

U.S. Fire Administration

NFIRS

Representativeness Study

October 2011



FEMA

Table of Contents

ABOUT THE NATIONAL FIRE INCIDENT REPORTING SYSTEM.....	1
BACKGROUND AND PURPOSE OF AN NFIRS REPRESENTATIVENESS STUDY	3
PAST NFIRS REPRESENTATIVENESS STUDIES.....	4
SCOPE AND METHODOLOGY	5
RESULTS	5
CONCLUSION.....	6
RECOMMENDATIONS.....	7

About the National Fire Incident Reporting System

The National Fire Incident Reporting System (NFIRS) is a voluntary, all incident based data collection system. Section 9b of the Fire Prevention and Control Act, Public Law (PL 93-498) specifies that the U.S. Fire Administration (USFA) develop standardized data reporting methods and encourage and assist State, local, and other agencies, public and private, in developing and reporting information. NFIRS was developed specifically to address these two requirements.

All fire departments in the United States and the U.S. Territories are eligible to participate in reporting to NFIRS on a voluntary basis. Participating fire departments collect a common core of information on an incident and any casualties that ensue by using a common set of definitions. In a few States, the data may be collected using paper forms, however, most of the data are submitted electronically. Local agencies forward the completed NFIRS modules to the State agency responsible for NFIRS data. The State agency combines the information with data from other fire departments into a statewide database and then transmits the data to the National Fire Data Center (NFDC) at USFA. Data on individual incidents and casualties are preserved incident by incident at local, State, and national levels. Once limited to fire incidents only, NFIRS now encompasses all incidents to which the fire department responds—fire, emergency medical services (EMS), hazardous materials (Hazmat), and the like.¹

For 2009, more than 1.1 million fire incidents were reported to NFIRS by approximately 69 percent of all fire departments in the United States. Based on data from the National Fire Protection Association (NFPA), there was an annual average estimate of 30,175 fire departments in the United States for the years 2007 to 2009. For this same three year period, 23,747 departments reported fires to NFIRS in at least one of these three years. This is about 79 percent of the departments estimated to be in the United States. NFIRS has seen approximately an 85 percent increase in the number of departments reporting fires between 1999 and 2009 (the last year for which NFIRS data were available at the time this study was undertaken). In 1999, there were 11,067 departments reporting fires to NFIRS and in 2009, there were 20,421 departments reporting fires. Some of this increase can be explained by the number of fire departments receiving Assistance to Firefighters Grants. If a fire department is a recipient of one of these grants, then NFIRS participation is required.²

¹ U.S. Fire Administration's, *Fire in the United States 2003-2007, 15th Edition*, October 2009.

² From the Assistance to Firefighters Grant Program guidance, if the applicant is a fire department, the department must agree to provide information, through established reporting channels, to NFIRS for the period covered by the assistance. If a fire department does not currently participate in the incident reporting system and does not have the capacity to report at the time of the award, the department must agree to provide information to the system for a 12-month period that begins as soon as the department develops the capacity to report. See http://www.fema.gov/firegrants/docs/2010_AFGguidance.pdf.

NFIRS data are used extensively at all levels of government for major fire protection-related decisions. At the local level, incident and casualty information are used for setting priorities and targeting resources. The data collected are particularly useful for designing fire prevention and educational programs and EMS-related activities specifically suited to the real emergency problems the local community faces.

At the State level, NFIRS is used in many capacities. Many States mandate NFIRS reporting departments for their own purposes. One valuable contribution is that some State legislatures use these data to justify budgets and to pass important bills on fire-related issues such as sprinklers, fireworks, and arson.

Many Federal agencies, in addition to USFA, make use of NFIRS data. NFIRS data are used, for example, by the Consumer Product Safety Commission (CPSC) to identify problem products and to monitor corrective actions. The Department of Transportation (DOT) uses NFIRS data to identify fire problems in automobiles, which has resulted in mandated recalls. The Department of Housing and Urban Development (HUD) uses NFIRS to evaluate safety of manufactured housing (mobile homes). The USFA uses the data to design prevention programs, to order firefighter safety priorities, to assist in the development of training courses at the National Fire Academy (NFA), and for a host of other purposes.³

It is important to note that NFIRS data are used by USFA and other Federal agencies to derive national fire data estimates. USFA does not use NFIRS data to produce State or county level fire estimates.

³ U.S. Fire Administration's, *Fire in the United States 2003-2007, 15th Edition*, October 2009.

Background and Purpose of an NFIRS Representativeness Study

In the past, the Office of Management and Budget (OMB) has questioned why the NFIRS data collection should be a census of incidents for all departments rather than a statistical sample. USFA has investigated the possibility of sampling and the issues surrounding it. While there are certain advantages to a statistical sampling methodology, USFA has not undertaken a sampling approach to fire data collection for several reasons. As previously mentioned, USFA is directed by Public Law to develop a standardized incident data reporting method and assist local and State agencies in reporting incident data to this system. Because NFIRS is used at the local, State, and Federal levels, abandoning it for a statistical sampling method would adversely impact State and local fire department data collection and the NFIRS standard, which is also used internationally. Additionally, much of the cost burden of the current NFIRS data collection is carried by the State NFIRS operations. USFA has relied heavily on States as cooperative partners in bearing the costs and resources of maintaining the system, and the States have relied on USFA to shoulder the development costs. Switching to a sampling method would mean USFA would need to acquire additional funding and personnel to design and maintain a new sampling system, leaving the State and local entities to wholly cover the cost of a data collection system.

OMB directed USFA to complete a study regarding the bias in NFIRS due to nonresponse. As a result, USFA completed this study to identify the percentage of fire departments that responded to the NFPA survey and also reported fire incidents to NFIRS to aid in examining the representativeness of NFIRS.

In addition, based on OMB's instructions for previous terms of clearance for the NFIRS form renewal, this study identifies how USFA might continue efforts to encourage even more participation in the all incident based data collection system.

Past NFIRS Representativeness Studies

Prior to this current representativeness study and at the direction of OMB, USFA has conducted several analyses to examine the extent of bias in NFIRS due to nonresponse. Brief summaries of the past studies are described as follows.

In a joint study effort in 2005, USFA and NFPA examined the biases in NFIRS participation, specifically whether the fire experience of NFIRS-reporting departments differed systematically from the fire experience of other non-reporting departments within the same population. Results based on data from 1997 and 2002 indicated that there were differences in total fire loss estimates derived from NFIRS reporting departments and non-NFIRS reporting departments; however, the degree of difference was not great enough to merit adjusting current scaling methodologies.⁴

In the fall of 2008, USFA undertook a study of the NFIRS data set to examine the potential bias in NFIRS due to fire department nonresponse. As a result, USFA completed an analysis to identify fire departments that did not participate in NFIRS, characteristics of these departments, and whether their nonresponse impacted the representativeness of NFIRS. Undertaken on a regional and county basis, the review provided insight into what, if any, adjustments could be made to minimize the impact of possible reporting bias on the fire loss estimates. States of particular concern for nonreporting were located in the Northeast and West regions of the country where the average rates of reporting were about 72 percent for each of these regions. By contrast, the Midwest region had an estimated 87 percent reporting rate.⁵ Based on the findings of the study, USFA concluded that NFIRS reporting departments were representative of the universe of all fire departments in the United States.

⁴ U.S. Fire Administration's, *Fire in the United States 2003-2007, 15th Edition*, October 2009.

⁵ U.S. Fire Administration's, *Fire in the United States 2003-2007, 15th Edition*, October 2009.

Scope and Methodology

To complete this NFIRS Representativeness Study, USFA matched the NFIRS database to NFPA proprietary data to determine the percentage of departments responding to the NFPA survey that also reported fires to NFIRS. Upon a special data request, NFPA provided USFA with a file of fire departments that responded to the 2009 NFPA Survey of Fire Departments for United States Fire Experience. This survey is based on a stratified random sample of fire departments where the strata are based on the size of community protected. A total of 2,732 departments responded to the survey. Estimates derived from the survey are based on ratio estimation methods. Additional information regarding the NFPA survey methodology is described in NFPA's report, *Fire Loss in the United States During 2009*: <http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf>.

The file of 2,732 fire departments provided by NFPA included the fire department name and address. To match the NFIRS database to the NFPA data, the State and Fire Department ID (FDID) fields are required to be able to identify unique fire departments within each State. Because NFPA does not collect the FDID number as part of their annual survey, USFA conducted a clerical process to add the FDID field to the NFPA file of fire departments.

Because NFIRS is a voluntary system, departments that report fires in one particular year may not report fires in the next year. As a result, USFA used the 2007-2009 NFIRS databases in this analysis to account for fluctuations in the year to year reporting of fire departments. In fire data analyses at the national level in general, USFA uses at least three years of data to account for variations in fire department participation each year.

The State and FDID fields were used to determine the unique number of fire departments that reported fires during this time period and to match against the NFPA file of departments. As noted earlier, from 2007 to 2009, a total of 23,747 departments reported fires to NFIRS.

Results

The NFPA file was initially matched to the 2009 NFIRS file of reported fires by State and FDID fields to determine the percentage of departments responding to the NFPA survey that also reported fires to NFIRS. This automated match resulted in 2,155 NFPA survey respondents that also reported fires to NFIRS. That is, 78 percent of the NFPA respondents also reported fires to NFIRS in 2009. The 577 departments that did not match were examined further to see if they, in fact, had reported to NFIRS. A manual comparison of these departments was completed and an additional 80 departments were identified as reporting to NFIRS. Then an automated match of the remaining 497 nonmatching NFPA departments was undertaken to determine if these departments reported fires in NFIRS in 2007 or 2008. An additional 98 departments and 52 departments were found to be reporting fires to NFIRS in 2008 and 2007, respectively. Thus, of the 2,732 NFPA survey respondents, a total of 2,385 departments (87 percent) reported fires to NFIRS from 2007 to 2009.

Conclusion

Based on the following, the USFA concludes that the distribution of participants is reasonably representative of the entire Nation, even though the sample is not random. There is no known major bias that will affect the results.

- 87 percent of the 2009 NFPA survey respondents were also determined to be reporting fire incidents to NFIRS from 2007 to 2009;
- NFIRS collects about one million fire incidents, or about two-thirds of all fire incidents each year;
- Data collected are reasonably well distributed geographically and by size of community; and,
- In 2009 alone, more than 18,000 additional departments (i.e., in addition to those responding to the NFPA survey) reported fires to NFIRS.

Most of the NFIRS data exhibit stability from one year to another, without radical changes. Results based on the full data set are generally similar to those based on part of the data, another indication of data reliability. Although improvements could be made—the individual incident reports could and should be filled out more completely and more accurately than they are today (as can be said about most real-world data collections as large as NFIRS), and all participating departments should have the same reporting requirements—the overall portrayal is a reasonably accurate description of the fire situation in the United States.⁶

It is important to reiterate that USFA along with other Federal agencies do not use NFIRS data to derive State level fire estimates. NFIRS data are used to show the fire problem at the national level. Because the findings in USFA's *NFIRS Representativeness Study* show a very high percentage of the NFPA respondents are also reporting fires to NFIRS, fire departments across the country, appear to be well represented in NFIRS. Therefore, USFA concludes that NFIRS reporting departments are representative of the universe of all fire departments in the United States. Additionally, there is no bias in NFIRS due to department nonresponse at the national level that would have meaningful impact on national level estimates.

⁶ U.S. Fire Administration's, *Fire in the United States 2003-2007, 15th Edition*, October 2009.

Recommendations

Based on this NFIRS Representativeness Study, it is recommended that USFA continue to work with NFIRS State Program Managers to encourage fire department participation in NFIRS. USFA proposes that NFIRS State Program Managers collaborate with nonreporting fire departments to encourage participation by emphasizing the importance of fire data analysis and how fire departments can use their data to show the need for funding and additional resources. Additionally, the U.S. Congress authorized and funded (beginning FY2009) USFA to develop Enhancements to NFIRS. These include a simplified NFIRS web-based reporting interface and a data warehouse for generating output reports for use in analyses. These improvements make reporting and accessing the NFIRS data much easier for fire departments.

USFA completed and deployed the new web-based data entry tool in the summer of 2010. The Data Entry Browser Interface (DEBI) is a one purpose tool for use by the fire service to document incident information within NFIRS. While the functionality is the same as the NFIRS client Data Entry Tool (DET) that has been available for use for many years, DEBI allows entry of incidents using a standard web browser, eliminating the need to download, install, and configure client software.

The development of a flexible NFIRS data warehouse with comprehensive data mining capabilities was completed in July of 2011. It is scheduled for deployment to national, State and fire department NFIRS users in three phases beginning in October of 2011. The data warehouse allows NFIRS users to access and report on nationally collected data with significantly increased functionality over the current report generation tool. The data has been transformed into a custom schema that greatly increases the speed of report generation and data access. NFIRS users are also now able to generate reports using data from other departments and States, which was not previously possible.

All States will be encouraged to develop programs to increase participation. State Program Managers will also be encouraged to continue to work with departments currently reporting to enhance data quality through training programs. USFA offers several NFIRS training courses for fire departments which include the NFIRS Program Manager course, NFIRS 5.0 Self-Study, and the Introduction to NFIRS 5.0. The NFIRS Program Manager course enables participants to promote, support, and manage NFIRS data collection successfully. The NFIRS 5.0 Self-Study (online) course provides an overview of the data collection system, its modules and data conversion issues. The Introduction to NFIRS 5.0 course emphasizes how to use standardized forms to achieve uniformity in incident and activity reporting. This training program is designed specifically to support local fire service organizations, and assists them in providing data both to management and decision makers, as well as to the State uniform fire reporting system. Additionally, USFA's NFIRS Support Center offers a consolidated national help desk to provide technical support regarding all aspects of NFIRS.