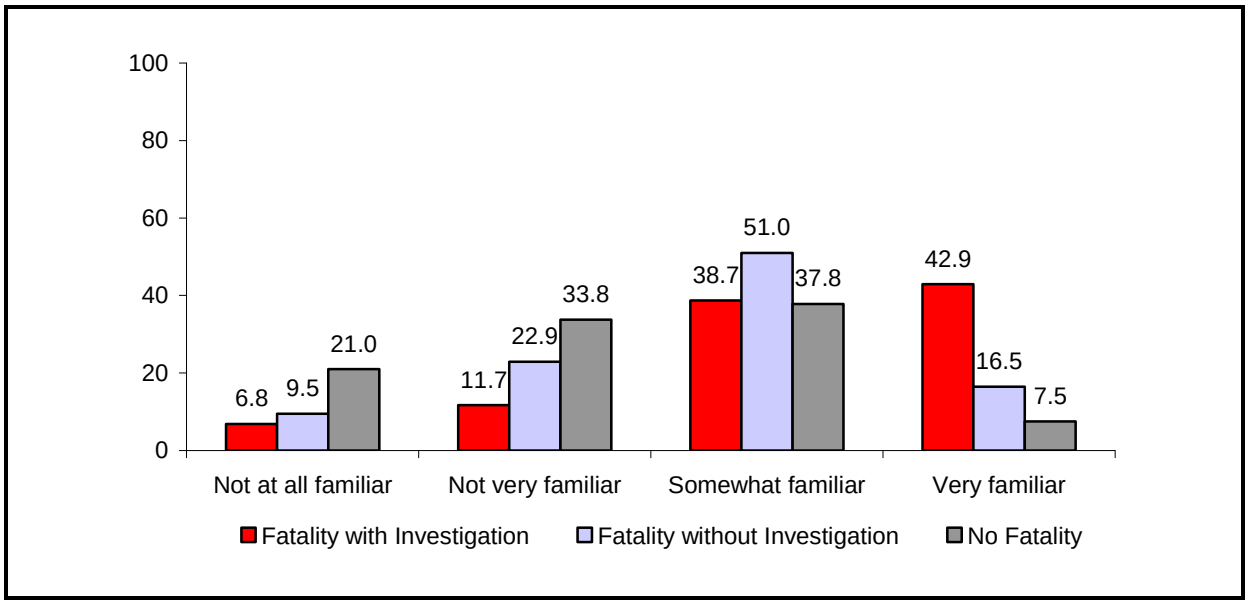
[5] Q = Question Item number in the Fire Department Survey. See Appendix A for the wording of the question.

[6] All percentages in this report are based on weighted data.

Figure 1. How Familiar Are You With the FFFIPP? (Question 9), by Fatality and FFFIPP Investigation (Percent)



Familiarity with FFFIPP Line of Duty Death Reports (Q43)

About two-fifths of the fire department officers (38.9 percent) report seeing FFFIPP reports several times per year or more. A quarter (26.8 percent) say they have never seen a FFFIPP report (***Figure 2***). The percentage of officers who have never seen a FFFIPP report is highest among rural (27.6 percent), volunteer (23.5 percent), and a mixture of volunteer and career (29.45) fire departments.

How FFFIPP Reports Are Obtained (Q44)

Fire department officers receive LODD reports primarily through NIOSH mailings. However, although NIOSH periodically sends FFFIPP reports to every fire department in the country, only 56 percent of the respondents to the Fire Department Survey reported receiving FFFIPP reports from NIOSH via mail. About one-fourth (24.7 percent) of fire department officers report that they download FFFIPP reports from the Internet, 10 percent get them from colleagues in other departments, and 6.9 percent obtain FFFIPP reports at conferences and other meetings (***Figure 3***).

Do Fire Department Officers Read FFFIPP Reports? (Q45)

Over half (53.3 percent) of all fire department officers have read a FFFIPP report within the previous 12 months. The percentage of officers who have not read a FFFIPP report during the past 12 months is highest among medium (18.1 percent) and small departments (21.3 percent) (***Figure 4***).

Figure 2. How Often Have You Seen NIOSH Reports That Describe Recent Firefighter Fatalities and Make Recommendations for Avoiding Similar Incidents? (Question 43), by Jurisdiction Type (Percent)

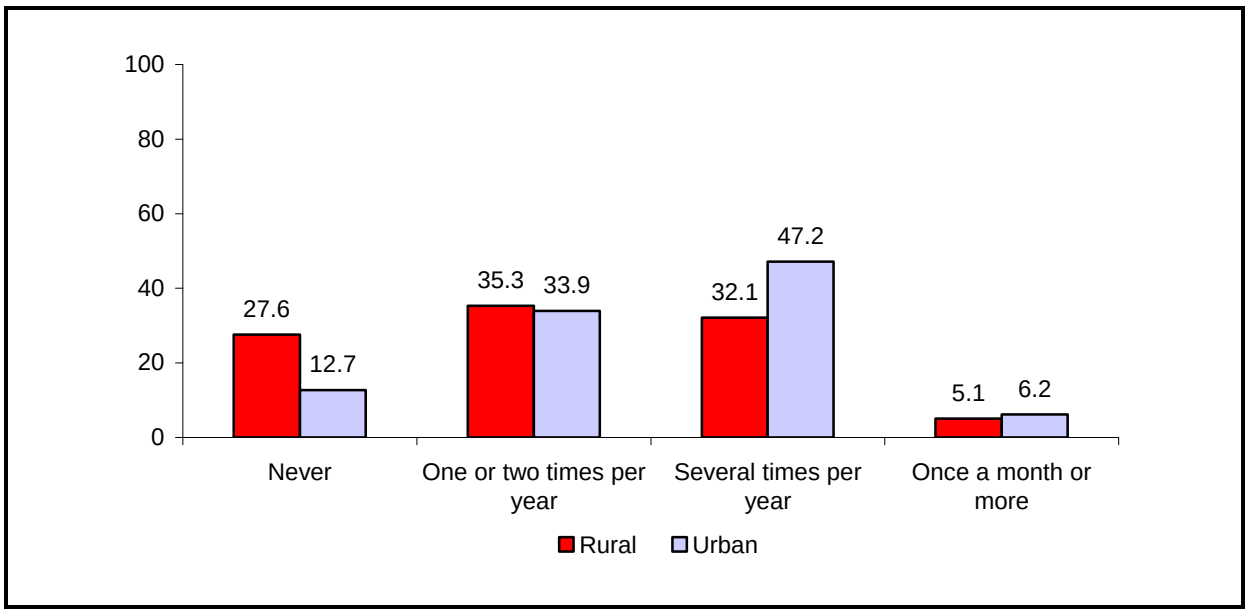


Figure 3. How Does Your Department Receive the NIOSH Firefighter Fatality Investigation Reports? (Question 44), by Size of Jurisdiction (Percent)

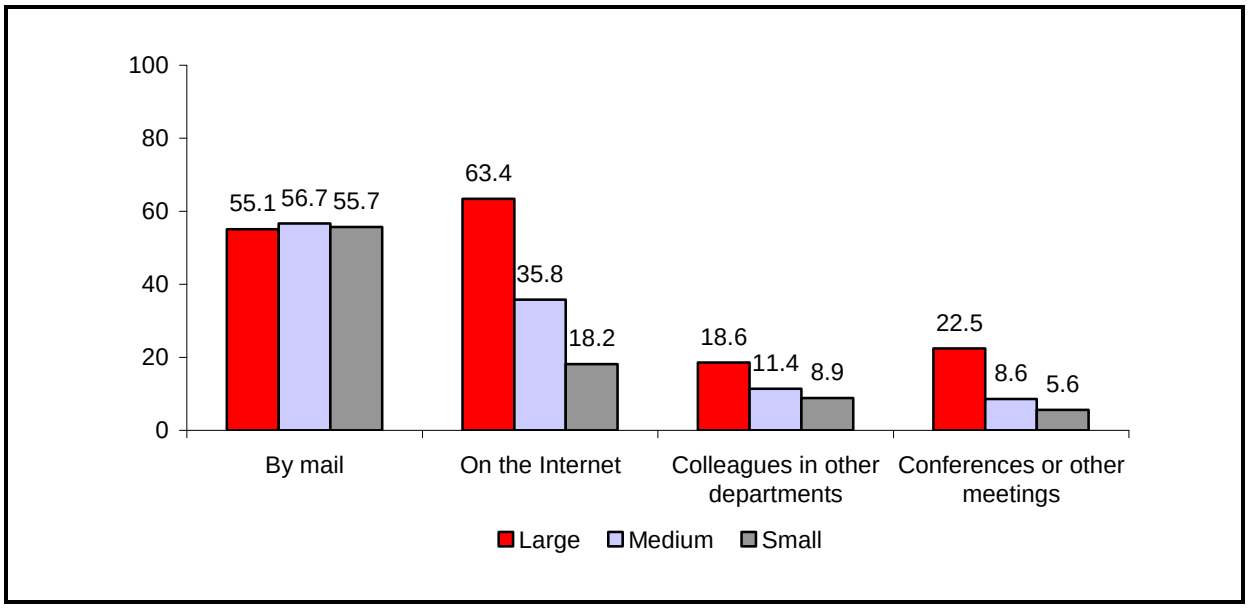
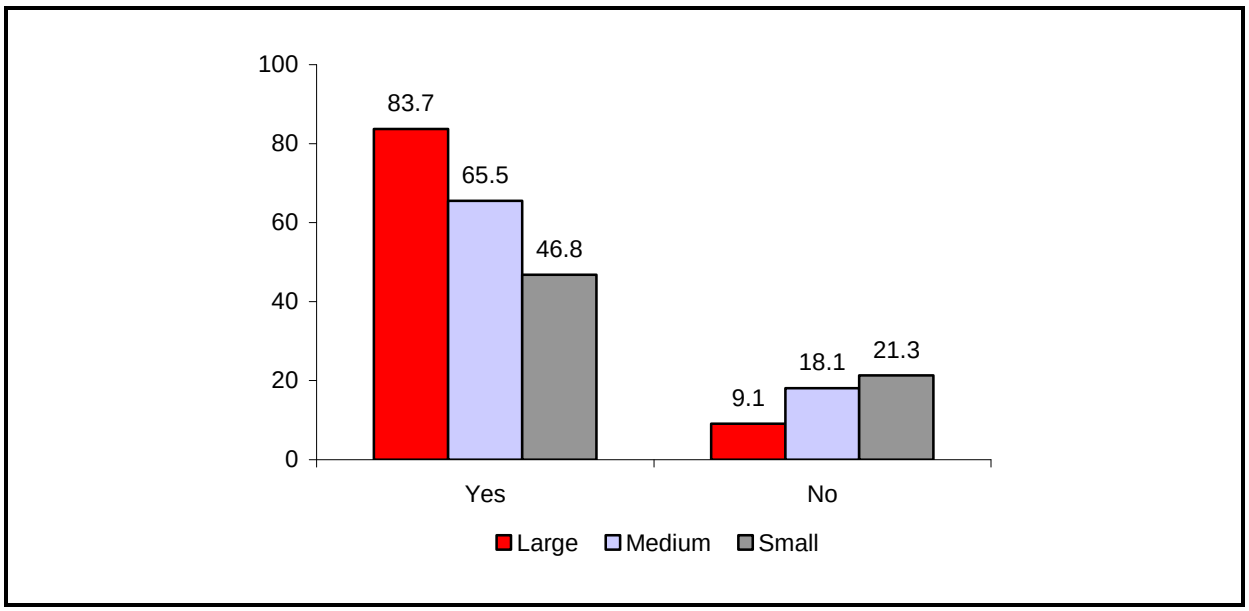


Figure 4. Have You Read Part or All of a NIOSH Firefighter Fatality Investigation Report in the Last 12 Months? (Question 45), by Size of Jurisdiction (Percent)



Other NIOSH Reports Received (Q53)

The majority of fire department officers (57.4 percent) report that they have seen NIOSH's Pocket Guide to Chemical Hazards. However, only 31.7 percent have seen an Alert, and 28.0 percent have seen a FFFIPP CD-ROM (28.0 percent). Relatively few have seen a Hazard IDs (16.6 percent), Respirator Maintenance Program Guide (13.8 percent), or Workplace Solutions (12.5 percent). A quarter of fire department officers (25.2 percent) report they have not seen any NIOSH materials (***Figure 5***). The percentage that has not seen any NIOSH material is highest among small (30.3 percent), rural (25.4 percent), volunteer (25.0 percent), and a mixture of volunteer and career (26.2 percent) fire departments.

Do Fire Departments Disseminate FFFIPP Recommendations to Firefighters? (Q50)

The majority of officers (60.7 percent) report that their fire department disseminates information it receives from NIOSH to their firefighters. About two-thirds of all firefighters (67.6 percent) work in departments where FFFIPP information is disseminated to firefighters (***Figure 6***).

Figure 5. What Other NIOSH Materials Have You Seen? (Question 53), by Size of Jurisdiction (Percent)

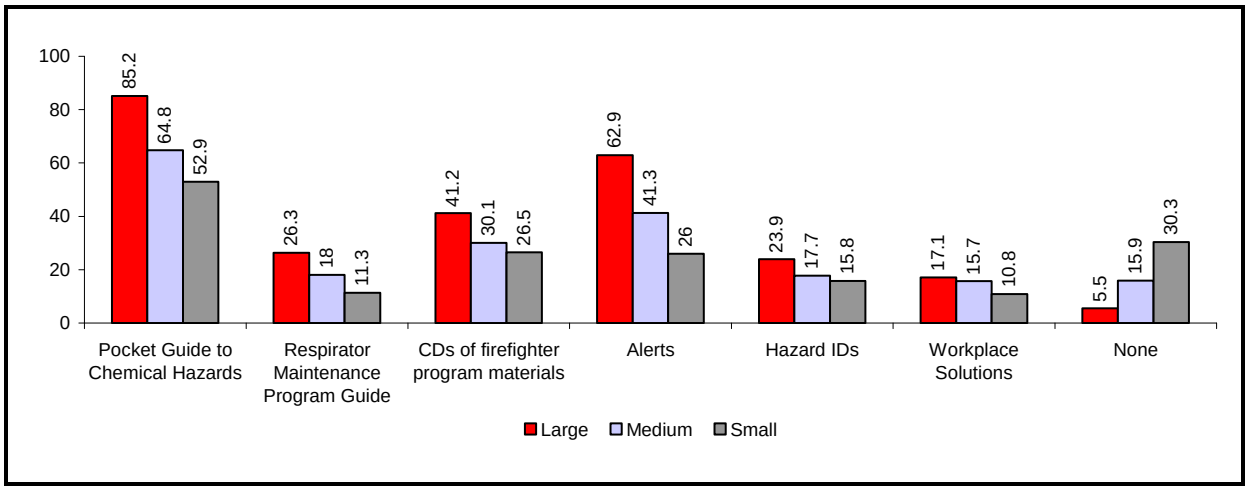
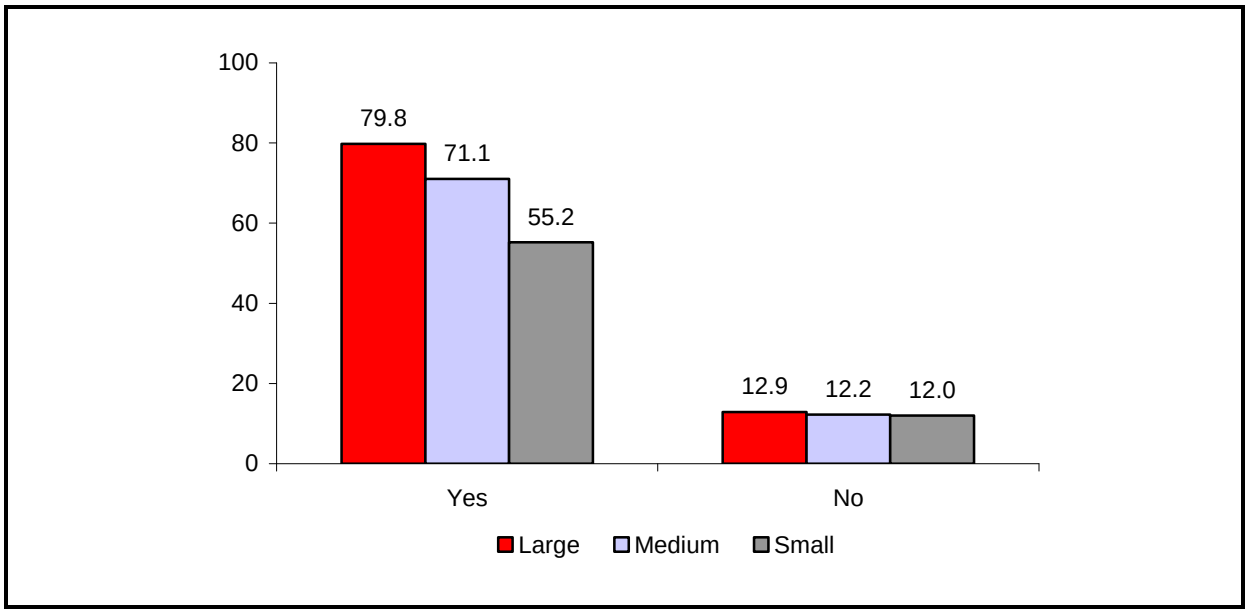


Figure 6. Does the Fire Department Disseminate the Information It Receives from NIOSH to the Firefighters? (Question 50), by Size of Jurisdiction (Percent)

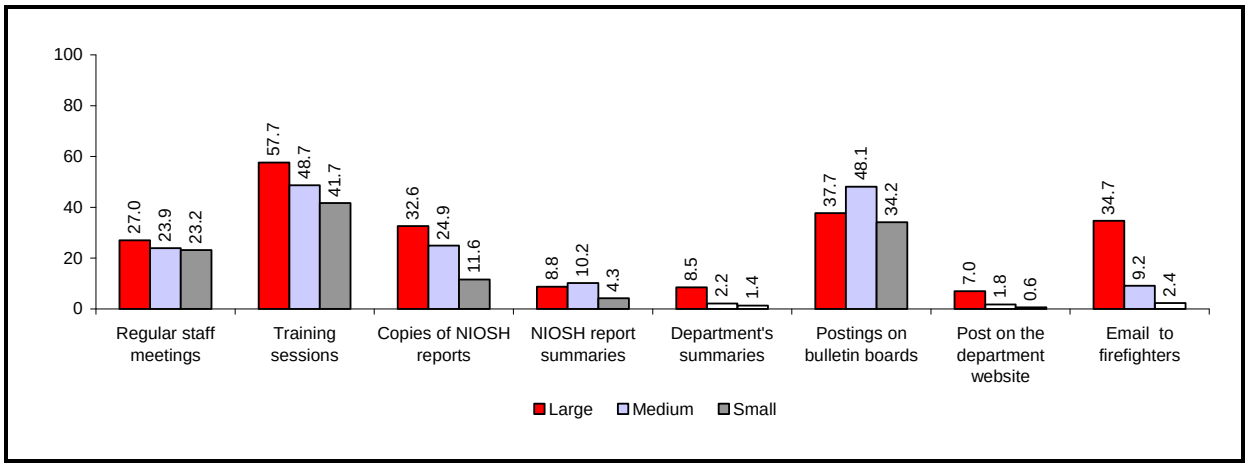


How Is the Information Disseminated within the Department? (Q50a, Focus Groups)

Information is disseminated to the firefighters primarily through training (44.2 percent of all departments), posting the FFFIPP report on the station bulletin board (38.5 percent), and briefings during regular staff meetings (23.5 percent). Other approaches fire departments use include providing copies to firefighters (16.2 percent), providing firefighters with NIOSH's summaries of reports (6.2 percent), sending e-mail

messages to firefighters (5.3 percent), providing summaries of reports prepared by the fire department (1.8 percent), and posting the FFFIPP report on the fire department's Web site (1.3 percent) (***Figure 7***).

Figure 7. How Is This Information Disseminated to Firefighters? (Question 50a), by Size of Jurisdiction (Percent)



In the focus group discussions, frontline firefighters suggested all of these can be effective approaches for communicating safety messages. Two training officers explained how they use FFFIPP LODD reports for training:

> *We use the information from NIOSH all the time for training. I hand out different LODDs and then require the trainees to answer six questions about the incident and to make a presentation to the full class. It's a valuable tool for training.*
>
> *I look over the history of firefighter deaths, based on the LODDs, and use PowerPoint slides to tell the class about lessons learned.*

FINDINGS: IMPLEMENTATION OF FFFIPP RECOMMENDATIONS

Summary

To assess how FFFIPP recommendations are being implemented, we collected information from the fire departments on

- the existence of personnel responsible for safety and training in the department (i.e., a training officer and safety officer),
- the SOPs that fire departments have established to reinforce safe practices,
- the nature of the training fire departments provide their firefighters, and

- other ways departments have implemented FFFIPP recommendations.

We found that most fire departments have both a training officer and a safety officer and that most have SOPs on five of the six types of recommendations addressed in this evaluation: PPE and clothing, radio communications, Incident Command Systems, motor vehicle safety, PASS devices, and maintenance of SCBA.[7] Few fire departments have SOPs on fitness and wellness.

The majority of fire departments in the country also require firefighters to be trained on five of the six types of recommendations addressed in this evaluation: using PPE (88.9 percent), fighting structure fires (82.8 percent), driving safety (77.7 percent), using radio communication devices (76.2 percent), using the Incident Command System (69.9 percent), and maintaining SCBA (60.3 percent). However, only 7 percent of the fire departments have a required physical fitness training program, and most (60.9 percent) fire departments do not require firefighters to be screened for CVD risk factors and CVD.

Most fire departments (84.0 percent) ensure that firefighters responsible for driving emergency vehicles receive driver training before being allowed to operate the vehicles. However, in focus group discussions, frontline firefighters said they need to be trained to the class of the vehicle and that home responders need additional training. Most fire departments (84.2 percent) require their firefighters to wear seat belts while in emergency vehicles, although frontline firefighters say many still are not using them.

The survey results also suggest that most fire departments

- have enough PASS devices for all of their firefighters to use when fighting structure fires. Almost all (88 percent) fire departments report that their firefighters use their PASS devices at least "most of the time."
- have SCBA for their firefighters and perform SCBA maintenance "at least several times a year" (77.0 percent). Firefighters in almost all fire departments (89.8 percent) reportedly use their SCBA at least "most of the time" while fighting structure fires. Many fire departments (49.7 percent), however, say that their firefighters still have to share facepieces.

[7] The six categories of Sentinel Recommendations are Incident Command, motor vehicle safety, equipment, radio communication, safety on the fireground, and fitness/wellness. Several discrete recommendations are included under each of these categories.

- have automated external defibrillators (AEDs) (77.4 percent) and perform routine maintenance on the AEDs. The AEDs are usually kept on the emergency vehicles (82.4 percent), at the fire station (3.7 percent), or both (13.8 percent).
- have radios or other two-way communication devices while responding to structure fires at least "most of the time" (91.0 percent).

According to the Fire Department Survey, Incident Command is established by most (84.2 percent) fire departments on a routine basis when responding to structure fires. However, focus group participants identified the failure to implement Incident Command as one of their most common safety concerns. The tasks that fire departments most often say are part of an Incident Commander's responsibilities include all three of the tasks identified in NIOSH recommendations: conduct an initial assessment (91.0 percent), monitor location of all firefighters at the scene (76.2 percent), and develop and initiate a risk management plan (52.3 percent). Incident Commanders in only about half of all fire departments (52.1 percent) usually assign an Incident Safety Officer (ISO).

The size of the fire department's jurisdiction is the most consistent predictor of its safety practices. When all other factors are controlled for, the larger the jurisdiction, the more likely it is that the FFFIPP has had an impact on fire departments and firefighters. The multivariate models also indicate that the type of department (career, volunteer, or combination) and jurisdiction type (urban or rural) are seldom significant factors regarding the impact of the FFFIPP. A notable exception is the provision of a physical fitness program. Even controlling for other factors in the model, urban and career fire departments are more likely than other departments to have either optional or required physical fitness programs. In addition, fire departments in the Northeast and West are more likely than those in other regions to have been affected by the FFFIPP. Finally, fire departments that have experienced a fatality are more likely to have made changes to their training programs and their existing SOPs based on NIOSH recommendations. Fire departments that have experience with a FFFIPP investigation are more likely to have developed new SOPs and used NIOSH recommendations for justifying grant applications.

Details

A summary of the bivariate response patterns related to the implementation of FFFIPP recommendations is provided below for each question in the survey that relates to this issue.

Safety Officers (Q1)

More than two-thirds of fire departments (70.3 percent) have a safety officer.

Training Officer (Q2)

Almost all fire departments (88.5 percent) have a training officer.

Standard Operating Procedures (Q3)

SOPs, or SOGs, are common management tools for fire departments. NIOSH recommends that fire departments "develop and implement a policy requiring the use of Personal Protective Equipment and protective clothing" and "implement an Incident Command System with written SOPs for all firefighters." We found that most fire departments have SOPs on five of the six types of recommendations addressed in this evaluation: PPE and clothing (89.1 percent of all departments), radio communications (84.8 percent), Incident Command Systems (83.7 percent), motor vehicle safety (78.8 percent), PASS devices (75.4 percent), and maintenance of SCBA (69.7 percent). Few fire departments have SOPs on fitness and wellness. Only 16.8 percent of fire departments have an SOP for participating in regular CVD screenings, and only 11.0 percent have an SOP for participating in a personal physical fitness program (***Figures 8*** and ***9***). The percentage of fire departments with SOPs for personal physical fitness programs was lowest in volunteer (14.1 percent) and combination volunteer-career (6.4 percent), Southern (9.3 percent), and rural (8.4 percent) fire departments.

Training (Q4)

The great majority of fire departments in the United States require firefighters to be trained on using PPE (88.9 percent), fighting structure fires (82.8 percent), driving safety (77.7 percent), using radio communication devices (76.2 percent), using the Incident Command System (69.9 percent), and maintaining SCBA (60.3 percent) (***Figure 10***). Fewer departments (35.5 percent) require training in rapid intervention teams (RITs).

Training Providers (Q5)

Firefighter training is provided by a variety of people. Over three-quarters of the fire departments provide training through their training officer (84.9 percent), other officers in the department (82.8 percent), and the state fire training academy (77.4 percent).

Figure 8. For Which of the Following Does Your Department Have SOPs/SOGs in Place? (Question 3, Part 1), by Type of Department (Percent)

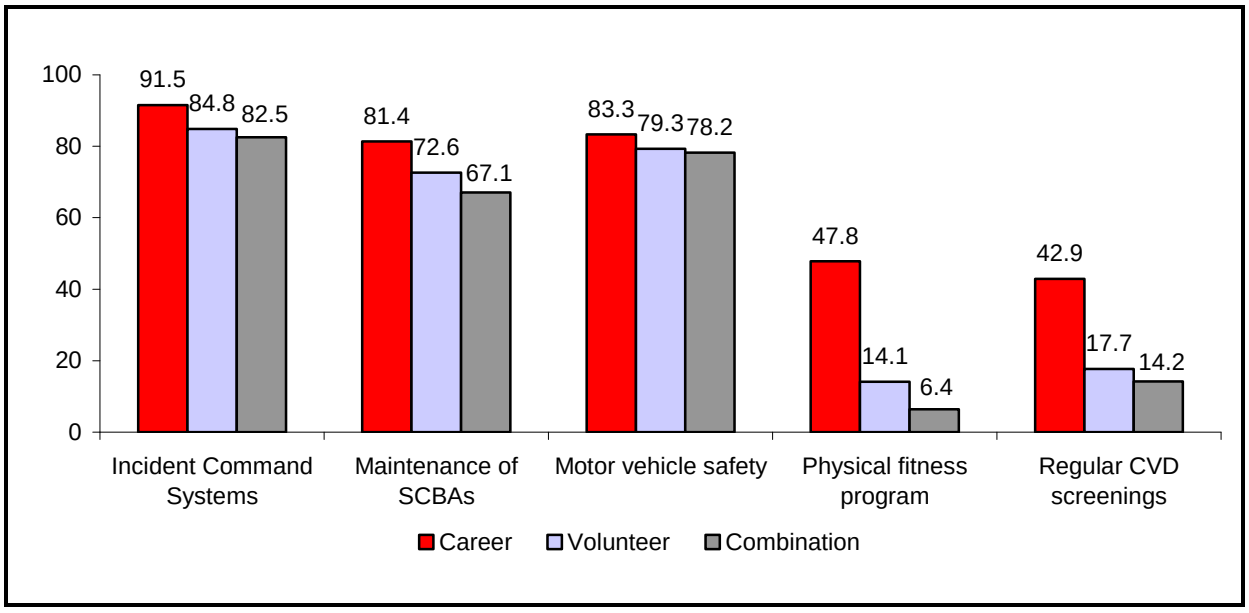


Figure 9. For Which of the Following Does Your Department Have SOPs/SOGs in Place? (Question 3, Part 2), by Type of Department (Percent)

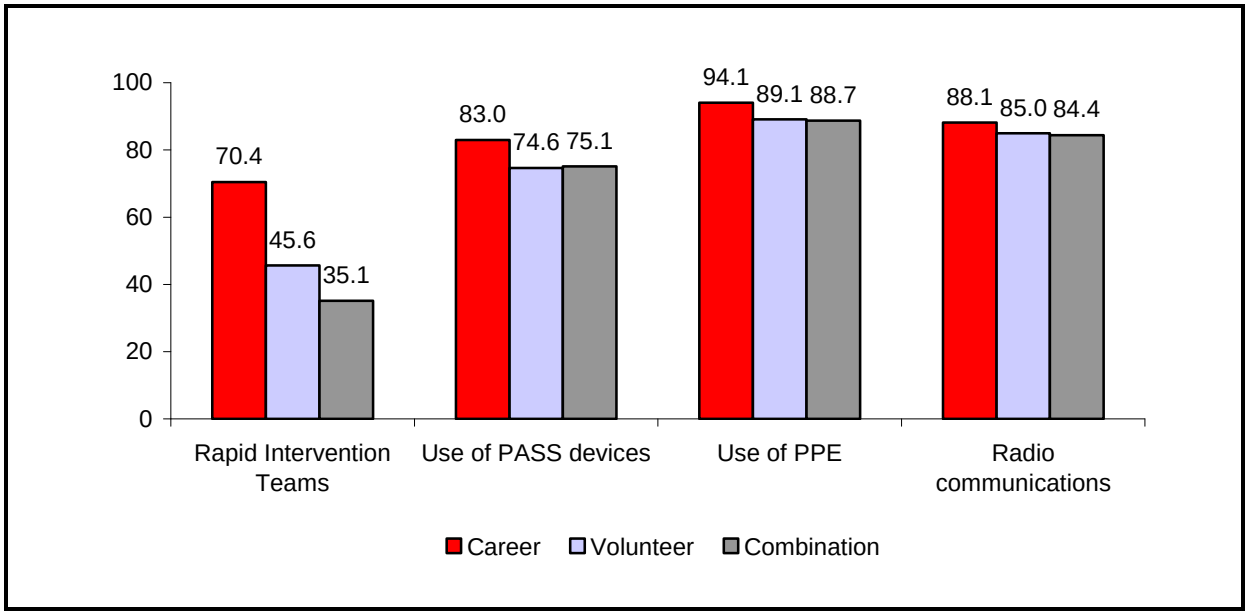
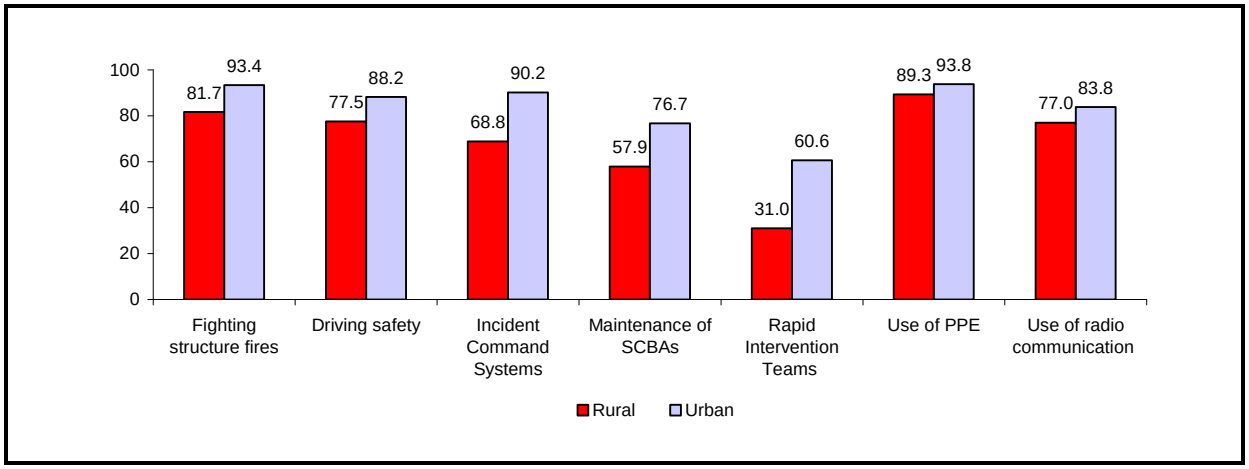


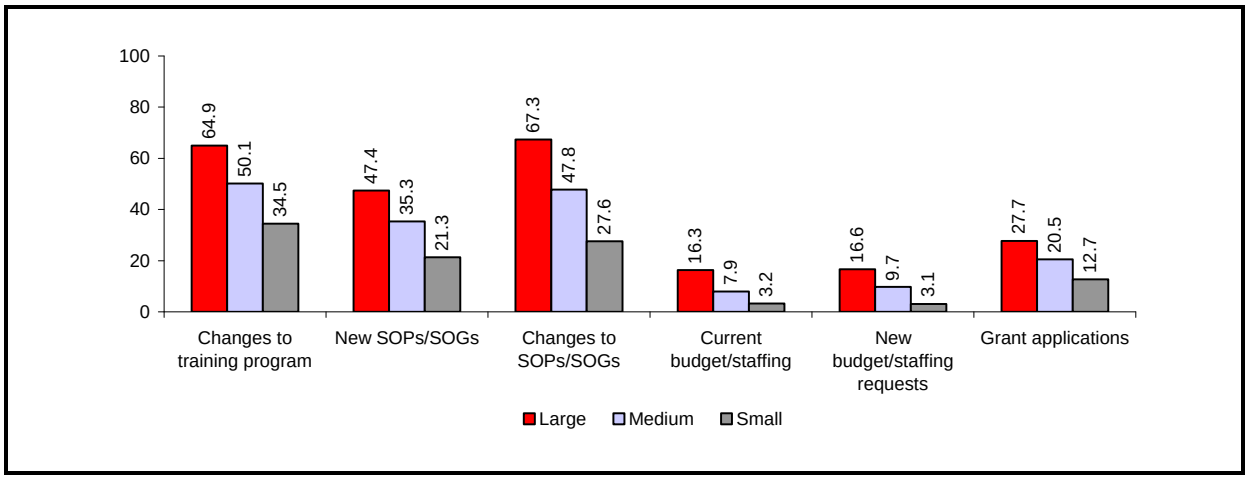
Figure 10. Required Training (Questions 4a-c), by Jurisdiction Type (Percent)



Use of NIOSH Recommendations (Q11, 11A, 11B)

Among those who have seen information about NIOSH's recommendations, the most common use of the recommendations is to modify the content of the firefighter training program (40.2 percent) and to change departmental SOPs (34.9 percent). Over one-third of all fire departments have made these changes as a result of the NIOSH recommendations. Other common applications of NIOSH recommendations are new SOPs (26.3 percent) and grant applications (15.5 percent). The most common topics of NIOSH recommendations that are used for training programs are PPE and clothing (41.6 percent), SCBA (40.1 percent), PASS systems (32.6 percent), Incident Command Systems (32.1 percent), traffic hazards (29.3 percent), and radio communications (23.0 percent). The greatest use of NIOSH recommendations for training is among fire departments in large jurisdictions, particularly training on PPE and SCBA (***Figure 11***).

Figure 11. In What Ways Has Your Department Used NIOSH Recommendations? (Question 11), by Size of Jurisdiction (Percent)



Department Fitness Training Program (Q12)

NIOSH recommends that fire departments make fitness/wellness programs mandatory for their firefighters. The vast majority (78.5 percent) of fire departments in the United States do not have a fitness training program for their firefighters, however. Only two-fifths (41.2 percent) of firefighters work in fire departments that have a fitness training program (either optional or required).

Cardiovascular Disease Screenings (Q13)

NIOSH recommends that fire departments conduct medical evaluations to screen firefighters for CVD risk factors and CVD. Well over half (60.9 percent) of all fire departments, however, still do not require these screenings. Only 17.1 percent require annual screenings; 14.5 percent screen only at the time of employment.

Driver Training (Q14, 15, Focus Groups)

NIOSH recommends that fire departments "ensure all drivers of fire department vehicles receive driver training at least twice a year and document the training." According to the Fire Department Survey, most firefighters (93.6 percent) responsible for driving emergency vehicles receive driver training before being allowed to operate the vehicles. Firefighters in about half of all fire departments (54.5 percent) also receive refresher driver training once or more a year. However, during the focus group discussions, firefighters said there is a need for better driver training. They said that firefighters need to be trained to the class of the vehicle, especially drivers of water tankers. Volunteer firefighters—the home responders—should also be trained.

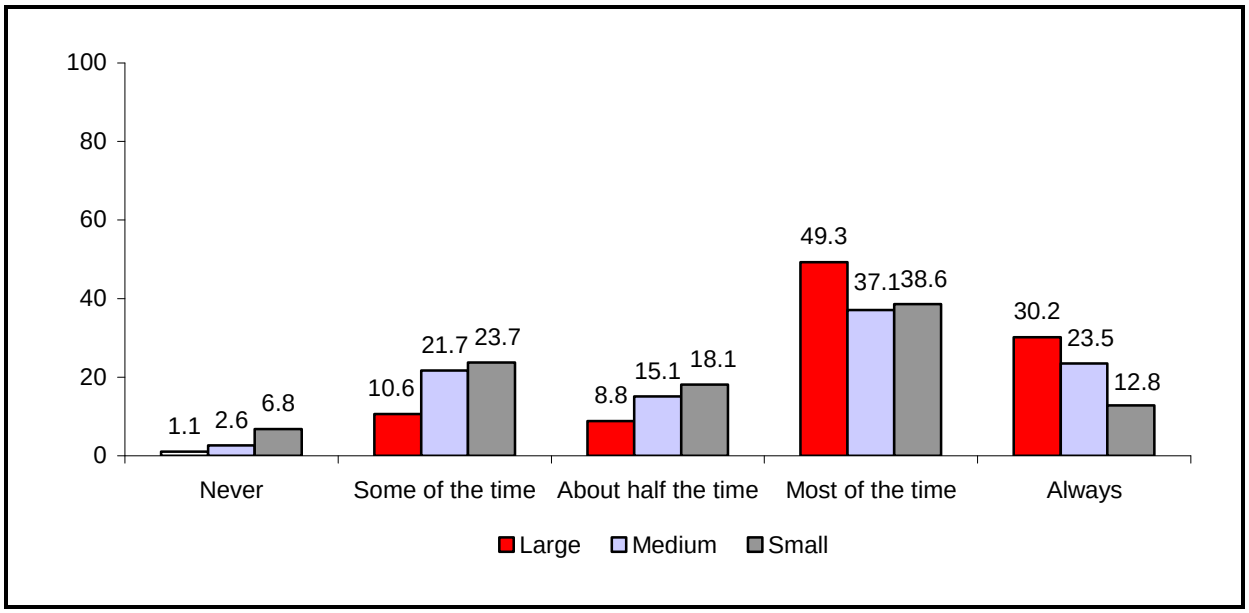
Seat Belt Requirement (Q16)

NIOSH recommends that fire departments "ensure that all firefighters riding in emergency fire apparatus are wearing and are properly belted and secured by seat belts." The findings from the Fire Department Survey indicate that the majority of fire departments (84.2 percent) require their firefighters to wear seat belts while they are in emergency vehicles.

Firefighters' Use of Seat Belts (Q18)

Firefighters in only about half (54.9 percent) of the nation's fire departments are thought to use their seat belts "most of the time" or "always"; 5.4 percent never use seat belts and 22.7 percent use seat belts only some of the time (***Figure 12***.)

Figure 12. About How Often Do You Think Your Firefighters Use Their Seat Belts When Riding in the Emergency Vehicles? (Question 18), by Size of Jurisdiction (Percent)

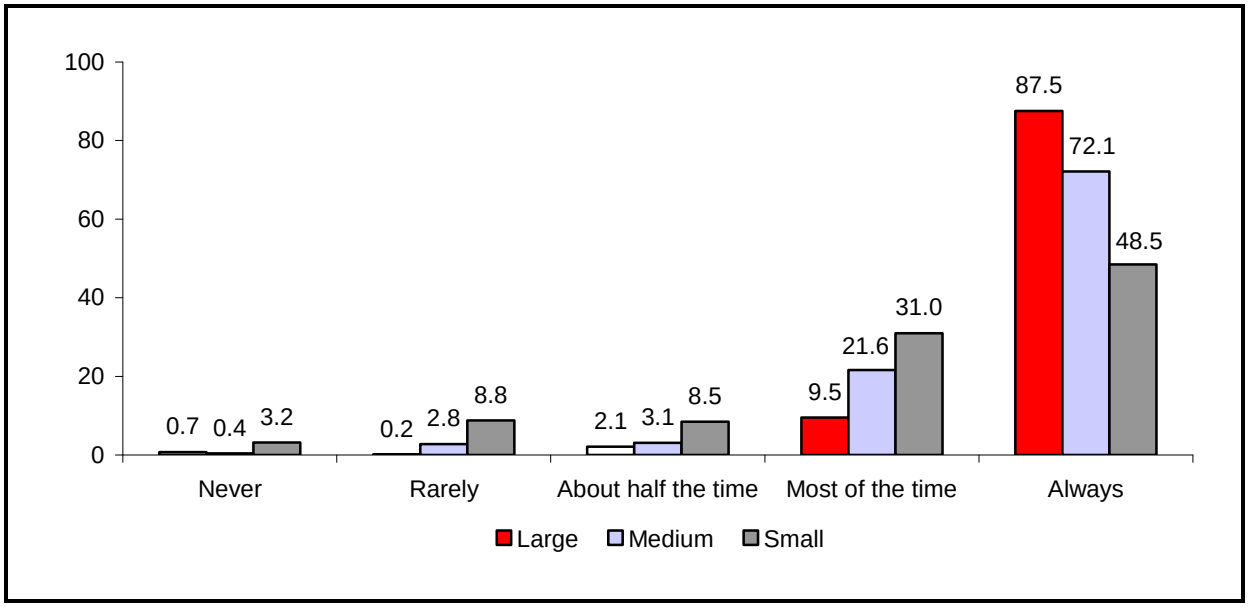


Establishing Incident Command (Q21, Focus Groups)

NIOSH recommends that fire departments "establish and implement an Incident Command System with written SOPs for all firefighters." In response to the question, "What is the worst safety incident that you have experienced in your career?" focus group participants identified a variety of safety problems. Among the most common was failure to implement Incident Command. Firefighters in four of the focus groups said there is "a lot of freelancing" rather than Incident Command. According to the Fire Department Survey,

however, 84.2 percent responded that Incident Command is established "always" or "most of the time" when responding to structure fires (***Figure 13***).

Figure 13. How Often Is Incident Command Established When Responding to Structure Fires? (Question 21), by Size of Jurisdiction (Percent)



Incident Commander's Responsibilities (Q23)

NIOSH recommends that fire departments ensure that the Incident Commander (1) "always maintains close accountability for all personnel at the fire scene," (2) "conducts an initial size-up of the incident before initiating firefighting efforts," and (3) "continually evaluates the risk versus gain during operations at an incident."[8] The tasks that fire departments say are part of an Incident Commander's responsibilities are (in order of mention) to

- develop and coordinate the fire attack strategy (93.1 percent of all departments);
- conduct an initial assessment (Item 2 above; 91.0 percent);
- monitor location of all firefighters at the scene (Item 1 above; 76.2 percent);
- ensure that at least four firefighters are on the scene before entering the building (68.6 percent);
- identify and implement a communication strategy (64.7 percent);

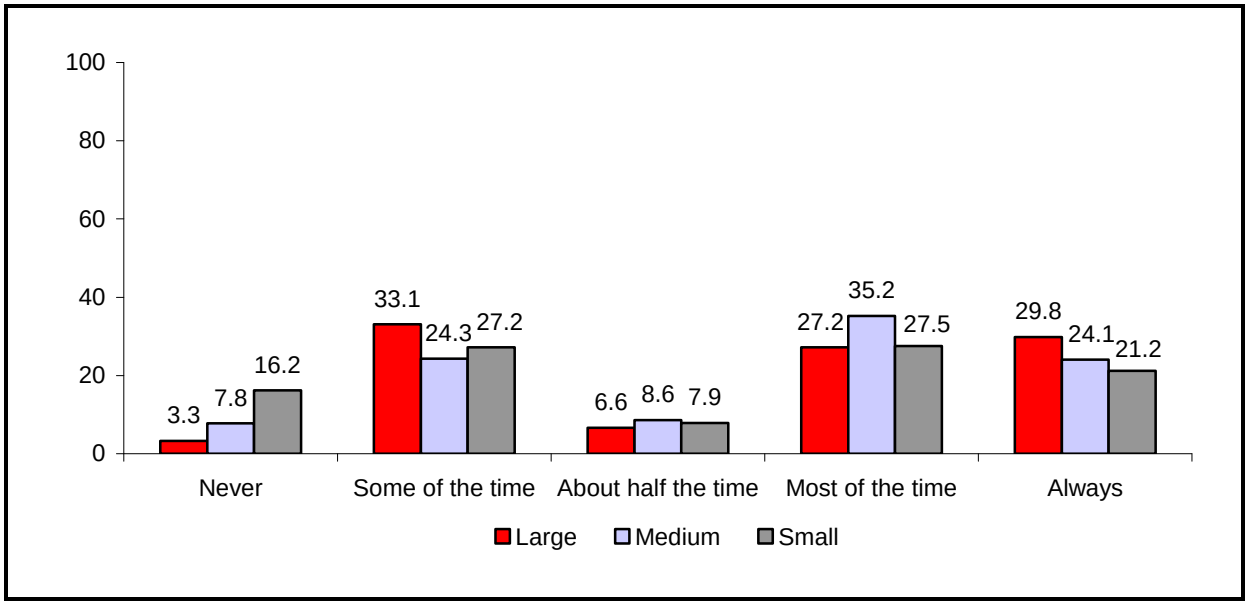
[8] These are Sentinel Recommendations 1-2 and 1-3, respectively. See Attachment 1 for further details.

- develop and initiate a risk management plan (Item 3 above; 52.3 percent);
- establish a collapse zone around the building (49.1 percent);
- establish an RIT or RIC (48.5 percent); and
- document all assessments, plans, and events related to the fire (38.8 percent).

Assigning ISO (Q24)

NIOSH recommends that fire departments ensure that the Incident Commander appoints "a separate Incident Safety Officer, independent from the Incident Commander." Incident Commanders in about half (52.1 percent) of all fire departments assign an ISO at least most of the time; 13.3 percent of fire departments never assign an ISO (***Figure 14***).

Figure 14. About How Often Does an Incident Commander Assign an Incident Safety Officer When Responding to Structure Fires? (Question 24), by Size of Jurisdiction (Percent)

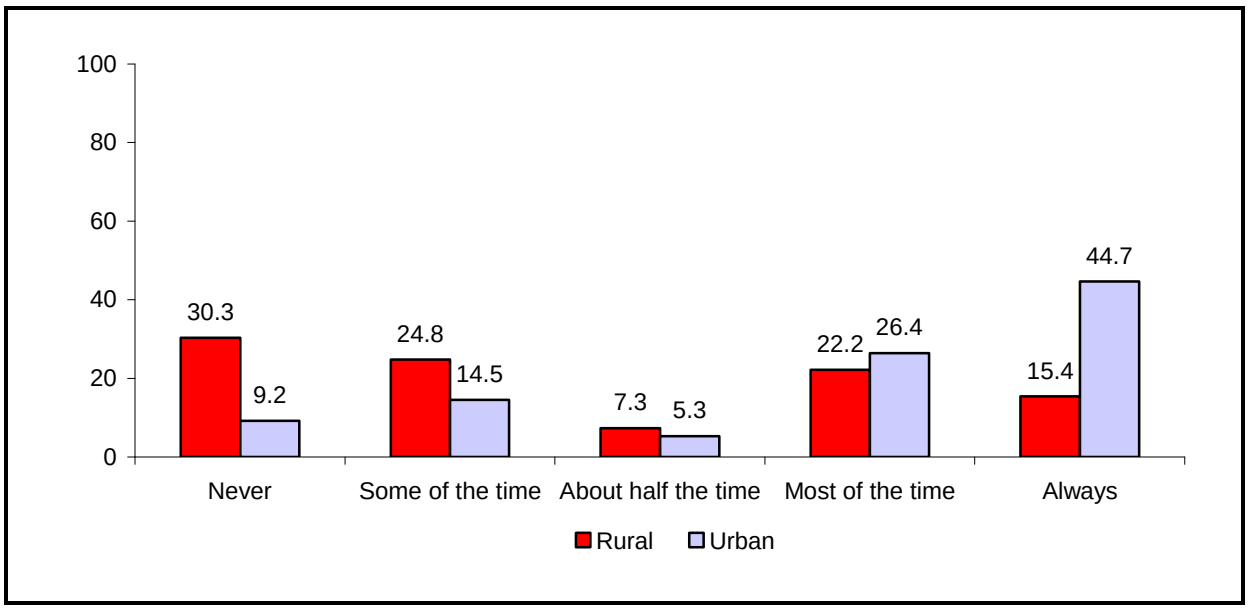


Use of RITs (Q26, Focus Groups)

NIOSH recommends that fire departments "ensure that a Rapid Intervention Team is established and in position immediately upon arrival at a fire scene." Firefighters in focus groups said that one of their main safety concerns is the failure to routinely (i.e., "most of the time" or "always") use RITs. Firefighters explained that, with not enough personnel on the scene, they sometimes need to enter structures without the RITs in place. Across all fire departments, under half (42.4 percent) said they have RITs available at least most of the time. Almost two-thirds (60.6 percent) of all firefighters are in departments that routinely

have RIT available at structure fires. Urban fire departments and departments in large jurisdictions are more likely to establish RITs than rural fire departments (***Figure 15***).

Figure 15. How Often Are RITs Available at Structure Fires? (Question 26), by Jurisdiction Type (Percent)



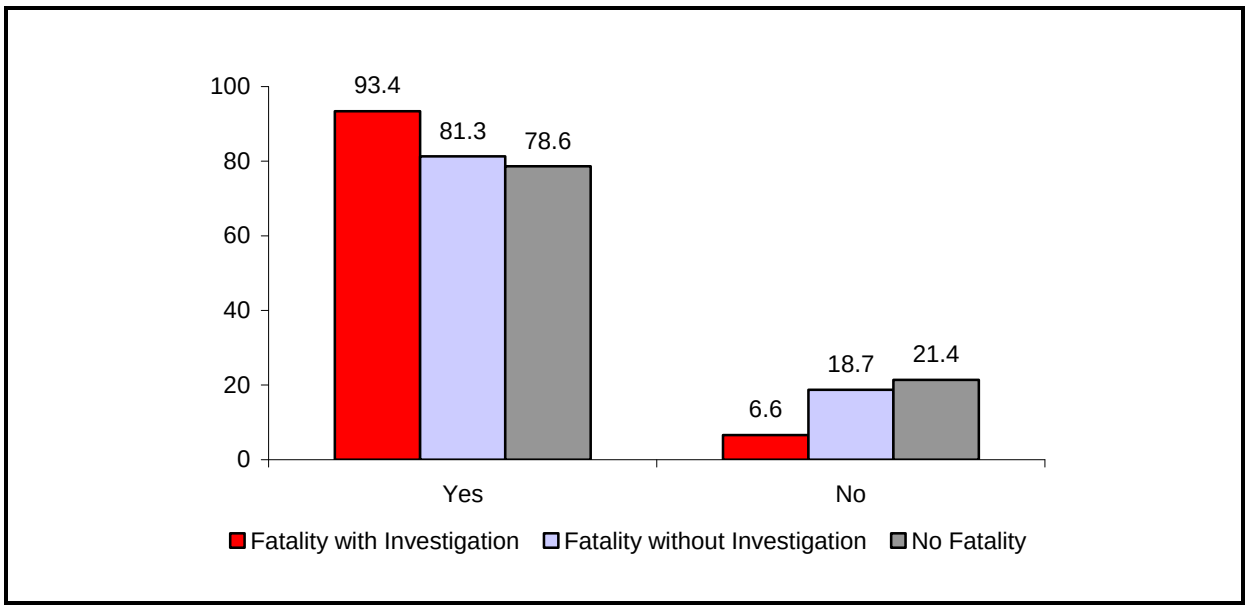
Availability of PASS Devices for All Firefighters (Q29)

Only about three-quarters (78.8 percent) of all fire departments say they have enough PASS devices for all of their firefighters to use when fighting structure fires. However, 93.4 percent of fire departments that have experience with a FFFIPP investigation report having enough PASS devices (***Figure 16***).

Use of PASS Devices (Q30)

NIOSH recommends that fire departments "strictly enforce the wearing and use of PASS devices when firefighters are involved in fire fighting, rescue, and other hazardous duties." Almost all (88.0 percent) fire departments report that their firefighters use their PASS devices at least most of the time.

Figure 16. Does Your Fire Department Have Enough PASS Devices for All Firefighters for Use When Fighting Structure Fires? (Question 29), by Fatality and FFFIPP Investigation (Percent)



Availability of SCBA and Personalized Face pieces (Q32, 33)

Almost all (99.2 percent) fire departments report that they have SCBA for their firefighters to use when they combat structure fires. About half (49.7 percent) of all fire departments, however, say that their firefighters have to share face pieces for SCBA. Sharing face pieces is more often required in the small fire departments (56.5 percent) than large fire departments (10.4 percent) (***Figure 17***).

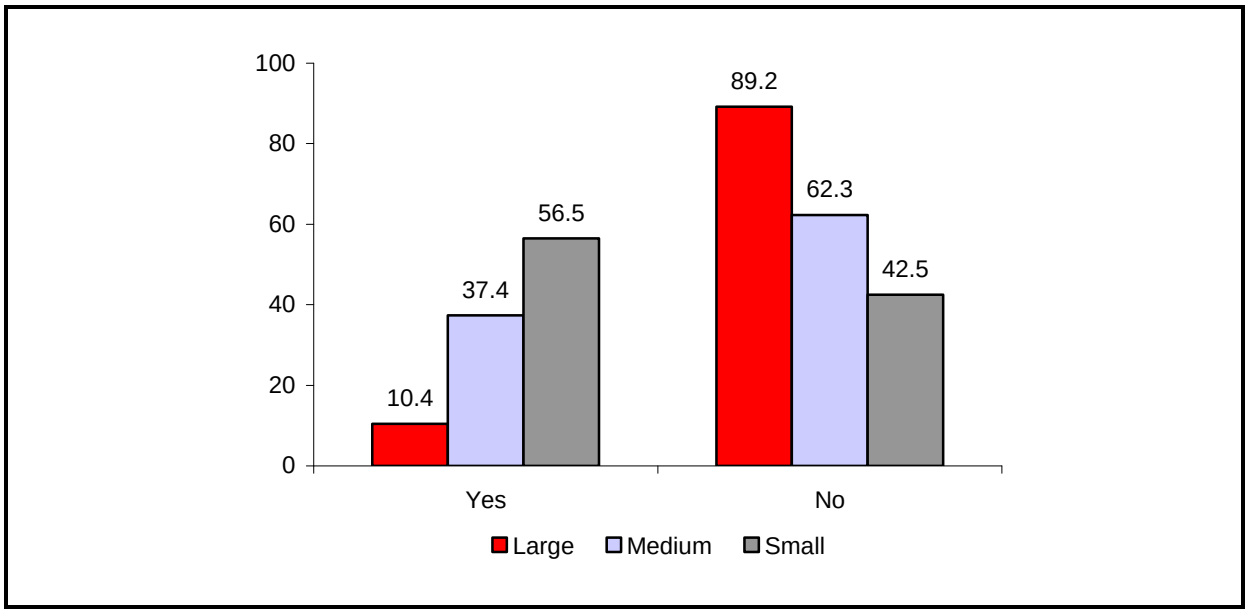
Use of SCBA (Q34)

NIOSH recommends that fire departments "ensure that officers enforce and firefighters wear their SCBA whenever there is a chance they might be exposed to a toxic or oxygen-deficient atmosphere, including initial assessment." Firefighters in almost all (89.8 percent) fire departments reportedly use SCBAs at least most of the time while fighting structure fires.

Maintenance of SCBA (Q36)

NIOSH recommends that fire departments "develop and implement a preventive maintenance program to ensure that all SCBA are adequately maintained. About three-fourths (76.0 percent) of fire departments perform SCBA maintenance at least several times a year. Fewer than 5 percent perform maintenance "less than once a year" or "never."

Figure 17. Do Your Firefighters Ever Have to Share Face Pieces for SCBAs? (Question 33), by Size of Jurisdiction (Percent)



Availability of AEDs (Q38, 38a)

About three-quarters (77.4 percent) of all fire departments have AEDs. Among fire departments that have AEDs, most keep their AEDs on the emergency vehicles (82.4 percent), at the fire station (3.7 percent), or in both locations (13.8 percent). About 85 percent of firefighters are in departments that have AEDs available.

Maintenance of AEDs (Q39)

NIOSH recommends that fire departments perform routine maintenance on their AEDs by following "manufacturers' instructions to replace battery packs immediately when the unit indicates a low battery or replace battery message." Among fire departments that have AEDs, most (86.3 percent) report that they perform routine maintenance on AEDs between once a year and once a month or more, or "after every time they are used."

Two-Way Communication Devices (Q40, 41)

NIOSH recommends that fire departments "ensure that firefighters who enter hazardous areas are equipped with two-way communications with incident command" and that the radio "does not bleed over, cause interference, or lose communication under field conditions." Firefighters in almost all (91.0 percent) fire departments have radios or other two-way communication devices while they are responding to structure fires at least "most of the time." Only 18 percent report that they "never" have problems under field conditions with these devices.

FINDINGS: BARRIERS AND FACILITATORS

The Fire Department Survey included a number of questions in which respondents could select from a list of possible reasons for not being able to implement a FFFIPP-recommended safety practice. The FFFIPP recommendations that are addressed in these questions concern the use of equipment— Self Contained Breathing Apparatus (SCBA), personally fitted SCBA face pieces, Personal Alert Safety System (PASS) devices, seat belts, and turnout gear generally—and procedures on the fireground, such as Incident Command, incident safety officers ISOs, and Rapid Intervention Teams (RITs). The response options included a number of factors that potentially make it difficult to follow safety guidelines, including funding, equipment, personnel, fire department practices, the situation on the fireground, and firefighter resistance. The Fire Department Survey also included questions about the extent to which funding is generally adequate for various purposes. These general questions about the adequacy of funding focused on equipment, training, and personnel.

Additionally, survey responses were partitioned by whether fire departments had experienced a FFFIPP investigation. Thus, the impact of a FFFIPP investigation to facilitate compliance to safety recommendations is reviewed.

To What Extent Do Limited Financial Resources Affect Fire Departments' Ability to Implement FFFIPP Recommendations? (Q33a, 37a, 42a-c)

The results of the Fire Department Survey suggest that a substantial portion of the nation's fire departments do not have enough funding to purchase the equipment, training, and personnel needed to implement FFFIPP-recommended safety practices.

- Almost half of all departments (48.6 percent) say they do not have enough funding for equipment. (Q42a)
- One-third of the fire departments (31.8 percent) say they do not have enough funding for personally fitted SCBA face pieces for all of their firefighters. (Q33a)
- Two-fifths (39.1 percent) of all fire departments say they do not have enough funds for training. (Q42b)
- More than half of fire departments (51.5 percent) do not have enough funding for the personnel they need. (Q42c)

To What Extent Do Fire Departments Have Enough (or Adequate) Personal Protective Gear for Their Firefighters? (Q17, 33a)

The results of the Fire Department Survey suggest that a lack of equipment hinders some departments from implementing FFFIPP-recommended safety practices. Fire departments also report that problems with existing equipment can keep firefighters from following safety practices.

- Almost half (49.7 percent) say their firefighters have to share face pieces. (Q33)
- One-quarter of all fire departments (24.6 percent) do not have enough SCBA for all of their firefighters to use. (Q33a)
- One-quarter (24.9 percent) say their firefighters are not able to fit comfortably in their seat belts while wearing turnout gear in emergency vehicles. (Q17)
- One-fifth (21.2 percent) say they do not have enough PASS devices for all fire fighters when fighting structure fires (Q29)

What Other Factors Limit Fire Departments' Ability to Follow Recommended Safety Practices? (Q22, 25, 28, 31, 33a, 35, 37a)

A number of additional barriers to implementing FFFIPP-recommended safety practices emerged from the Fire Department Survey. The most commonly cited barrier is insufficient personnel at the scene. More than half say this prevents them from assigning an ISO (51.7 percent) and establishing RITs (53.5 percent) (Q25 and Q28). One-fifth (21.2 percent) say it prevents them from establishing Incident Command (Q22).

The second most common reason for not implementing a FFFIPP-recommended safety practice is the situation on the fireground:

- One-third of the departments (32.3 percent) say they sometimes do not assign an ISO because the fire is not large enough. (Q25)
- One-third of the departments (34.9 percent) do not establish RIT because the fire is not large enough. (Q28)
- One-quarter of the departments (25.9 percent) say their firefighters sometimes do not use SCBA because the situation does not require them. (Q35)
- One-fifth (22.5 percent) sometimes do not establish Incident Command because the fire is not big enough to require it. (Q22)
- About 9.5 percent say their firefighters sometimes do not use their PASS devices because the situation does not require them. (Q31)

"Usual fire department practice" is cited as the reason that

- Almost one-quarter of fire departments (23.4 percent) say their firefighters do not use personally fitted face pieces for their SCBA (because "shared systems work fine for our needs"). (Q33a)
- About one-fifth (19.7 percent) do not have Chemical/Biological/Radiological/Nuclear (CBRN) SCBA ("We do not have enough technical information to purchase CBRN SCBAs"). (Q37a)

Very few fire departments cite firefighter resistance as a reason a FFFIPP-recommended safety practice is not followed:

- Only 10.3 percent say firefighters do not think they need SCBA. (Q35)
- Only 4.6 percent say firefighters do not think they need PASS devices. (Q31)
- Less than 1.0 percent (0.3 percent) say firefighters do not like using the personally fitted SCBA face pieces. (Q33a)

What Factors Help Promote Safe Practices? (Focus Groups)

The results of the firefighter focus groups suggest that a number of circumstances encourage safe practices. Among the factors that can encourage safe practices are experience with an on-duty firefighter fatality, experience with a FFFIPP investigation, financial and legal penalties, an officer's attention to specific safety issues, and union representation.

Experience with an On-Duty Firefighter Fatality

Departments that have a prior fatality are less likely than other departments to identify personnel, equipment, or situational barriers to implementing FFFIPP-recommended safety practices. Data from the focus group discussions support these findings. Firefighters whose departments have experienced a line-of-duty death are aware of the FFFIPP and its impact on department policy:

> *If there is a specific incident and it gets a lot of media attention, the impact can be huge and immediate.*

Experiencing a FFFIPP Investigation

FFFIPP investigations appear to have had a significant impact on some departmental policies, training programs, and the availability of safety equipment. The Fire Department Survey results suggest that FFFIPP investigations may have had an impact on

- changes in training programs regarding structure fires, driver safety, Incident Command, and RITs;
- SOPs/SOGs on SCBA maintenance and the use of PASS devices; and
- the availability of individual SCBA face pieces.

Table 2 provides details about these impacts. The statistically significant results are indicated by the numbers in the superscripts in column 1.

Data from the focus group discussions support these findings. For example, frontline firefighters whose departments have experienced a FFFIPP investigation told us the following:

> *The LODD report affected a lot of our procedures. Both policies and practices were affected.*
>
> *We had a NIOSH investigation at my department, and it was really tough. They came in and they really reamed us. But afterwards, it was like we made 25 years of progress in a few months. We didn't have an accountability system. The gear was 10 years old and had never been cleaned. It really raised the Chief's consciousness. Until then, we just got away with it. Then a light bulb went off.*
>
> Another focus group participant noted the following:
>
> *Having an independent agency conduct the investigation is important. Their brutal honesty when they come in is what helps…. It usually brings good change when it comes.*

Enforcement Mechanisms

Firefighters indicated that the most effective ways to encourage safety practices are enforcement mechanisms tied to financial and other penalties. The focus group data suggest that financial and legal penalties, as well as their officer's attention to specific safety issues, can have a significant impact on firefighter behavior.

Several firefighters described the financial and legal penalties on fire departments that can motivate greater safety practices. Firefighters are aware that their actions can result in citations, lawsuits, and fines against the fire department:

> *The department's ISO rate is determined, in part, by its rating on the level of safety training provided. The ISO rate, in turn, affects insurance rates.*

Table 2. Percentage of Fire Departments Who Have Safety Elements and Who Experienced a Fatality and FFFIPP Investigation[a]

Safety Element	1 Fatality and FFFIPP Investigation	2 Fatality and No FFFIPP investigation	3 No Fatality
SOPs/SOGs (Q3)[b] in place for			
– SCBA maintenance	80.8%[2,3]	68.7%	69.6%
– motor vehicle safety	90.3%[3]	82.7%	78.7%
– personal physical fitness	24.3%[3]	18.1%	10.9%
– RITs	64.0%[3]	55.5%	40.1%
– use of PASS devices	83.2%[2,3]	71.5%	75.3%
Required training (Q4) on			
– structure fires	90.4%[2,3]	76.3%	82.8%
– driver safety	92.0%[2,3]	80.3%	77.6%
– Incident Command	86.3%[2,3]	73.6%	69.7%
– maintenance of SCBA	73.4%[3]	61.1%	60.2%
– RITs	60.5%[2,3]	36.1%	35.4%
Made changes to SOPs/SOGs (Q11)	66.2%[2,3]	51.3%	34.5%
Made changes to training program (Q11)	68.0%	56.3%	39.8%
Trained firefighters on physical fitness and CVD	28.8%[2,3]	16.3%	8.3%
Provide annual CVD screening (Q13)	32.6%	24.4%	17.0%
Use RITs at least most of the time (Q26)	64.4%[3]	59.1%	42.0%
Have enough PASS devices (Q29)	93.4%[2,3]	81.3%	78.6%
Always use PASS devices (Q30)	91.0%[2,3]	74.4%	75.1%
Firefighters do not have to share SCBA face pieces (Q33)	64.1%[2,3]	44.2%	49.4%
Always carry radios or other 2-way communication devices while responding to structure fires (Q40)	82.5%[2,3]	66.6%	70.4%

CVD = cardiovascular disease; PASS = Personal Alert Safety System; RIT = rapid intervention team; SCBA = self-contained breathing apparatus; SOG = standard operating guideline; SOP = standard operating procedure.

[a] The numbers in the square brackets indicate that the percentage estimate is significantly different at the 95 percent confidence interval from the corresponding estimate in the column identified (column 2 or 3). The superscript [2], for example, indicates that, among departments that had experienced a firefighter fatality, the presence of the safety feature varies significantly depending on whether the fire department had experienced a FFFIPP investigation or not. The superscript [3] indicates that the presence of the safety feature varies significantly between fire departments that had experienced a fatality and a FFFIPP investigation and fire departments that had not experienced a fatality at all.

[b] Text in parentheses refers to the question number in the Fire Department Survey

Firefighters acknowledge that they take safety precautions more seriously if there are tangible personal penalties for ignoring them. The penalties that can be imposed on firefighters include days off without pay, denied promotions, demotions or loss of job, and loss of death benefits in the event of a line of duty death.

> *Our chief makes us take days off without pay if the firefighter does not use a seat belt. That gets people's attention. He's also said that if you lose an eye because you failed to have your gear on properly, you will be fired.*

As these comments suggest, fire department officers play a key role in promoting safety. However, firefighters can receive mixed messages from their officers, as the following comment shows:

> *Most of the awards for valor usually involve … doing things you aren't supposed to do. It's in our nature to want to save someone. If nothing goes wrong despite ignoring the rule, you'll be praised for saving someone.*

Firefighters also told us that union representation promotes safety.

FINDINGS: RECOMMENDED CHANGES TO CONTENT AND FORMAT OF NIOSH RECOMMENDATIONS

A number of questions were posed during the focus group discussions and in the Fire Department Survey about NIOSH's current materials for disseminating the findings of the FFFIPP investigations. Firefighters say that learning about specific incidents helps them develop safer work practices, and they appreciate that the LODD reports are unbiased. Firefighters think the LODD reports are generally well designed, but recommend that NIOSH add more visual aids to clarify the fire scene. Fire department officers want more straightforward and less generic recommendations. They also want help translating FFFIPP recommendations into ready-made training material and sample SOPs.

The most common recommendation from firefighters is for improvements in the ways FFFIPP materials are disseminated and marketed. They recommend that NIOSH update the FFFIPP mailing list and e-mail listserv, implement procedures for refreshing these lists regularly, and better advertise the lists.

Finally, firefighters suggest that NIOSH develop coordinated campaigns around specific issues to raise awareness throughout the fire service. They suggest that NIOSH prepare summary documents with statistics showing the number of deaths and injuries due to specific unsafe practices.

Details about these issues follow.

Does NIOSH Provide Useful and Practical Recommendations? (Q49, 52A-C, Focus Groups)

About two-thirds of the officers who are aware of the NIOSH reports indicate that they agree or strongly agree that NIOSH reports are practical (68.4 percent), easy to understand (69.5 percent), and specific and concrete (57.9 percent). The remaining third primarily expressed a neutral opinion about the reports (they neither agreed nor disagreed with these statements).[9] Many focus group participants said they valued the detailed, factual information provided in NIOSH's LODD reports. Learning about specific incidents helped them develop safer work practices.

Does NIOSH Present the Findings of FFFIPP Investigations in Ways That Are Accessible to Fire Department Staff? (Q47-49, 53A-54, Focus Groups)

Officers and firefighters are very appreciative of the unbiased, factual information provided in the LODD reports and offer a number of suggestions for enhancing the information provided in them, including ideas about both formatting and content.

Format of the LODD Reports (Focus Groups)

Firefighters think the LODD reports are generally well designed, but recommend making it easier to skim through them by making more effective use of headings and headlines, adding more visual aids to clarify the fire scene (a timeline, a diagram of the fire scene, and more photos), and including information about the victim(s).

Amount of Detail (Q47) and Length of Reports (Q48, Focus Groups)

Among those officers who are familiar with the FFFIPP LODD reports, 88.2 percent rate the amount of detail in the reports as "about right." The firefighters who participated in the focus groups are similarly satisfied with the length of the LODD reports.

Both officers and frontline firefighters, however, suggest that more visual aids be added to the LODD reports to clarify the fire scene. The most common suggestions for enhancing the LODDs are adding

- a graphic showing a timeline of events,

[9] Very few officers suggested that they thought the recommendations were impractical (only 1.2 percent of those who said they were aware of the reports), not easy to understand (3.0 percent), or not specific and concrete (5.0 percent).

- a diagram of the fire scene (e.g., the floor plan), and
- more photos.

Several officers and firefighters also want more information about the victim(s) to heighten the impact of the recommendations. Other firefighters and officers want more technical detail about the scene and a broader scope of investigation.

Satisfaction with Other NIOSH Materials (Q53, Q53a, Focus Groups)

Besides the LODD reports, the only NIOSH item that most officers are aware of is the Pocket Guide to Chemical Hazards. A quarter of the officers (25.2 percent) say they have not seen any NIOSH materials other than LODD reports. In order of frequency, the overall proportion of officers who have seen additional NIOSH materials are as follows:

- Pocket Guide to Chemical Hazards, 57.4 percent
- Alerts, 31.7 percent
- CDs of firefighter program materials, 28.0 percent
- Hazard IDs, 16.6 percent
- Respirator Maintenance Program Guide, 13.8 percent
- Workplace Solutions, 12.5 percent

Officers in about two-fifths of all fire departments (39.3 percent) that have seen other NIOSH materials report that they are satisfied or very satisfied with the additional materials.

Firefighters who participated in the focus group discussions are less familiar with these materials than those who answered the survey. One focus group thought a different format would be more compelling for conveying lessons learned across a number of FFFIPP investigations. Their suggestion is to add statistics showing the number of deaths and injuries due to specific unsafe practices and to make use of communication techniques employed by the media.

Visited the NIOSH Web Site? (Q54)

The majority of officers responding to the Fire Department Survey (59.4 percent) have not visited the NIOSH Web site.

How Can the Findings of FFFIPP Investigations Be Made More Useful? (Q49, Q56, Focus Groups)

Fire department officers' and firefighters' responses offered a number of recommendations for improving the impact of the findings from FFFIPP investigations. The six most common are as follows.

Improve Distribution Mechanisms and Marketing (259 suggestions)

By far the most common recommendation from the fire department officers is for improvements in the ways FFFIPP materials are disseminated. Comments ranged from the broad "improve the marketing of the materials," to specific suggestions about updated mailing lists. Some officers said they had not known about the materials and asked to be placed on the mailing list. The range of suggestions fell into the following categories:

- Mail materials directly to fire departments, especially smaller departments (71 suggestions).
- Improve the marketing of the materials (61 suggestions).
- Develop and maintain updated e-mail listservs (60 suggestions).
- Improve distribution of reports (40 suggestions).
- Maintain an updated contact list of fire department recipients (27 suggestions).
- Communicate information to state and local agencies (7 suggestions).
- Mail materials directly to safety and training officers (4 suggestions).
- Create a banner with the NIOSH Web site address to post on fire station bulletin boards (1 suggestion).

Firefighters want NIOSH to facilitate access to the FFFIPP information. Most of the frontline firefighters who participated in the focus groups are not familiar with the FFFIPP or FFFIPP information products. A recurring theme in the discussions was the value of FFFIPP's investigations and the firefighters' interest in learning about the results of these investigations.

To bridge the wide gap between level of interest and access to materials among this sector of the fire service, firefighters and officers had a number of suggestions. Following are some specific suggestions from officers and focus group participants:

- Update the FFFIPP mailing list and implement procedures for refreshing the list periodically.

- Advertise the mailing list (and how to join it).
- Send LODD reports in PDF format via e-mail.
- Mail CD-ROMs of FFFIPP findings to the fire departments.
- Advertise the e-mail listserv (and how to join it) at all fire stations.
- Revise the NIOSH Web site to make it more firefighter-friendly.
- Communicate recommendations to the state and local agencies that determine funding for fire departments.

Use Additional Media for Dissemination (98 suggestions)

Another consistent theme in the focus group discussions and survey data was the need for NIOSH to disseminate information from FFFIPP investigations in multiple formats, in addition to the LODD reports. Firefighters urged NIOSH to consider popularized versions of the reports to make them more accessible to the average firefighter.

Another common request is for one-page summaries. Both firefighters and officers say these would be helpful. Several respondents to the Fire Department Survey also recommend brief summaries of findings about specific issues or equipment. These could be used easily to train firefighters, as well as to justify budget requests.

Other Fire Department Survey respondents recommend that NIOSH develop specific safety procedure posters that could be placed in the fire stations. Focus group participants suggest NIOSH

- develop coordinated campaigns around specific issues, focusing on one issue at a time to raise awareness throughout the fire service, and
- prepare summary documents with statistics showing the number of deaths and injuries due to specific unsafe practices, using communication techniques employed by the print media.

Design Materials for Training (26 suggestions)

Fire department officers also want help translating FFFIPP recommendations into actionable items for their departments. There is particular interest in receiving ready-made training materials (including PowerPoint presentations and lesson plans) based on the LODD reports. Training officers may spend several hours translating the information in the LODD reports into a training tool. Often, this process involves creating PowerPoint presentations and identifying visuals to illustrate the LODD report's text.

Partner with Other Organizations to Promote Recommendations (21 suggestions)

Respondents to the Fire Department Survey recommend that NIOSH partner with other organizations to enhance the dissemination of FFFIPP findings. Specific partners the officers suggest are trade journals, fire service organizations, and state and federal training programs.

Add Content to Materials on How to Implement Recommendations (13 suggestions)

Specific requests for additional information include sample SOPs and other management tools for implementing recommendations. Officers from small fire departments also request information that is tailored to their budget and size constraints.

Link with Enforcement (11 suggestions)

Several respondents to the Fire Department Survey want a link between NIOSH recommendations and some form of enforcement.

Are Needed Supporting Materials Available to Fire Departments? (Q51)

Only about a quarter of fire departments that have seen NIOSH reports (24.8 percent) usually have access to documents referenced in NIOSH reports.

IMPLICATIONS AND RECOMMENDATIONS

Firefighters have dangerous jobs. They are called on to rescue people and protect property under serious and hazardous conditions. They are also exposed to dangers en route to emergencies and while responding to roadside incidents. Some 100 firefighters die each year on duty, and another 80,000 are injured.

How many of these deaths and injuries are preventable is unknown. However, the knowledge and technology clearly exist to reduce the rates of firefighter fatalities and injuries from their current levels. Recommendations developed through NIOSH's FFFIPP point to a number of safety practices that could improve the health and safety of the nation's firefighters. In this section, we present the implications of the evaluation data for these issues and suggest approaches NIOSH could consider to address the existing gap between safety knowledge and practice in the nation's fire service.

Shortfalls persist in current firefighter safety practices. The evidence from this evaluation suggests that not all fire departments and firefighters follow FFFIPP recommendations. FFFIPP investigations regularly conclude with recommendations that had

already been promulgated in prior LODD reports and other NIOSH materials. In the focus groups and survey conducted for this evaluation, firefighters and their officers conceded that safety practices are not always followed.

The evaluation provides evidence from the Fire Department Survey and focus groups on the extent to which fire departments implement 17 of the most common FFFIPP recommendations (which serve as the "sentinel" recommendations for this evaluation). The survey data suggest the following, for example:

- Although about 84 percent of all fire departments have an SOP on the use of Incident Command Systems, only 11 percent have one for a physical fitness program.
- More than half of fire departments (60.9 percent) do not require CVD screenings. Only 17.0 percent require annual screenings.
- Only half (52.3 percent) implement a risk management plan when incident command is established for a structure fire.
- Only half (52.1 percent) assign an incident safety officer at least most of the time.
- Less than half of all fire departments (42.4 percent) establish RITs at the fire scene at least most of the time.
- Although more than 80.0 percent of fire departments say the drivers of emergency vehicles receive training, only half (54.5 percent) provide refresher training once a year or more. NIOSH recommends refresher training twice a year.
- Only half of fire departments (54.9 percent) say their firefighters use seat belts at least "most of the time"; 15.8 percent do not require firefighters to wear seat belts while they ride in emergency vehicles.
- One-fifth of fire departments (21.2 percent) do not have PASS devices for all their firefighters to use when fighting structure fires.
- Almost one-fifth of rural fire departments (19.3 percent) report problems at least half the time with their two-way radios, such as bleed over, interference, or loss of communication under field conditions.

Each of these facts represents an opportunity to improve the implementation of FFFIPP recommendations. Each of these applicable recommendations has been featured in

multiple LODD reports. The shortfall in implementation indicates that better ways are needed for transferring existing safety knowledge into practice throughout the fire service.

Following are key implications from the evaluation data, along with recommendations for addressing these implications.

Small, Volunteer Departments Have the Greatest Challenges to Following Safety Guidelines

In the survey data on fire department safety practices, there are a number of distinct patterns that suggest where efforts are most needed to minimize the gap between knowledge and practice. With few exceptions, the fire departments that are most likely to be implementing FFFIPP recommendations are career departments in large, urban jurisdictions, particularly those in the Northeast. Fire departments with lower levels of implementation tend to be volunteer or combination career-volunteer departments in small, rural jurisdictions, particularly those in the South and Midwest. Small, volunteer fire departments typically have fewer financial resources and staff.

On the basis of these findings, NIOSH may wish to consider a number of outreach efforts to improve the dissemination and use of FFFIPP information.

Recommendation: Outreach Efforts

1. Enhance outreach efforts to small, rural, and volunteer fire departments.

Existing Resources Limit Safety Practices

The adequacy of financial and personnel resources appears to play a large role in whether a fire department is implementing the FFFIPP recommendations. For example, the survey data indicate the following:

- Almost half of all fire departments (48.6 percent) do not have enough funding for the equipment they need. A third of the departments (31.8 percent) do not have enough funding for personally fitted face pieces for their SCBA. (Q42a, 33a)
- Two-fifths (39.1 percent) do not have enough funding to train firefighters. (Q42b)
- More than half (51.5 percent) do not have enough funding for the personnel they need. (Q42c)
- Lack of personnel at a fire scene prevents more than half of all fire departments from assigning an Incident Safety Officer (51.7 percent) and establishing RITs (53.5 percent). (Q25, 28)

These findings may suggest that fire departments need help identifying financial resources. On the basis of these findings, NIOSH and its partner organizations may wish to consider the following recommendations to improve use of the FFFIPP information.

Recommendations: Technical Assistance

2. Develop documents about recommended equipment, training, or procedures that could be used to justify budget requests.
3. For smaller, volunteer departments, provide additional technical assistance for preparing grant applications.

Gaps in Knowledge and Attitudes also Limit Safety

There is evidence from the evaluation that the knowledge and attitudes of firefighters and officers play a role in safety practices:

- A quarter of all fire departments (23.4 percent) do not think personally fitted face pieces are needed for SCBA (i.e., shared face pieces work fine for their needs); about 5.0 percent did not know they were recommended. (Q33a)
- About 10 percent say firefighters sometimes do not think they need SCBA. (Q35)
- Almost a third (29.4 percent) have never established RITs, and 4.0 percent say they do not need them. (Q26,Q28)
- A third of the departments (34.9 percent) do not always establish an RIT because they think some situations do not warrant one. (Q28)
- A third of the fire departments (32.3 percent) say they do not always use an Incident Safety Officer because fires are not usually big enough. (Q25)

On the basis of these findings, NIOSH may wish to consider the following actions.

Recommendation: NIOSH Web Site

4. Improve the FFFIPP Web site with a firefighter-friendly page that connects broad topics with recommendations and action items, with links to specific FFFIPP LODD reports and other FFFIPP materials and resources.

Recommendation: Outreach

5. Contact fire departments that experience a firefighter fatality or "near miss" incident, regardless of whether an investigation is planned. Partnering with other

organizations as needed, provide relevant FFFIPP materials and offer technical assistance to help address safety issues.

FFFIPP Investigations and LODD Reports Provide Useful Information

The evidence suggests that LODD reports are valued by many firefighters because they are unbiased, detailed, and factual. Learning about specific incidents helps firefighters understand safety issues and appears to improve their safety practices. Most fire departments (88.2 percent) think the amount of detail provided is about right, but only about half of those who had seen these FFFIPP reports say that they are practical, easy to understand, specific, and concrete. Fire departments that have experienced an on-duty firefighter fatality are more appreciative of the LODD reports than departments that have not.

The experience of a FFFIPP investigation by a fire department was associated with a number of firefighter safety practices. Fire departments that had had FFFIPP investigations were significantly more likely than others to offer training on several important fire safety elements, to make changes to their SOPs and SOGs for major fire safety elements, and to have enough SCBA face pieces so that firefighters did not have to share them.

On the basis of these findings, NIOSH may wish to consider the following actions for disseminating the results of individual FFFIPP investigations of on-duty firefighter fatalities.

Recommendations: LODD Reports

6. Continue developing and disseminating LODD reports.
7. Continue providing all four sections of the current reports, including a summary, investigation results, discussion, and recommendations.
8. Consider the use of formatting, headings, and headlines to enhance the messages communicated both in individual LODD reports and over the LODD series.

Fire Departments Need Additional Information in the LODD Reports

One of the most common suggestions by firefighters and their officers is for additional graphics in the LODD reports. Adding a timeline, a diagram of the fire scene, and more photos, as well as making more effective use of headings and headlines, would make the information presented in the reports more cognitively accessible and more compelling to read. The repetition across multiple LODD reports of generic recommendations appears

ineffective, however. Many fire department officers say they need more straightforward recommendations.

On the basis of these findings, NIOSH may wish to consider a number of actions to improve the value of the FFFIPP information.

Recommendations: Content of the LODD Reports

9. To improve accessibility and information, incorporate more photos, timelines, diagrams, and other visual aids into the FFFIPP reports.
10. Review the investigation protocol, particularly the sources used for developing technical recommendations. Consider using an outside panel of experts to review findings.

Firefighters and Fire Departments Need Information Presented in Additional Formats

The evidence from this evaluation demonstrates that fire departments are already trying to improve the knowledge-to-practice translation. Training officers spend hours creating training materials based on the LODD reports. Usually, these take the form of PowerPoint slides to which they add media clips and other visuals. Because such efforts are more challenging for small, volunteer departments to fulfill, the knowledge-to-practice gap could be narrowed by NIOSH's providing departments with training tools based on the FFFIPP's findings.

Other officers need guidance and tools for implementing FFFIPP recommendations. Needed tools include sample SOPs and materials that could be shared with budget authorities and funding agencies to support the departments' requests for additional resources. Officers from small departments also need recommendations that take into account their limited financial and personnel resources.

In addition, firefighters would be more likely to learn about and act on FFFIPP recommendations if the information were presented in more accessible formats. These range from one-page summaries on specific operational issues (such as the "2 in 2 out" rule or the use of Incident Command and RITs), to coordinated campaigns on individual topics. They also include longer summary documents (such as the Safety First document NIOSH has developed) with updated graphics and formatting, as well as video reenactments and other more popularized materials.

On the basis of these findings, NIOSH may wish to consider a number of actions to improve the dissemination and use of the FFFIPP information.

Recommendations: Ancillary Materials

11. Help transfer knowledge gained from FFFIPP investigations by creating training tools based on the FFFIPP reports, including PowerPoint slides and lesson plans. Incorporate photos, timelines, diagrams, and other visual aids.

12. Expand the production of existing publications, such as Safety First, Workplace Solutions, and Hazard IDs, to include additional topics. Make use of graphics, statistics, and other tools to communicate the level of risk and practical steps firefighters and fire departments can take to promote safety.

13. Explore new technology for disseminating the findings of FFFIPP investigations in a public service campaign format. Use videos, public service channels, and Internet streaming video to present safety messages on each key FFFIPP recommendation. These messages should draw from multiple fatality investigations and should employ public safety advocacy techniques.

FFFIPP Materials Need to Be Better Marketed and Distributed

The evaluation data indicate that, although most fire departments are aware of FFFIPP reports, more than one-quarter (26.8 percent) have never seen a FFFIPP report. Many fire departments are unaware of FFFIPP resources. Firefighters do not understand the FFFIPP's role or how FFFIPP investigations are conducted. Over half of all officers (54.3 percent) are not familiar with the FFFIPP. Among small departments, 62 percent are not aware of the FFFIPP. Similarly, participants in the focus groups suggested a number of ideas for presenting FFFIPP findings that demonstrated they were not aware of already existing NIOSH resources. These resources include the NIOSH Web site, the FFFIPP CD-ROM, and the summary reports.

These findings suggest that there is room for improvement in the way current FFFIPP documents are disseminated. NIOSH could improve its impact by better marketing existing resources and by diversifying the communication channels used for dissemination. Firefighters and their officers offer a number of suggestions to address this issue.

On the basis of these findings, NIOSH may wish to consider a number of actions to improve the dissemination and use of the FFFIPP information.

Recommendations: Distribution

14. Ensure that NIOSH materials reach all fire departments by instituting new measures to maintain a complete and up-to-date mailing list.

15. Ensure that NIOSH e-mail lists are up to date (e.g., with an e-mail cohort maintenance or refresher program that generates automatic e-mails to listserv members to confirm addresses).

Recommendations: Marketing

16. Improve the promotion of the FFFIPP Web site. Create a poster suitable for fire station bulletin boards, with the NIOSH Web site featured prominently.

17. Consider coordinated promotional campaigns on single themes.

Increasing Awareness of the FFFIPP and FFFIPP Investigations Will Likely Improve Safety Practices

In both the focus group discussions and the survey responses, firefighters made it clear that they are more receptive to safety information when its importance is reinforced by media coverage, political pressure, potential sanctions from insurance companies, state occupational safety and health agencies, and their officers.

This finding suggests that there is an opportunity to increase knowledge of FFFIPP recommendations by increasing awareness of the program itself. Raising the FFFIPP investigators' profiles, for example, would likely raise the attention given to investigation reports, which in turn would increase the attention firefighters, fire departments, and local funding authorities would give to the FFFIPP recommendations. The recommendation at the 2006 NIOSH stakeholders' conference that FFFIPP investigators wear identifiable clothing (i.e., caps and jackets with the NIOSH acronym) was an acknowledgment of this causal link in the knowledge-to-practice chain.

Recommendations: Marketing

18. Develop additional mechanisms for raising awareness about the FFFIPP across the fire service and the public.

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APPENDIX A. SENTINEL RECOMMENDATIONS FOR THE FFFIPP EVALUATION

DOMAIN #1: INCIDENT COMMAND

Recommendation #1: Fire Departments should establish and implement an Incident Command System with written standard operating procedures for all firefighters.

Recommendation #2: Ensure that the Incident Command always maintains close accountability for all personnel at the fire scene.

Recommendation #3: Ensure that Incident Command conducts an initial size-up of the incident before initiating firefighting efforts and continually evaluates the risk versus gain during operations at an incident.

Recommendation #4: Ensure that a separate Incident Safety Officer, independent from the Incident Commander, is appointed.

DOMAIN #2: MOTOR VEHICLE SAFETY

Recommendation #1: Ensure that all firefighters riding in emergency fire apparatus are wearing and are properly belted and secured by seat belts.

Recommendation #2: Ensure all drivers of fire department vehicles are responsible for the safe and prudent operation of the vehicle under all conditions.

Recommendation #3: Ensure all drivers of fire department vehicles receive driver training at least twice a year and document the training.

DOMAIN #3: EQUIPMENT

Recommendation #1: Develop and implement a preventive maintenance program to ensure that all Self-contained Breathing Apparatus are adequately maintained.

Recommendation #2: Fire departments, emergency medical services, and other users of automated external defibrillators should follow the manufacturers' instructions to replace battery packs immediately when the unit indicates a low battery or replace battery message.

Recommendation #3: Fire departments should develop and implement a policy requiring the use of Personal Protective Equipment and protective clothing.

DOMAIN #4: RADIO COMMUNICATION

Recommendation #1: Fire departments should ensure those firefighters who enter hazardous areas, e.g., burning or suspected unsafe structures, are equipped with two-way communications with incident command.

Recommendation #2: Ensure that firefighters are equipped with a radio that does not bleed over, cause interference, or lose communication under field conditions.

DOMAIN #5: SAFETY ON THE FIREGROUND

Recommendation #1: Ensure that a Rapid Intervention Team is established and in position immediately upon arrival.

Recommendation #2: Fire departments should strictly enforce the wearing and use of PASS devices when firefighters are involved in firefighting, rescue, and other hazardous duties.

Recommendation #3: Ensure that officers enforce and firefighters wear their SCBAs whenever there is a chance they might be exposed to a toxic or oxygen-deficient atmosphere, including the initial assessment.

DOMAIN #6: FITNESS/WELLNESS

Recommendation #1: Fitness/wellness programs should be mandatory.

Recommendation #2: Conduct medical evaluations to screen firefighters for coronary artery disease (CAD) risk factors and CAD.

APPENDIX B. DEFINITIONS OF THE STRATIFICATION VARIABLES

Census region	The US Census Bureau's definition of the four geographic regions as applied to the state in which the fire department is located. The four geographic regions will be defined as follows: 1. **Northeast**—Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont 2. **South**—Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia, plus the District of Columbia 3. **Midwest**—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin 4. **West**—Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming
Department type	Percentage of firefighters who are paid, career versus volunteer firefighters: 1. **All career**—100% career firefighters 2. **Mostly career**—51% to 99% career firefighters 3. **Mostly volunteer**—1% to 50% career firefighters 4. **All volunteer**—100% volunteer firefighters
Jurisdiction type	The population density of the area served by a fire department (population protected by square miles covered):[a] 1. **Urban**—fire departments with at least 825 persons per square mile 2. **Rural**—fewer than 825 persons per square mile
Jurisdiction size	Size of protected population as reported on the NFPA database: 1. **Large**—at least 50,000 persons protected 2. **Medium**—at least 5,000 and fewer than 50,000 persons protected 3. **Small**—fewer than 5,000 persons protected

[a] This definition assumes that 65 percent of the fire department's coverage area would be considered the central area, and 35 percent of the coverage area would be considered the surrounding area. In the 2000 Census, the US Census Bureau defines "urban" as all territory, population, and housing units located within an urbanized area or an urban cluster. The Census Bureau defines urbanized areas and urban clusters as densely populated areas that consist of core block groups or blocks with a population density of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile (US Census, 2003).

APPENDIX C. FIRE DEPARTMENT SURVEY: SAMPLE SIZES, ELIGIBILITY RATES, AND RESPONSE RATES

Characteristic	Sample Size	Eligibility Rate	Response Rate
Total	**3,000**	**98.5**	**54.9**
High-priority strata			
Total	425	98.4	62.7
Strata			
Previous FFFIPP investigation involving a traumatic injury fatality	117	100.0	70.9
Previous FFFIPP investigation involving a cardiovascular CVD fatality	91	95.6	66.7
Traumatic injury fire fighter fatality without investigation	120	98.3	54.2
Cardiovascular disease fire fighter fatality without investigation	95	98.9	60.6
10 largest fire departments[a]	2	100.0	0.0
Remainder strata			
Total	2,575	98.5	53.6
Census region			
Northeast	542	99.6	49.3
South	879	98.2	50.2
Midwest	780	98.3	59.1
West	374	97.9	56.8
Rural/urban			
Rural	1,555	98.8	53.6
Urban	613	98.9	68.0
Unknown	407	96.8	31.7
Size (defined by population protected)			
Large (at least 50,000 persons)	279	98.2	77.0
Medium (5,000-49,999 persons)	752	98.9	63.3
Small (0-4,999 persons)	1,544	98.3	44.7
Department type			
All career	359	98.9	76.3
All volunteer	816	97.5	50.8

[a] Eight of the 10 largest fire departments are counted in the other high priority strata.

Note: Eligibility and response rates displayed in this table are unweighted percentages.

APPENDIX D. FIRE DEPARTMENT QUESTIONNAIRE

OMB No: 0920-0697
Exp. Date: 10/31/2007

Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) Evaluation

Fire Department Survey

Conducted by: RTI International

Sponsored by: National Institute for Occupational Safety and Health (NIOSH) and the Centers for Disease Control and Prevention (CDC)

Dear Fire Chief,

The Fire Department Survey is being conducted for the National Institute for Occupational Safety and Health (NIOSH). In 1998, Congress funded NIOSH to create the Fire Fighter Fatality Investigation and Prevention Program (FFFIPP). Through the FFFIPP, NIOSH studies the events that lead to firefighter deaths and makes recommendations to help prevent firefighter deaths and serious injuries.

This survey is part of an evaluation that NIOSH is conducting to learn about the usefulness of the Fire Fighter Fatality Investigation and Prevention Program. The FFFIPP Evaluation will supply information to improve the value of the program. In addition to this survey, the evaluation also includes focus groups with firefighters. These focus groups are organized separately from this survey and will involve individual firefighters from across the country.

Your fire department has been selected as one of approximately 3,000 fire departments from across the country to take part in the survey. The Fire Department Survey should be answered by either the fire chief, the chief safety officer and/or a training officer for your fire department. Questions in the survey ask about department policies and procedures that may potentially have an impact on firefighter safety. The survey should take about 25 minutes to finish. After completing the survey, please send it back to us in the enclosed envelope. There is no cost to your fire department for the postage.

RTI International, a non-profit research organization, is conducting the FFFIPP Evaluation for NIOSH. The answers we get from your fire department will be used to further develop and improve the Fire Fighter Fatality Investigation and Prevention Program. Being a part of this study is voluntary, but your answers are important to us. Please be assured that the answers you provide will be kept private. The results from this survey will be reported in aggregate form so that specific answers cannot be connected to you or your fire department.

If you have any questions about this survey or about the FFFIPP Evaluation in general, please feel free to call me toll-free at 1-800-334-8571, x7722. If you have a question about your rights as a study participant, you can call RTI's Office of Research Protection toll-free at 1-866-214-2043.

Thank you very much for helping with this important study.

Sincerely,

Kristina Peterson

Kristina Peterson, Ph.D.
Project Director, FFFIPP Evaluation

Instructions

• Use a No. 2 pencil or black pen only • Make heavy dark marks inside the boxes • Erase cleanly any answer you wish to change • If asked to "specify" or "explain" on the survey, please write your response in the space provided. • If asked to "MARK ALL THAT APPLY," please mark all of the appropriate answers to these questions • If any question does not apply to you or you are not sure what it means, just leave it blank • Make no other marks or comments on the survey pages, since they interfere with the automatic reading	**This kind of mark will work: (Correct Mark)** ☒ **These kinds of marks will NOT work: (Incorrect Marks)** ☐ ☐ ☑ ■

SECTION 1. TRAINING AND SAFETY

The following questions ask about your department's policies and procedures for training and safety. It is important to get accurate data on what fire departments are currently doing so that NIOSH can improve the FFFIPP program. Please answer the survey questions as honestly and to the best of your ability as possible. Your answers will be kept private, and will in no way be connected to you or your fire department.

1. Does your department have a Safety Officer?

☐ No [→ SKIP TO QUESTION 2]

☐ Yes

1a. What kind of a position does your Safety Officer have within your department?

☐ Full-time paid position

☐ Part-time paid position

☐ Volunteer position

☐ Other (Please specify:_____)

1b. Has your Safety Officer been certified by the Fire Department Safety Officers Association (FDSOA) or some other organization?

☐ No, not certified

☐ Yes, certified by FDSOA

☐ Yes, certified by some other organization (Please specify: _____)

2. Does your department have a Training Officer?

☐ No

☐ Yes

3. Some fire departments use Standard Operating Procedures (SOP) or Standard Operating Guidelines (SOG) to describe how certain situations should be approached. For which of the following does your department have SOPs/SOGs in place? MARK ALL THAT APPLY.

- ☐ Incident Command Systems
- ☐ Maintenance of SCBAs
- ☐ Motor vehicle safety
- ☐ Participation in a personal physical fitness program
- ☐ Participation in regular health screenings for cardiovascular disease (CVD)
- ☐ Rapid Intervention Teams (RITs), also known as Rapid Intervention Crews (RICs) or Firefighter Assistance and Search Teams (FAST)
- ☐ Use of Personal Alert Safety System (PASS) devices
- ☐ Use of personal protective equipment and protective clothing
- ☐ Use of radio communications
- ☐ Other (Please specify:_____)
- ☐ Does not apply. Our fire department does not use SOPs/SOGs.

4. Do your firefighters receive training on any of the topics listed below? If so, is training optional or required? Please place an "X" in the appropriate box for each topic below.

	No Training	**Optional Training**	**Required Training**
a. Fighting structure fires	☐	☐	☐
b. Driving safety	☐	☐	☐
c. Incident Command systems	☐	☐	☐
d. Maintenance of Self-Contained Breathing Apparatuses (SCBAs)	☐	☐	☐
e. Rapid Intervention Teams (RITs)	☐	☐	☐
f. Use of personal protective equipment and /or protective clothing	☐	☐	☐
g. Use of radio communication devices	☐	☐	☐

5. Who provides training to your firefighters? MARK ALL THAT APPLY.

- ☐ Our department's Training Officer
- ☐ Other officers within our department
- ☐ State fire training agency
- ☐ United States Fire Administration's (USFA) National Fire Academy in Emmitsburg, MD
- ☐ Conferences or regional meetings
- ☐ Other (Please specify:_____)

6. What other trainings have your firefighters attended in the last 12 months? MARK ALL THAT APPLY.
   - ☐ Roadside incidents/Motor Vehicle Accidents (MVA)
   - ☐ Scuba diving
   - ☐ Swift water rescue
   - ☐ Wildland fire fighting
   - ☐ HAZMAT
   - ☐ Other (Please specify:_____)

SECTION 2. HEALTH AND SAFETY INFORMATION

The following questions ask about your department's policies and procedures for obtaining health and safety information.

7. There are many sources of health and safety information used by fire departments. Please indicate which of the following organizations your department has used to gain health and safety information. Please mark "X" in the box to indicate which mode (e.g., email, magazine, training, etc.) your department has used to get information from each organization.

	Websites/ email messages	**Magazines/ newsletters**	**Conferences/ meetings**	**Training/ courses**	**Not Applicable, I do not use information from this organization**
National Institute for Occupational Safety and Health (NIOSH)	☐	☐	☐	☐	☐
Occupational Safety & Health Administration (OSHA)	☐	☐	☐	☐	☐
Federal Emergency Management Agency (FEMA)	☐	☐	☐	☐	☐
United States Fire Administration (USFA)	☐	☐	☐	☐	☐
International Association of Fire Chiefs (IAFC)	☐	☐	☐	☐	☐
International Association of Firefighters (IAFF)	☐	☐	☐	☐	☐
National Volunteer Fire Council (NVFC)	☐	☐	☐	☐	☐
National Fire Protection Association (NFPA)	☐	☐	☐	☐	☐
Fire Department Safety Officers Association (FDSOA)	☐	☐	☐	☐	☐
Other (Please specify: _____ _____)	☐	☐	☐	☐	☐

8. How familiar are you with the National Institute for Occupational Safety and Health (NIOSH)?

- ☐ Not at all familiar
- ☐ Not very familiar
- ☐ Somewhat familiar
- ☐ Very familiar

9. How familiar are you with NIOSH's Fire Fighter Fatality Investigation and Prevention Program (FFFIPP)?

- ☐ Not at all familiar
- ☐ Not very familiar
- ☐ Somewhat familiar
- ☐ Very familiar

10. How does your department receive information about NIOSH's firefighter safety and health recommendations? MARK ALL THAT APPLY.

- ☐ NIOSH mailings
- ☐ National conference presentations
- ☐ State-level conference presentations
- ☐ Other firefighters or departments
- ☐ At seminars or other training opportunities (not conferences)
- ☐ Trade publications (such as Firehouse and Fire Engineering)
- ☐ NIOSH website
- ☐ Links from other websites (such as NFPA and Firehouse)
- ☐ Media reports - newspaper, television, radio
- ☐ Other (Please specify:_____)
- ☐ Does not apply. We have not received information about NIOSH recommendations. [→ SKIP TO QUESTION 12]

11. In what ways has your department used NIOSH recommendations? MARK ALL THAT APPLY.

- ☐ Made changes to training program
- ☐ Developed new SOPs/SOGs
- ☐ Made changes to SOPs/SOGs
- ☐ Justified current budget/staffing
- ☐ Made new budget/staffing requests
- ☐ Justified grant applications
- ☐ Does not apply. We have not used NIOSH recommendations. [→ SKIP TO QUESTION 12]

11a. Please describe the changes you made:

_____

_____

_____

_____

11b. Can you identify topics of NIOSH recommendations that you have used for training purposes? If so, MARK ALL THAT APPLY.

- ☐ Traffic hazards
- ☐ Personal protective equipment and clothing
- ☐ SCBA
- ☐ PASS systems
- ☐ Incident Command systems
- ☐ Radio communications
- ☐ Physical fitness and cardiovascular disease (CVD)
- ☐ Building code compliance (e.g., warning against the use of wooden trusses)
- ☐ Other (Please specify:_____)
- ☐ Does not apply. We have not used NIOSH recommendations for training purposes. [→ SKIP TO QUESTION 12]

SECTION 3. FITNESS AND WELL-BEING

The following questions ask about your department's policies and procedures for encouraging firefighter fitness and general well-being.

12. Does your department have a fitness training that involves physical exercise and/or other health promotion activities (for example a cardiovascular fitness program, physical training program, wellness program, or other fitness program)?

- ☐ No
- ☐ Yes, it's required
- ☐ Yes, it's optional (Please explain:_____)

13. How often do your firefighters receive screenings for cardiovascular disease (CVD) and its risk factors?

- ☐ One time, when they first join the department
- ☐ Less frequently than once a year
- ☐ One time a year
- ☐ More than one time a year
- ☐ Does not apply. Firefighters are not required to receive CVD screenings

SECTION 4. DRIVING SAFETY

The following questions ask about your department's policies and procedures for encouraging firefighter fitness and general well-being.

14. Do all drivers of vehicles responding to emergency calls receive driver training before being allowed to operate the vehicles? MARK ALL THAT APPLY.

- ☐ No
- ☐ Yes, they receive training required by the department
- ☐ Yes, they receive training required by the state
- ☐ Yes, they receive optional training

15. How often do drivers of your fire department vehicles receive "refresher" driver training to continue being allowed to drive the vehicles?

- ☐ Two or more times a year
- ☐ Once every year
- ☐ Less frequently than once a year
- ☐ Does not apply. Firefighters are not required to receive continuing driver training.

16. Does your fire department have a requirement regarding seat belt use in emergency vehicles?

- ☐ No
- ☐ Yes

17. To what extent do you agree or disagree that your firefighters are able to fit comfortably in their seatbelts while wearing turnout gear in your emergency vehicles?

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree nor disagree
- ☐ Agree
- ☐ Strongly agree

18. About how often do you think your firefighters use their seatbelts when riding in the emergency vehicles?

- ☐ Never
- ☐ Some of the time
- ☐ About half the time
- ☐ Most of the time
- ☐ Always

SECTION 5. STRUCTURE FIRES

The following questions ask about your department's experience with as well as policies and procedures for dealing with structure fires.

19. Approximately how many emergency calls did your department respond to in the past 12 months?

    Total number of emergency calls | | | | | | |

20. Of the emergency calls your department responded to in the past 12 months, about how many of these were structure fires?

    Total number of structure fires | | | | | | |

21. How often is Incident Command established when responding to structure fires?

    - ☐ Never
    - ☐ Rarely
    - ☐ About half the time
    - ☐ Most of the time
    - ☐ Always [→SKIP TO QUESTION 23]

22. What are the reasons why Incident Command is not always established by your fire department? MARK ALL THAT APPLY.

    - ☐ Fires are not usually big enough to require an Incident Commander
    - ☐ Not enough firefighters available at the scene of the fire
    - ☐ Other (Please specify:_____)
    - ☐ Does not apply. My department always assigns an Incident Commander for structure fires.

23. When Incident Command is established for a structure fire, what are the Incident Commander's responsibilities? MARK ALL THAT APPLY.

    - ☐ Conduct an initial assessment before the other firefighters begin entering the building
    - ☐ Develop and coordinate the fire attack strategy
    - ☐ Develop and initiate a risk management plan
    - ☐ Document all assessments, plans and events related to the fire
    - ☐ Ensure that at least four (4) firefighters are on the scene before entering the building
    - ☐ Establish a collapse zone around the building
    - ☐ Establish Rapid Intervention Team (RIT) or Rapid Intervention Crew (RIC)
    - ☐ Identify and implement a communication strategy
    - ☐ Monitor location of all firefighters at the scene
    - ☐ Other (Please specify:_____)

24. About how often does an Incident Commander assign an Incident Safety Officer when responding to structure fires?

- ☐ Never
- ☐ Some of the time
- ☐ About half the time
- ☐ Most of the time
- ☐ Always [→ SKIP TO QUESTION 26]

25. What are the reasons why an Incident Commander does not always assign an Incident Safety Officer? MARK ALL THAT APPLY.

- ☐ Fires are not big enough to require an Incident Commander
- ☐ Not enough firefighters are available at the scene of the fire
- ☐ Other (Please specify:_____)
- ☐ Does not apply. Our Incident Commanders always assign an Incident Safety Officer for structure fires.

26. How often are Rapid Intervention Teams (RITs) or Rapid Intervention Crews (RICs) available at structure fires?

- ☐ Never [→ SKIP TO QUESTION 28]
- ☐ Some of the time
- ☐ About half the time
- ☐ Most of the time
- ☐ Always [→ SKIP TO QUESTION 29]

27. In what situations are RITs/RICs established? MARK ALL THAT APPLY.

- ☐ When the building has more than one story/floor
- ☐ When there are enough firefighters on hand at the scene of the fire
- ☐ Whenever firefighters enter a burning building
- ☐ Other (Please specify:_____)

28. What are the reasons why your fire department does not use RITs/RICs in every structure fire? MARK ALL THAT APPLY.

- ☐ The structure fire may not be large enough to need an RIT/RIC
- ☐ We don't have enough equipment, SCBAs, or turnout gear to establish an RIT/RIC
- ☐ We don't have enough firefighters available at the scene of the fire
- ☐ We don't have enough training or trained personnel at the scene to establish an RIT/RIC
- ☐ We have never established an RIT/RIC
- ☐ We use other fire departments in the area for RITs/RICs
- ☐ We use other safety practices and so we don't need them
- ☐ Other (Please specify:_____)

29. Does your fire department have enough Personal Alert Safety System (PASS) devices for all firefighters for use when fighting structure fires?

- ☐ No
- ☐ Yes

30. About how often do you think your firefighters wear their PASS devices when fighting structure fires?

- ☐ Never
- ☐ Some of the time
- ☐ About half the time
- ☐ Most of the time
- ☐ Always [→ SKIP TO QUESTION 32]

31. Why do you think your firefighters do not use their PASS devices more often? MARK ALL THAT APPLY.

- ☐ They don't have a PASS device to use
- ☐ Situation doesn't require them
- ☐ Firefighters think the devices do not always work reliably
- ☐ Firefighters don't think they need them
- ☐ Devices go off while firefighters are resting

32. Does your department have Self Contained Breathing Apparatuses (SCBA) for your firefighters to use when combating structure fires?

- ☐ No [→SKIP TO QUESTION 37]
- ☐ Yes

33. Do your firefighters ever have to share facepieces for SCBAs?

- ☐ No [→ SKIP TO QUESTION 34]
- ☐ Yes

33a. What are the reasons why your fire department does not have personally-fitted SCBA facepieces for all of your firefighters? MARK ALL THAT APPLY.

- ☐ Didn't know it was recommended
- ☐ Firefighters don't like using the equipment
- ☐ Have never needed them (e.g., we don't do interior attacks)
- ☐ They cost too much, there is not enough money in the budget
- ☐ We don't have enough equipment for all of our firefighters
- ☐ Shared systems work fine for our needs
- ☐ Other (Please specify:_____)

34. About how often do you think your firefighters use SCBAs while fighting structure fires?

- ☐ Never
- ☐ Some of the time
- ☐ About half the time
- ☐ Most of the time
- ☐ Always [→ SKIP TO QUESTION 36]

35. Why do you think your firefighters do not use SCBAs more often when fighting structure fires? MARK ALL THAT APPLY.

- ☐ Situation doesn't require them
- ☐ Firefighters do not trust that the SCBAs will work reliably
- ☐ Firefighters don't think they need them
- ☐ Firefighters don't like sharing facepieces with others
- ☐ Firefighters are concerned that the SCBA may be or become contaminated
- ☐ Wearing SCBAs makes it more difficult to work
- ☐ Firefighters don't have SCBAs to use

36. How often is routine maintenance performed on your SCBAs?

- ☐ After every time they are used
- ☐ Once a month or more
- ☐ Several times a year
- ☐ Once a year
- ☐ Less than once a year
- ☐ Never. Maintenance has not been done on our SCBAs.
- ☐ Does not apply. My department does not have SCBAs.

37. How many Chemical/Biological/Radiological/Nuclear (**CBRN**) SCBAs--with the label shown below--are available (or on order) for use by firefighters within your department at this time?

Number available now: ☐☐☐ [→ SKIP TO QUESTION 38]

Number on order: ☐☐☐ [→ SKIP TO QUESTION 38]

- ☐ Does not apply. My department does not have CBRN SCBAs.

37a. What are the reasons why your fire department does not have CBRN SCBAs? MARK ALL THAT APPLY.

- ☐ CBRN SCBA devices are not needed in our department
- ☐ We didn't know they were available
- ☐ We don't have adequate technical information to purchase them
- ☐ We don't have adequate funding to purchase them
- ☐ Other (Please specify:_____)

38. Does your fire department have Automated External Defibrillators (AEDs)?

- ☐ No [→ SKIP TO QUESTION 39]
- ☐ Yes

38a. At your fire department, where do you have AEDs?

- ☐ At the fire station(s)
- ☐ On the emergency vehicles (or apparatus)
- ☐ Both at the fire station(s) and on the vehicles (or apparatus)

39. How often has routine maintenance, including replacement of battery packs, been performed on your AEDs?

- ☐ After every time they are used
- ☐ Once a month or more
- ☐ Several times a year
- ☐ Once a year
- ☐ Less frequently than once a year
- ☐ Never. Maintenance on our AEDs has not been done.

40. About how often do your firefighters carry radios or other two-way communication devices while responding to structure fires?

- ☐ Never
- ☐ Some of the time
- ☐ About half the time
- ☐ Most of the time
- ☐ Always

41. Some radios and other two-way communication devices can have problems under field conditions, such as bleed-over, interference, or loss of communication. About how often do your communication devices have these or other problems?

- ☐ Never
- ☐ Some of the time
- ☐ About half the time
- ☐ Most of the time
- ☐ Always

42. How would you rate your department's budget in the following areas?

	Not adequate	Adequate	More than adequate
a. Equipment	☐	☐	☐
b. Training	☐	☐	☐
c. Personnel	☐	☐	☐

SECTION 6. EDUCATIONAL MATERIAL

The following questions ask about your policies and procedures for providing educational material to firefighters and others within your department. In addition, there are a number of questions asking about familiarity and satisfaction with the educational materials provided by NIOSH and the FFFIPP.

43. How often have you seen NIOSH reports that describe recent firefighter fatalities and make recommendations for avoiding similar incidents? Please refer to the insert sheet included with this survey for examples of NIOSH firefighter safety reports.

- ☐ Never [→SKIP TO QUESTION 53]
- ☐ One or two times per year
- ☐ Several times per year
- ☐ Once a month or more

44. How does your department receive the NIOSH Fire Fighter Fatality Investigation reports? MARK ALL THAT APPLY.

- ☐ By mail
- ☐ On the Internet
- ☐ From colleagues in other departments
- ☐ At conferences or other meetings

45. Have you read part or all of a NIOSH Fire Fighter Fatality Investigation report in the last 12 months?

- ☐ No
- ☐ Yes

46. Which parts of the NIOSH reports do you usually read? MARK ALL THAT APPLY.

- ☐ Summary
- ☐ Investigation Results
- ☐ Discussion
- ☐ Recommendation

47. Overall, how would you rate the amount of detail in the NIOSH reports?

- ☐ Too little detail
- ☐ About the right amount of detail
- ☐ Too much detail

48. Which parts of the NIOSH reports do you think should be changed in length?

	Eliminate entirely	**Make shorter**	**Don't change the length**	**Make longer**
a. Summary	☐	☐	☐	☐
b. Investigation results	☐	☐	☐	☐
c. Discussion	☐	☐	☐	☐
d. Recommendation	☐	☐	☐	☐

49. Do you have any other suggestions for how the NIOSH reports could be improved?

_____

_____

_____

50. Does the fire department disseminate the information it receives from NIOSH to the firefighters?

- ☐ No [→ SKIP TO QUESTION 51]
- ☐ Yes

50a. How is this information disseminated to firefighters? MARK ALL THAT APPLY.

- ☐ Regular staff meetings
- ☐ Training sessions
- ☐ Provide copies of NIOSH reports to firefighters
- ☐ Provide copies of NIOSH report summaries to firefighters
- ☐ Provide summaries prepared by department to firefighters
- ☐ Postings on bulletin boards
- ☐ Post report on the department website
- ☐ Send message to firefighters by email
- ☐ Other (Please specify:_____)

51. The NIOSH reports sometimes reference other documents, such as guidelines or more detailed technical reports. Does your fire department usually have access to documents that are referenced in NIOSH reports?

- ☐ No
- ☐ Yes

52. NIOSH reports always include recommendations that are designed to help improve the health and safety of firefighters. How much do you agree or disagree with the following statements about the NIOSH recommendations:

	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
a. Recommendations are practical	☐	☐	☐	☐	☐
b. Recommendations are easy to understand	☐	☐	☐	☐	☐
c. Recommendations are specific and concrete	☐	☐	☐	☐	☐

53. What other NIOSH materials have you seen? MARK ALL THAT APPLY.

- ☐ Pocket guide to chemical hazards
- ☐ Respirator maintenance program guide
- ☐ CDs of firefighter program materials
- ☐ Alerts
- ☐ Hazard IDs
- ☐ Workplace Solutions
- ☐ Other (Please specify:_____)
- ☐ None. I have not seen any NIOSH materials. [→ SKIP TO QUESTION 54]

53a. How satisfied or dissatisfied are you with these NIOSH materials?

- ☐ Very dissatisfied
- ☐ Dissatisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Satisfied
- ☐ Very satisfied

54. Have you ever visited the NIOSH website at www.cdc.gov/niosh/firehome.html?

- ☐ No
- ☐ Yes, in the last year
- ☐ Yes, longer than one year ago

55. In which of these ways would you most prefer to receive information about NIOSH recommendations? MARK YOUR THREE (3) FAVORITES.

- ☐ Cable television programming
- ☐ CD/DVD
- ☐ Conference presentations or meetings
- ☐ Email
- ☐ Fire Fighter Fatality Investigation Reports
- ☐ NIOSH Website
- ☐ One-page Fact Sheets
- ☐ Pocket Guides
- ☐ Posters
- ☐ Summary Reports
- ☐ Training session/class
- ☐ Other (Please specify:_____)

56. What could NIOSH do to improve the way the recommendations are communicated to fire departments?

_____

_____

_____

_____

SECTION 7. YOUR DEPARTMENT INFORMATION

The following questions ask about your department. These questions will help us understand your survey responses as they relate to the size of your department.

57. How many career and volunteer firefighters currently work at your fire department? (Please count only those who are involved in fire suppression)

Full-time (*career*) uniformed firefighters ☐☐☐

Part-time (*career*) uniformed firefighters ☐☐☐

Part-time (*on-call or volunteer*) firefighters ☐☐☐

58. How many fire stations do you currently have in your fire department?

Number of fire stations: ☐☐☐

59. What type of jurisdiction does your fire department serve?

- ☐ Rural (population density is **less** than 825 persons per square mile)
- ☐ Urban (population density is **more** than 825 persons per square mile)

60. What is the size of the population your fire department serves?

- ☐ Small (protecting a population of less than 5,000)
- ☐ Medium (protecting a population of 5,000 to 49,999)
- ☐ Large (protecting a population of 50,000 or more)

61. During the past 5 years, has your department experienced a firefighter fatality?

- ☐ No
- ☐ Yes, due to a cardiovascular event (e.g., heart attack, heart disease, stroke, etc.)
- ☐ Yes, due to a vehicle accident while responding to or returning from a call
- ☐ Yes, due to a traumatic injury or accident on the fire ground
- ☐ Yes, due to some other reason (please specify: _____)

62. Who completed this survey?

- ☐ Fire Chief
- ☐ Safety officer
- ☐ Training officer
- ☐ Other (Please specify:_____)

Thank you for taking the time to answer this survey.

Please return this survey to RTI in the provided envelope.

APPENDIX E. STATISTICAL METHODOLOGY

Post-Data Collection Methodology

Building the Analysis File

All questionnaire data from responding fire departments were pooled into one analysis file. This file included the sample weights, sample design information, and any variables needed for proper estimation of variance. A codebook of this analysis file was created that displayed weighted and unweighted frequencies and percentages for all variables. The codebook provides information on item nonresponse and sample sizes.

Methodology Used to Create the Sample Weights and Estimates

One final, nonresponse-adjusted sample weight was created for each responding fire department. This weight consists of a product of two factors: the base weight and the nonresponse adjustment. These are defined as follows:

1. The **base weight** is the inverse, unconditional probability of selecting the fire department into the sample. This weight accounts for the clustering and stratification used in the sample design. Note that if all selected fire departments respond to the survey, then the sum of the base weight will equal the total number of fire departments on the sample frame, and no nonresponse adjustment would be necessary.
2. The **nonresponse adjustment** is an adjustment imposed on the sampling weight of fire department respondents to account for those departments that did not respond to the survey. In general, this adjustment was greater than "1" so that each respondent fire department will account for itself as well as some portion of the nonrespondents in the final estimate.

There are numerous ways of constructing a nonresponse adjustment. We used a response propensity model-based approach described recently in Folsom and Singh (2000). The Folsom and Singh modeling approach is based on a simple generalization of constrained models first suggested by Deville and Sarndal (1992). These models allow the user to impose predetermined constraints on the resulting model-based nonresponse adjustment to minimize the effect that the weight adjustment has on variance. The variance reduction property of the adjustments is another distinct advantage of this approach.

The modeling approach has been used in recent years to generate nonresponse adjustments because (1) it has been proven to be a cost-efficient approach for creating

nonresponse adjustments and (2) potential bias reduction can be achieved over the commonly used weighting class approach. This increases bias reduction because the adjustment uses more statistically significant main effects and lower-order interactions than a weighting class approach. Also, if the resulting response propensity model contains all main effect and interaction terms for a set of categorical variables, the modeling approach to deriving the weighting adjustments is numerically equivalent to the weighting class approach. Consequently, the modeling approach is a generalization of the weighting class approach.

For the FFFIPP survey response propensity model, we considered those variables that we suspect will be significant predicators of response propensity. The statistical significance of these variables was tested during the model-building process. The statistical significance of lower-order interactions of these variables was also considered.

To illustrate, we will let

i = indice for fire department,

ρ_i = unconditional probability of selecting the fire department into the Fire Department sample, and

α_i = nonresponse adjustment.

The base weight for fire department *i* will equal ρ_i^{-1}, and the final weight will equal

$$w_i = \rho_i^{-1} \times \alpha_i . \qquad \text{(E.1)}$$

The survey weights for the Fire Department Survey are summarized in Exhibit E-1.

After the data were collected, we produced estimates of population percentages. In summary, these were computed as follows. We will let

δ_i = a 0/1 indicator identifying those fire departments that belong to some subgroup of interest;

x_i = response to a particular questionnaire item. Because most of the items on the Fire Department Survey are categorical, this will equal "1" if fire department *i* gives a particular response on a question and "0" otherwise.

Table E.1. Fire Department Survey: Summary of Sample Weights

Characteristic	Respondent Sample	Minimum Weight	Maximum Weight	Unequal Weighting Effect
Total	**1,622**	**1**	**61**	**1.458**
High-priority strata				
Total	262	1	6	1.255
Strata				
Previous FFFIPP investigation involving a traumatic injury fatality	83	1	2	1.057
Previous FFFIPP investigation involving a cardiovascular infarction fatality	58	1	2	1.023
Traumatic injury fire fighter fatality without investigation	64	1	4	1.152
Cardiovascular disease fire fighter fatality without investigation	57	2	6	1.074
10 largest fire departments[a]	0	—	—	—
Remainder strata				
Total	1,360	1	61	1.264
Census region				
Northeast	266	1	61	1.151
South	433	2	41	1.297
Midwest	453	1	41	1.203
West	208	1	55	1.456
Rural/urban				
Rural	823	1	32	1.072
Urban	412	1	36	1.648
Unknown	125	2	61	1.048
Size (defined by population protected)				
Large (at least 50,000 persons)	211	1	9	1.183
Medium (5,000-49,999 persons)	471	3	61	1.123
Small (0-4,999 persons)	678	1	55	1.060
Department type				
All career	271	1	21	1.389
All volunteer	404	2	61	1.247
Combination	685	1	39	1.025

[a] Eight of the 10 largest fire departments are counted in the other high-priority strata.

The estimates of means (e.g., percentages) were computed as

$$\frac{\sum_{i \in \text{Respondents}} w_i \delta_i x_i}{\sum_{i \in \text{Respondents}} w_i \delta_i}. \quad \text{(E.2)}$$

Eligibility and Response Rates

Ineligibility was determined using questions on the survey that specifically addressed the eligibility issues. The eligibility rate of those cases of unknown eligibility was assumed to be the same as those for which the eligibility was known. The cases of unknown eligibility were defined as fire departments from which we did not receive a response and that we were unable to contact to inquire about their eligibility. Known eligibility status was defined by the responses that we received from the survey and/or the information we received through ad hoc inquiries with the fire department about their eligibility. The eligibility rates were defined using the following formula:

$$EligibilityRate = \frac{KE + e(UK)}{KE + KI + UK}, \quad \text{(E.3)}$$

where

KE = known eligible.

KI = known ineligible.

UK = unknown eligibility, and

$e = \frac{KE}{KE + KI}$.

The response rates for the survey were calculated based on the recommendations of the American Association for Public Opinion Research (AAPOR) published in its *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*. As with the eligibility rate, this formula assumes that a proportion of the cases with unknown eligibility are eligible. The response rate was only calculated for those that were deemed either as known eligible or unknown eligibility. This being a mail survey, we did not have any "noncontacts." The formula for the response rate was defined as follows:

$$RR4 = \frac{(I + P)}{(I + P) + (R + NC + O) + e(UK)}, \quad \text{(E.4)}$$

where

I = complete interview,

P = partial interview,

R = refusal,

NC = noncontact,

O = other nonresponse,

UK = unknown eligibility, and

$$e = \frac{KE}{KE + KI}.$$

Editing of Questionnaire Data

All of the questionnaire data from responding fire departments have been edited to ensure every variable has a value for every record on the analysis file. This editing ensures a basic level of consistency between responses on each record when appropriate—for example, the data were edited to reflect the skip patterns present in the questionnaire. Variables resulting from questions that were skipped or intentionally missed were coded with a negative numeric value indicating the reason for item nonresponse. The following special codes were used:

Code	Definition
−5	Bad Data
−6	Multiple Response
−8	Blank (no answer)
−9	Legitimate Skip

Estimation and Variance Estimation

All estimates produced in the final analysis tables were generated with the final, nonresponse-adjusted sample weight. Variances were computed using RTI's SUDAAN software to properly account for the complex design features of the study, such as stratification and unequal weighting.

Unless otherwise noted, all estimates displayed in analysis tables were computed assuming that any item missing data was missing at random. Thus, percentages were computed only among the records that responded to the corresponding row item in the tables.

Computing Confidence Intervals

Asymmetric confidence intervals are displayed for all percentage estimates. These tend to have better coverage properties for percentage estimates, particularly for small percentages. These were computed as follows:

Suppose $f(p) = \log(p) - \log(1 - p)$, where p is the percentage estimate.

Then the standard error estimate of $f(p)$ is $s[f(p)] \approx \frac{s(p)}{p(1-p)}$.

Suppose

$$L_f = f(p) - t_{\alpha/2} s[f(p)]$$
$$U_f = f(p) + t_{\alpha/2} s[f(p)].$$

Then the confidence interval for p will be

$$\left(\frac{\exp(L_f)}{1 + \exp(L_f)}, \frac{\exp(U_f)}{1 + \exp(U_f)} \right) \quad . \qquad \text{(E.5)}$$

Suppression Rule

The suppression rule that was used for all tables is the following:

> If any estimate was less than 0.1 then a ** appears in the table and we included a footnote indicating "**Estimate rounds to zero."

Any estimate with a relative standard error $\left(i.e., \frac{s(\theta)}{\theta} \right)$ that is greater than 0.50 or that has a sample size of 30 or less was considered imprecise. In the tables, we displayed a superscripted "+" and a footnote indicating "+Low precision" was displayed. Suppressed estimates were still displayed.

Testing the Significance of Differences

To test the significance of differences in the tables, we used the standard *t*-test as follows:

Let $T = \frac{\theta_1 - \theta_2}{s(\theta_1 - \theta_2)}$, where $s(\theta_1 - \theta_2)$ is the design-based standard error of the difference $\theta_1 - \theta_2$. Then the significance probability associated with a two-sided test is equal to

$$\varphi = 2 \times \left[1 - P_{t,df}\left(t < |T|\right)\right] . \quad \text{(E.6)}$$

If $0.00 \leq \varphi \leq 0.05,$ then the difference is deemed significant at the 95 percent confidence level.

APPENDIX F. CHARACTERISTICS OF FOCUS GROUP PARTICIPANTS

Number of Participants	34
Career volunteer	
Career firefighters	16
Volunteer firefighters	18
Gender	
Male	29
Female	5
Urban/Rural	
Urban	5
Suburban	14
Rural	15
Region	
Northeast	6
South	22
Midwest	6
West	0
Unionized	
Yes	15
No	19