A Review and Analysis of Reported Hotel and Motel Fire Fatalities

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January 24, 1995

Dear Industry Colleague:

The following materials represent an effort by the American Hotel & Motel Association to clarify current published data regarding hotel and motel fire fatalities.

Part I is a brief summary of the findings of a study commissioned by AH&MA and our position on these findings.

Part II is the study, *A Review of the Validity of Estimates of Hotel and Motel Fire Deaths*, prepared by TriData Corporation in December 1994.

Thank you for your interest in this matter. Please direct any questions or comments on the following to:

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Part I

AH&MA Comments
A Review and Analysis of
Reported Hotel and Motel Fire Fatalities

Background

In the early eighties, a few serious and well publicized hotel fires brought fire safety to the forefront of industry concerns. Following these events, the industry increased its commitment to fire safety and embarked on a decade long battle to eliminate fire related fatalities. The industry has spent more than one billion dollars on fire safety by upgrading facilities, training employees and educating guests.

Current fire loss estimates for hotels and motels published by the National Fire Protection Association (NFPA) show that the industry's commitment and investment have paid off. According to NFPA statistics, fatalities resulting from fires in hotels and motels have fallen from an estimated 165 in 1980 to an estimated 20 in 1993[1]. The dramatic success of the industry's efforts is readily apparent in Figure 1. The breadth of success is further confirmed by a dramatic 48 percent reduction in hotel fires over this same period while the total number of rooms climbed 65 percent. However, in recent years, the estimate of fatalities in hotel and motel fires has leveled off at approximately 20 to 30 civilian fire deaths per year. This has occurred despite continuing investment and attention by the industry. The industry has begun to question these estimates because known fire experience does not seem to correlate with the NFPA figures. Actual experience, in fact, has indicated that losses are well below the published estimates.

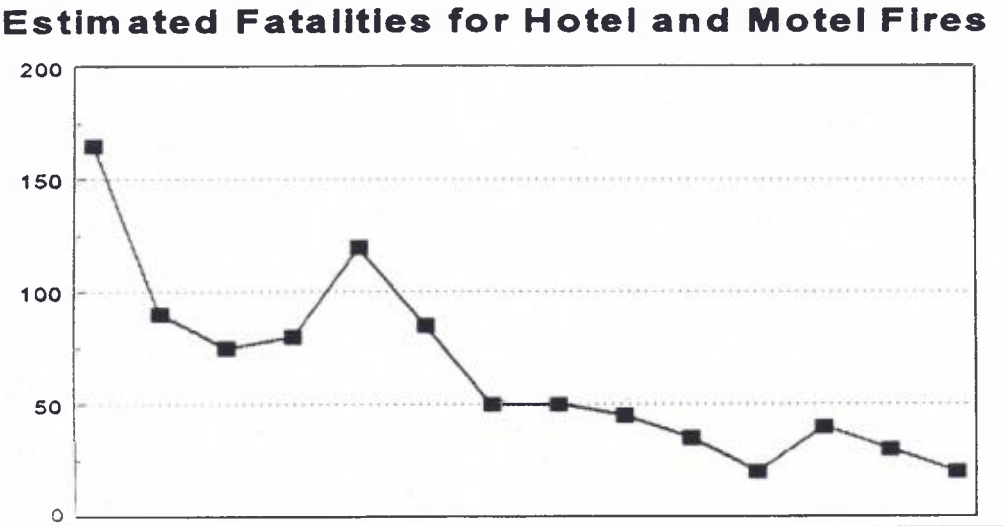

Figure 1

[1] From "*Fire Loss in the United States in* 1993," NFPA Journal, September/October 1994. Estimated value has been reduced to correct for the misclassification of a long term residence property as a hotel.

The industry was further concerned because it was unclear why losses seemed to "level off." What seemed to be a continuing lack of progress was both a concern and frustration to industry officials. Lodging industry leaders are concerned that media scrutiny of the published fire estimates continues to heavily impact the industry's reputation and perceived level of safety. Thus, stagnation at current loss levels, whether resulting from actual causes or errors in the estimates, is neither acceptable nor healthy for the industry as a whole.

After several years of "flat" estimates, the members of the American Hotel & Motel Association (AH&MA) Safety and Fire Protection Committee decided that it was necessary to take a closer look into hotel and motel fire estimates.

The Study

In June 1994, the AH&MA commissioned the TriData Corporation to conduct a survey of all available data sources to validate estimates of hotel and motel fire fatalities. It was anticipated that the study would provide one of two results:

(1) a more accurate estimate of fire related fatalities and identify the reason current estimates fail to properly represent actual experience; or,

(2) information that will help to more clearly define fire safety issues that require increased industry attention.

The study was designed to gather information from every possible source[2], identifying every hotel and motel fire incident occurring from 1988 to 1992 that resulted in a loss of life. For each identified incident, the occupancy type, number of stories in the building, the presence and extent of fire sprinkler systems was confirmed.

Results

Upon completion of the report, the results of the study clearly demonstrate that contemporary estimates of hotel and motel fatalities are significantly overstated. The study identified occupancy misclassification as the leading cause of error in the published estimates. This somewhat surprising finding brings into question the effectiveness of the current survey instruments, designed for larger samples, in measuring small sample populations.

"[A]n astounding 47 percent" error rate in reported NFIRS[3] data was identified by the study. Errors primarily resulted from misclassification of the occupancy as a hotel or motel and were

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[2]Sources include: NFIRS, NFPA fire experience survey and Fire Incident Data Organization system, National Injury Information Clearinghouse of the Consumer Product Safety Commission, U.S. Department of Labor's Occupational Health and Safety Administration and Bureau of Labor Statistics, the National Safety Council, National Center for Health Statistics of the Centers for Disease Control, the Data Times on-line index of major newspapers.

[3]National Fire Incident Reporting System (NFIRS)

primarily attributed to:

(1) Misunderstanding the definition of the occupancy categories (e.g., reporting a rooming house as a hotel).

(2) Clerical error.

(3) Miscategorization of the occupancy due to the appearance that the property is a hotel or motel (e.g., a boarding house uses the name "XYZ Hotel").

It is reasonable to presume that some of this erroneous data would also affect NFPA estimates if the NFIRS data was used by reporting fire departments to complete the NFPA survey form. Such a finding does not, in general, impugn either the current NFIRS or NFPA data gathering or estimating processes. It merely serves to demonstrate that these survey instruments, which are designed to capture large populations, may not accurately represent a very small subset of that population (i.e., hotel and motel fires).

In relation to these fire surveying instruments, it must be asked at what point does the incident population become too small to measure accurately? According to the TriData study, "[While] fatalities are still occurring in hotels and motels [they are occurring] at a rate perhaps thirty to fifty percent lower than what has been published." In fact, using all sources available, TriData estimates that from 1988 to 1992 there was an average of 12 fatalities resulting from hotel and motel fires. This is 65 percent less than the average of 34 fatalities[4] for the same period published by the NFPA and approximately 90 percent less than 1980. Presuming it was only possible to confirm half of the fires that occurred in the United States with this study, TriData estimates only 10 to 18 occurred each year. This is an exceptionally conservative number since, given the scope of the study, it is reasonably assured that at least half of the incidents were captured by the study.

The verification of true hotel and motel data by this study also shows that misclassified data, that may help identify problematic occupancies, is "lost" when the fire incident is attributed to the wrong occupancy classification. In the case of hotels and motels, the fire experience of longer-term residential occupancies that seem to house lower income tenants is missed by classifying the property as a hotel or motel. Proper classification of the data would help identify those problematic occupancies that may require the additional attention of national code development authorities and code enforcement officials.

The study also attempted to confirm the presence and extent of automatic fire sprinkler systems for each of the incidents that were identified. From 1988 to 1992 there were 57 incidents in hotels and motels in which a fatality occurred. Of these incidents three were identified as having sprinklers at the property to some extent. Two of the properties were confirmed to have only partial sprinkler installations and, in these cases, the fatality occurred in an unsprinklered area.

The study also found that 89.7 percent of the fatal fire incidents resulted in a single fatality.

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[4] Represents an average of NFPA estimates for the five year period from 1988 to 1992.

Unfortunately, detailed data was not available to determine the victim's proximity to the fire. However, from this study and knowing the nature of hotel and motel rooms, it is generally presumed that the victim was at the ignition source of the fire (i.e., "intimate with" the fire). When this is the case, none of the approved methods used in hotel and motel construction (i.e., sprinkler or fire boundary protection) would have prevented the fatality. In fact, NFPA's Life Safety Code®, the premiere nationally recognized code, acknowledges that "the objective of [the] *Code* is to protect the occupants not intimate with the initial fire development from loss of life ..." The study uncovered that several incidents were even a result of an intentional act such as suicide or intoxication. Here, too, design and construction may not have prevented the fire accident. The Life Safety Code® declares that "the prevention of accidental personal injuries during the course of normal occupancy of buildings [and] personal injuries incurred by an individual's own negligence ... have not been considered as the basis for any provisions of this *Code*."

Overall, this study has demonstrated that an industry can have tremendous success reducing fire related fatalities through active implementation of recognized fire codes and fire safety programs. For hotels and motels this success has meant that the number of incidents has diminished to such an extent that the true data has become masked by errors that previously had little effect on the national estimates.

Recommendations

This study has demonstrated the difficulties of measuring fire data from a broad spectrum of occupancy types with the same measurement instrument. Fire data for the relatively small hotel and motel sector is normally measured as a subgroup of a larger "Residential" category. In the seventies and early eighties, fire related fatalities for this small subgroup were relatively high. Therefore, it was possible to take measurements with the same, more general, survey instrument used to measure larger incident populations. As the number of fatal fires decreased, the error resulting from use of the more general instrument increased. If the incident rate continues to decrease, a point is reached where errors begin to dominate the sample.

For this reason and in the interest of presenting the most accurate data possible, AH&MA believes that there are only two possible alternatives that will lead to the proper representation of hotel and motel fire data. The first, and most preferable, would be to refine the data collection instrument or collection methods to improve the accuracy of hotel and motel fire data. This could be accomplished in many ways. However, regardless of the method by which this is accomplished, it is reasonable to presume that this will involve committing significantly more resources for data collection. Should additional resources not be available for data validation, an alternate course must be considered.

The other alternative is simply to eliminate the hotel and motel subcategory, by recognizing that the fire incident population is too small to accurately measure with the current instruments. Hotel and motel fire incidents could then be reported under the "Residential - Other" subcategory. By combining hotels and motels with other small sample populations a newer, more accurate, subcategory will result. Although hotel and motel numbers would no longer be tracked, the advantage is that numbers which may misrepresent the performance of the industry will no longer be

published.

The implementation of either alternative should be coupled with a national campaign that focuses on training those fire service personnel who record and report fire incidents. Such a campaign could include general public relations information to increase awareness and offer formal or semi-formal courses for key fire services personnel. The results of this study would also encourage concentrating any fire safety initiatives on the problematic lower income occupancies found to be misclassified.

Regardless of what action is taken, some changes must be made to correct the serious errors that exist in the current hotel and motel fatal fire estimates.

Part II

The Study:
"A Review of the Validity of Estimates of Hotel and Motel Fire Deaths"

A Review of the Validity of Estimates of Hotel and Motel Fire Deaths

Final Revision

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Objectives

The objectives of this study were to determine what data sources for fire deaths were available, what these sources report as the number of deaths associated with hotel and motel fires, and whether or not the NFPA estimates and interpretations are accurate portrayals of the fire experience of hotels and motels.

Currents estimates by the NFPA place hotel/motel deaths at 30 per year for 1992. This estimate is much larger than what the lodging industry has believed the problem to be. It therefore chartered this study by TriData Corporation of Arlington, Virginia to look in detail at the validity of the data, and the various sources of data on hotel and motel fire fatalities, to see if the current estimates are accurate. Our finding is that the current estimates of hotel and motel fire deaths are ***not*** accurate, and could be overstated by 30 to 50 percent.

Hotel/Motel Data Collected

There are two major sources of data on hotel/motel fires: The National Fire Protection Association's (NFPA) survey of fire departments and the National Fire Incident Reporting System (NFIRS).

The NFPA annually publishes data in the September-October issue of *Fire Journal* on the magnitude of the U.S. fire problem. For 1992 they estimated 30 fatalities in hotels and motels, and that was a 25 percent drop from 1991. The NFPA source is a statistical sample of several thousand fire departments.

The NFPA survey of fire departments collects summary statistics from each department, not data on individual fires. The categorization of occupancy types given by fire departments are accepted at face value. The forms used by NFPA show total

numbers of fires and fatalities for major categories such as residential, commercial, industrial, vehicles, and other fires. The residential category is further broken into sub-categories including one- and two-family dwellings, apartments, hotels and motels, and other residential. The data from these departments is extrapolated to a national estimate using a ratio estimation method with stratification by community size. Ten communities sizes are used. For each fire statistic (fire, deaths, injuries, dollar loss) a sample loss rate is computed for each stratum or community size. The sample loss rates by community size are then multiplied by population weighting factors to determine the estimates of the particular fire statistic for the particular community size. These community size-based estimates for a specific fire statistic are calculated at the sub-category level (i.e., at a sub-category level such as hotels/motels) and are combined to yield estimates at the major category level. Lastly, the estimates at the major category level (residential, vehicle, etc.) are combined to provide an overall national estimate for the fire statistic.

A second estimate of the hotel fire problem comes from the National Fire Incident Reporting System (NFIRS). It receives data from a much larger sample of departments than the NFPA — between 13,500 and 14,000 departments a year. Although approximately 40 states are represented in the NFIRS sample, not every fire department in each state participates. The data is collected fire by fire, and can be used to estimate the percent of fires and fire fatalities falling in different occupancy classes with greater accuracy than can be obtained from the NFPA survey. To make national estimates, the NFIRS percentages of fatalities by category are multiplied by the estimate of the total number of fire deaths from the NFPA survey. (NFIRS does not yet have its own estimate of the total number of U.S. fire deaths because the system does not have complete data on the population protected by the departments that report to NFIRS.)

Both of the above sources confirm that the magnitude of the hotel and motel fire problem has dropped dramatically since 1980. Whereas estimates of hotel fire deaths

averaged over 100 per year in the 1970s and early 1980s, the above sources indicate that fatalities have dropped by about 70 percent to an estimated 30 fatalities per year.

Data Validation and Augmentation

Several approaches were used to estimate the validity of the existing data and to augment the existing data sources with additional information on hotel/motel fires and fire deaths. The major effort was to identify every fire labeled as either a hotel or a residential hotel fire in NFIRS over the latest five years (1988 to 1992, the latest year for which NFIRS data is available), and then to obtain additional data on the occupancy classification from fire incident reports and discussions with each fire department that submitted an incident report with a hotel fire fatality.

Before proceeding further, it is important to understand the NFIRS categorization of hotel and motels as an occupancy and the problems associated with collecting sprinkler data.

Classification of Hotels/Motels/Inns - The main problem with the validity of hotel and motel data is the difficulty firefighters seem to have in classifying occupancies as hotels, motels, or something else. Apartments, rooming/boarding houses, hotels/motels, dormitories, and home hotels can cross boundaries to some extent and cause confusion not only to the firefighters, but in some cases to the fire departments that inspect them. The NFIRS Fixed Property Use (FPU) category 44 is for the traditional hotel or motel. It is for a place where people usually stay less than a month and where most units do not have kitchen facilities. A second category of hotels is "home hotels," FPU 48, for hotels that offer kitchen facilities in most or all of their units.[1] Again, these hotels are meant for people generally staying no longer than a month. Occupancies that are meant for

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[1] The NFPA Survey of fire departments does not include home hotels (FPU 48) in its category labeled hotels and motels, and thus would exclude fires in suite-style hotels which are a rapidly growing segment of the lodging industry.

longer term residence are divided into boarding and rooming houses (FPU 43) or apartments (FPU 42), depending on the number of units they have and, to some extent, the character of the occupancy. Boarding houses can be for transients but must have less than 15 units. The NFIRS definitions (based on the NFPA 901 code, dated 1976) and the FPU code for those properties are given below.

> *Apartments (FPU 42)* : Quarters for families living independently of each other, and with kitchen facilities in individual units, whether designated as 'apartment house', 'garden apartment', 'tenement', 'condominium apartment', 'flat' or by any other name. Regardless of local terminology, living units shall be classified here when three or more units are located within common fire division walls, and the units are under a common roof, or have a common basement.
>
> *Rooming, Boarding, Lodging Houses (FPU 43)*: Living quarters in which separate sleeping rooms are rented, with sleeping accommodations for a total of not more than 15 persons, on either a transient or permanent basis, with or without meals, but without separate cooking facilities for individual occupants.
>
> *Hotel, Motels, Inn, Lodges (FPU 44)*: Living quarters in which there are sleeping accommodations for hire for more than 15 persons, primarily used by transients, lodged with or without meals, but without separate cooking facilities in each unit, whether designated as a 'hotel', 'motel', 'club', 'apartment hotel', 'YMCA', 'lodge', or by any other name. Included are dormitories for transient occupants.
>
> *Home Hotels (FPU 48)*: Living quarters of persons or families living independently of each other, with kitchen facilities and with a transient population, whether designated as 'hotel', 'apartment', 'apartment hotel', or by any other name.

There are three types of problems encountered when a hotel-like occupancy is classified in NFIRS:

1. Misclassifying an occupancy because of ignorance about the definition of the categories (e.g., reporting a rooming house as a hotel).

2. Misclassification by clerical error (e.g., writing down 44 instead of 42) for the fixed property use on the NFIRS form.

3. Misclassifying an occupancy because it appears to be a hotel or motel, perhaps even by name, but in fact is a different type of occupancy. The XYZ Hotel

changes in use to become low-income apartments, but is still referred to as the XYZ Hotel. This is a much more difficult problem to cure.

Sprinklers - Just as there are many errors made in properly categorizing hotel-like occupancies, there can be (and are) many errors made in characterizing the presence or absence of sprinklers in fatal fires. The overall (raw) NFIRS data on sprinklers has a very high unknown rate (no data reported) of 30 to 40 percent and makes the data much less reliable than one would like. For every NFIRS-reported fire confirmed to be in a hotel or motel, we therefore obtained information on whether it was sprinklered, and if so to what extent and where the sprinklers were located relative to the fire and the fatality.

NFIRS Data - For every fire reported in NFIRS FPU category 44 or 48, the fire department that reported the fire was contacted to confirm the incident and an effort was made to obtain more information on the nature of the occupancy and whether sprinklers were present. We also tried to identify the number of stories in the hotels or motels that had fatal fires. The results of this effort for the 29 incidents that were confirmed as hotel or motel fires with fatalities are reported below in Table 1. Table 2 reports information on the remaining incidents which were reported in NFIRS as hotel/motel incidents but were not confirmed as such. By and large, these incidents were misclassified and occurred in other types of residential occupancies.

The unextrapolated (raw or unconfirmed) NFIRS data for five-year period 1988 to 1992 had a total of 65 fire fatalities, approximately 13 fire deaths per year, reported as being in hotels and motels (Fixed Property Use 44), and another 6 listed in the separate category of home hotels (Fixed Property Use 48), for a total of 71.

Table 1. Validated Hotel/Motel Fire Deaths
NFIRS 1988-1992

Incident			NFIRS Coded Hotel/ Motel Type	Source of Validation	Incident Report Status	Civilian Fatalities	Sprinkler	Stories
NFIRS ID	Department	Date						
WP801	Austin, TX	2/09/88	Home Hotel: 20-99 units	Fire department official; Motel is more accurate classification	Rqst'd	1	None Noted	2
CS931	Chicago, IL	3/30/88	20-99 units	Fire department official	Rec'd	1	None Noted	3-4
KR502	Levelland, TX	4/10/88	less than 20 units	Fire department Captain	Rec'd	2	None Noted	1 or 2
CS931	Chicago, IL	6/10/88	20-99 units	Fire department official; Home hotel is more accurate classification	Rec'd	1	Yes; location unknown	7-12
57301	Moscow, ID	7/06/88	20-99 units	Fire Chief	Rec'd	1	None Noted	2
36195	San Bernardino, CA	7/26/88	Unspecified Hotel type	Fire department official	Rec'd	1	None Noted	2
AW824	City of San Antonio, TX	10/11/88	100 or more units (seasonal)	Fire department official	Rec'd	1	None Noted	2
18027	Cleveland, OH	1/20/89	20-99 units	Fire department Captain	Rec'd	1	None Noted	10
82420	Southgate, MI	2/11/89	less than 20 units	Fire department official	Rec'd	1	None Noted	1
63350	Royal Oak, MI	10/09/89	20-99 units	Fire department Inspector	Rec'd	1	None Noted	2
19105	Los Angeles City, CA	12/31/89	Unspecified Hotel type	Incident report	Rec'd	1	Unknown	Unknown
21021	City of Hagerstown, MD	2/18/90	20-99 units	Dispatcher	Rec'd	4	Yes; at fire origin only (mech. room), not where victims found	3
34080	Fullerton, CA	4/16/90	Unspecified Hotel type	Fire department official	Rec'd	1	None Noted	3
55023	New Richmond, WI	4/30/90	less than 20 units	Fire Chief	Rec'd	1	None Noted	1
17049	Cambridge, MA	6/10/90	100 or more units	Fire department deputy	Rec'd	1	None Noted	13-24
30095	Costa Mesa, CA	9/15/90	Unspecified Hotel type	Incident report	Rec'd	1	None Noted	2

Table 1. Validated Hotel/Motel Fire Deaths
NFIRS 1988-1992

Incident			NFIRS Coded Hotel/ Motel Type	Source of Validation	Incident Report Status	Civilian Fatalities	Sprinkler	Stories
NFIRS ID	Department	Date						
57422	Jackson, TN	10/28/90	20-99 units	Fire Marshal	Rec'd	1	None Noted	2
30030	Westminster, CA	12/03/90	Unspecified Hotel type	Incident report	Rec'd	1	None Noted	2
09010	Union City, NJ	1/09/91	less than 20 units (seasonal)	Fire Chief	Rec'd	1	Partially; not sprinklered at fire origin or at location of victim	4
17M15	Seattle, WA	3/01/91	20-99 units	Fire Marshal	Rec'd	1	None Noted	2
49145	Santa Rosa, CA	3/09/91	Unspecified Hotel type	Fire department official	Rec'd	1	None Noted	2
AV612	Temple, TX	3/13/91	20-99 units (seasonal)	Deputy Fire Chief	Rec'd	1	None Noted	1
35005	Salt Lake City, UT	3/16/91	20-99 units	Fire department official	Rec'd	2	Undetermined	1
42008	Clinton Hgts., NY	11/15/91	Unspecified Hotel type	Fire Chief	Rec'd	1	None Noted	1
41202	Beckley, WV	6/28/92	20-99 units	Fire Chief	Rec'd	1	None Noted	3
WH252	Williamson Co., IL	7/04/92	less than 20 units	Fire Chief	No report available	1	None Noted	1
LV101	Leavenworth, KS	8/21/92	less than 20 units	Assistant Fire Chief	Rec'd	1	None Noted	1
57029	Moraine, OH	11/10/92	20-99 units	Fire Chief	Rec'd	1	None Noted	1
20110	Eugene Dept. of Public Safety, OR	11/13/92	Unspecified Hotel type	Incident report	Rec'd	1	None Noted	2
Confirmed Hotel/Motel Fatalities						34		
Hotel/Motel Fatalities reported to NFIRS						71		

Table 2. Incorrectly Classified and Unconfirmed Hotel/Motel Fire Deaths
NFIRS 1988-1992

Incident			NFIRS Coded Hotel/ Motel Type	Source of Validation	Incident Report Status	Fatalities
NFIRS ID	Department	Date				
05040	Danbury, CT	2/08/88	20-99 units	Fire department official; Occupancy: Boarding house	Rec'd	1
19105	Los Angeles City, CA	3/04/88	Unspecified Hotel type	Arson division official; Occupancy: Rooming house	Rec'd	1
PB601	Kingsville, TX	9/21/88	less than 20 units	Incident report; Occupancy: Residence	Rec'd	1
SP706	Corpus Christi, TX	12/03/88	20-99 units (seasonal)	Fire department official; Occupancy: Long-term residence for vagrants	No report available	2
10052	Hollywood, FL	1/13/89	20-99 units	Fire department Inspector; Occupancy: Rooming house	Rqst'd	1
07090	Contra Costa Co., CA	7/05/89	Unspecified Hotel type	Fire department official; Occupancy correct - no fatalities	Rqst'd	1*
05003	Wildwood, NJ	8/19/89	less than 20 units (seasonal)	Fire department Lieutenant; Occupancy: Apartment	Rec'd	1
49030	Mackinac Island, MI	9/09/89	20-99 units (seasonal)	Fire department official; Occupancy: Mixed use w/dormitory rooms	Rec'd (Letter)	2
CS931	Chicago, IL	10/23/89	100 or more units	Incident report; Occupancy: Apartment	Rec'd	1
10032	Dania, FL	12/25/89	20-99 units	Fire Prevention official; Occupancy: Long-term residence for vagrants	Rec'd	1
CS931	Chicago, IL	1/01/90	less than 20 units	Incident report; Occupancy: Apartment	Rec'd	1
08104	Sleepy Eye, MN	2/08/90	Home Hotel: 20-99 units	Fire Chief; Occupancy: Subsidized apartments for elderly	Rec'd	1
32007	Waterford, NY	2/16/90	Unspecified Hotel type	Fire department official; Occupancy: Apartment	Rqst'd	1
04707	Bureau of Indian Affairs, MN	3/08/90	Home Hotel: 100 or more units	Unconfirmed - No response from department		1 (unconfirmed)

Table 2. Incorrectly Classified and Unconfirmed Hotel/Motel Fire Deaths
NFIRS 1988-1992

Incident			NFIRS Coded Hotel/ Motel Type	Source of Validation	Incident Report Status	Fatalities
NFIRS ID	Department	Date				
49109	Jefferson Twp., OH	3/25/90	less than 20 units	Fire Chief; Occupancy: Boarding house	Rec'd	1
30020	Sacramento, CA	4/10/90	Unspecified Hotel type	Unconfirmed - Fire department official could not locate file		1 (unconfirmed)
37170	Vista, CA	5/01/90	Unspecified Hotel type	Fire department official; Occupancy: Residential duplex	Rec'd	1
46032	Lewiston No. 1, NY	5/03/90	Unspecified Hotel type	Unconfirmed - Fire Chief contacted but did not confirm incident data nor send report		1 (unconfirmed)
11070	Trenton, NJ	5/05/90	less than 20 units	Incident report; Occupancy: Residence	Rec'd	1
CS931	Chicago, IL	10/16/90	20-99 units	Incident report; Occupancy: Apartment	Rec'd	2
AN403	Muleshoe, TX	10/24/90	less than 20 units	Unconfirmed - City Attorney reported records only kept for 3 years		1 (unconfirmed)
SW101	Liberal, KS	11/10/90	Home Hotel: less than 20 units	Fire department official familiar w/property; Occupancy: Long-term residence for vagrants	No report available	1
02800	Providence, RI	12/10/90	100 or more units	Incident report; Occupancy: Apartment	Rec'd	1
26600	Hot Springs, AR	1/09/91	less than 20 units	Fire department official; Occupancy: Apartment	Rec'd	1
18027	Cleveland, OH	1/15/91	20-99 units	Fire department Captain; Occupancy: Apartment	Rec'd	1
WY101	Kansas City, KS	8/12/91	Home Hotel: 20-99 units	Fire department Special Investigator; Occupancy: Long-term rental use	Rec'd	1
04052	Lealman, FL	11/14/91	Home Hotel: 20-99 units	Fire Chief; Occupancy: Mobile home	No report available	1
35015	Napoleon, OH	1/21/92	less than 20 units	Fire Chief; Occupancy: Apartment	Rec'd	3

Table 2. Incorrectly Classified and Unconfirmed Hotel/Motel Fire Deaths
NFIRS 1988-1992

Incident			NFIRS Coded Hotel/ Motel Type	Source of Validation	Incident Report Status	Fatalities
NFIRS ID	Department	Date				
28008	City of Rochester, NY	3/23/92	100 or more units	Incident report; Occupancy: Apartment	Rec'd	1
05003	Wildwood, NJ	7/02/92	20-99 units (seasonal)	Fire department Lieutenant; Occupancy: Rooming house / apartment	Rec'd	1
25009	Columbus, OH	9/01/92	20-99 units	Fire Chief; Occupancy: Rooming house / apartment	Rqst'd	1
39050	Manteca, CA	11/11/92	Unspecified Hotel type	Fire department official; Occupancy: Apartment	Rec'd	1

* Department said there were no fatalities in this fire although one fatality was reported in error. (There was, however, one civilian injury.)

State Fire Marshals - The next step was to contact all 50 state fire marshal's offices, of which 45 provided data on 1992. Most states provided data for 1993 but it is incomplete; only a small fraction have complete data on 1993.

Every state fire marshal's office also was contacted to see if they had identified hotel fires other than those in NFIRS, whether they had information on the occupancy types, and their count of the total number of hotel and motel fires in 1992 and 1993.

Not all state fire marshal's offices keep data by occupancy type apart from what they receive from their fire incident reporting system. Those states that try to keep a complete census of their fire deaths rely on death certificate information and newspaper clippings in addition to their state fire incident reporting system, and generally are trying to keep a total count rather than sorting out the extra, non-NFIRS data by occupancy. The data collected from the State Fire Marshal's offices are included in Table 3.

Table 3. Summary of State Fire Marshal Hotel Fire Fatality Data 1992-1993

State	Contact	Phone	Hotel Fire Deaths		Data Sources / Comments
			1992	1993*	
AL	Katrina	205-269-3579	0	0	Data from reporting departments only
AK	Greg	907-269-5604	0	0	Data from fire departments & state troopers
AZ	Ron Pope	602-255-4072	-	-	No statewide data
AR	Sheldon Richardson	501-574-1521	0	0	Data from articles, clippings, NFIRS
CA	Alta	916-262-1886	1	-	1993 data not compiled
CO	Paul Cooke	303-239-4463	-	-	NO RESPONSE
CT	Sheryl Salvatore	203-238-6257	-	-	Requested hotel data; not received
DE	Diane Towns	302-739-5665	-	-	NFIRS lay dormant for 2 years; no hotel data.
FL	Pat Gibney	904-922-3172	1	0	

Table 3. Summary of State Fire Marshal Hotel Fire Fatality Data 1992-1993

State	Contact	Phone	Hotel Fire Deaths		Data Sources / Comments
			1992	1993*	
GA	April Hayes	404-656-0535	0	0	Data from Bureau of Vital Statistics, articles, NFIRS
HI	Cheryl	808-523-4305	0	0	Data from fire department reports
ID	Ruby Andridge	208-334-3808	0	0	Data from fire department reports
IL	Barbara Petrilli	217-785-0969	1	21	Note: Paxton Hotel occupancy type uncertain
IN	Mike Newsome	317-232-6236	0	0	Data from NFIRS
IA	Karen Shipley	515-281-7003	0	0	Data from NFIRS
KS	Elena Ness	913-296-3401	1	0	Data from fire department reports
KY	Charlene Slemp	502-564-3626	0	0	
LA	Jack Oliver	504-925-4911	0	0	Data from death certificates
ME	Karen Peterson	207-287-3473	0	0	
MD	Kathy Rose	410-764-4324	0	0	Data from fatality report survey & death certificates
MA	Ms. Marty Aarons	617-351-6040	0	0	Data from articles & police reports
MI	Bob Jensen	517-322-1939	0	1	
MN	Nora	612-643-3091	1	1	The 1992 death may have been in an apartment; occupancy type was unclear
MS	Ray Gilday	601-359-1062	Unk	0	Data from death certificates
MO	Joan Schwartze	314-751-2930	-	-	Data from death certificates
MT	Celia	406-444-2050	0	1	Data from fire department reports
NE	Lori Loyd	402-471-9472	0	0	Data from NFIRS
NV	Brian Slope	702-687-4290	0	0	Data from fire department reports
NH	Robert Farley	603-271-3294	0	0	
NJ	Andy Fritz	609-633-6324	3	0	
NM	Louise Bacca	505-827-3550	0	0	

Table 3. Summary of State Fire Marshal Hotel Fire Fatality Data 1992-1993

State	Contact	Phone	Hotel Fire Deaths		Data Sources / Comments
			1992	1993*	
NY	Fred Richardson	518-474-6746	1	0	
NC	Cindy Winbon	919-733-5435	-	0	Data for 1992 not available
ND	Bob Allan	701-221-5470	0	0	Data from articles
OH	Cindy	614-752-7120	5	-	1993 data incomplete
OK	Sherry	405-524-9610	0	0	Data from fire department reports
OR	Vi Tulley	503-378-3473	1	0	Data from fire department reports & death certificates
PA	Kent Lead	717-783-8150	-	-	No statewide reporting - information from death certificates
RI	Don Byrne	401-277-2335	0	0	
SC	Sondra Senn	803-896-9800	0	0	Data from fire department reports & NFIRS
SD	Helen	605-773-3562	0	0	State investigates all fatal fires
TN	Dennis Mulder	615-741-2981	1	0	Data from death certificates & NFIRS
TX	Sylvia	512-873-1700	0	-	Data from fire department reports; 1993 data incomplete
UT	Janet Herron	801-965-4354	0	1	Data from fire department reports
VT	David LePlant	802-886-2712	0	0	Data from fire department reports
VA	Marion Long	804-527-4238	0	0	Data from Dept. of Health statistics
WA	Kathy Gerik	206-493-2661	-	-	No statewide reporting
WV	Tonya	304-558-2191	1	0	Data from fire department reports
WI	Karen Johnson	608-267-5264	-	-	1992 & 1993 data incomplete
WY	Donna Depew	307-777-7907	0	0	Fire department reporting mandatory; cross checked with death certificates
Summary			17	25	

* 1993 data is as of October 1994

Other Sources - We contacted the National Injury Information Clearinghouse of the Consumer Product Safety Commission (CPSC), the Department of Labor's Occupational Health and Safety Administration (OSHA) and its Bureau of Labor Statistics, the National Safety Council, and the National Center for Health Statistics (NCHS) of the Centers for Disease Control (CDC). Although all these agencies track fire or fire-related data either directly or, in the case of the CPSC, indirectly through consumer products, none are designed to aggregate or track their data by occupancy or building use/type. The NCHS data did note the place of the accident but not in sufficient detail to ascertain whether the death occurred in a hotel or motel. Another data source we investigated was the Data Times on-line index to the major newspapers. We were able to roughly identify a small number (four) of fatal hotel fires, but as the responding fire departments were not specified, we were unable to confirm the specifics of the incidents, including the occupancy type. These incidents are shown in Table 4.

Table 4. Additional Hotel/Motel Fatal Incidents
Data-Times Index, 1988 to 1992

Date	Location	Fatalities	Source
2/17/89	Detroit, MI	4	L.A. Times; UPI
4/6/90	Miami Beach, FL (Fontana Hotel)	4	Washington Post; L.A. Times
4/?/90	Orange Co., CA	1	L.A. Times
12/1/91	San Diego, CA (Maryland Hotel)	1	L.A. Times
Additional Fatalities		10	

The final data source we contacted was the NFPA's FIDO database. The FIDO database is a selected set of fire incidents that the NFPA feels are of technical interest or that experienced high levels of loss. For fatal fires, this inclusion criteria is three or more deaths in a single fire. The fatality data from FIDO is published each year in the NFPA Journal and the incidents in Table 5 reflect this data.

Table 5. Additional Hotel/Motel Fatal Incidents NFPA FIDO Data, 1988 to 1992		
Date	Location	Fatalities
1/28/89	Pennsylvania	5
4/6/90	Florida (this appears to be the Fontana Hotel noted above with 4 fatalities reported)	9 (5)
7/12/91	Minnesota	7
Additional Fatalities		21 (17)

The Results

NFIRS Fatality Data

There were 71 fatalities in 61 incidents reported in NFIRS for 1988-1992 as being in hotels or motels. These incidents involved 55 fire departments. Of the 55 departments, we were able to reach 53.[2] Incident reports were requested from all 53 departments. To date, all but four incidents have been confirmed either by telephone or by incident report.

Of the original 71 fatalities identified as being in structures with Fixed Property Use 44 or 48, we have information on 67 fatalities in 57 incidents. The only reported firefighter fatality was in error — there were no firefighter fatalities reported to NFIRS in the 1988 to 1992 period.[3]

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[2] The two departments not returning calls were Lewiston, New York, and the Bureau of Indian Affairs in Minnesota.

[3] A fire in Contra Costa County, California was reported to have had a firefighter fatality but there was no fatality — it was apparently a clerical error.

Of the remaining 66 fire fatalities for which data was available, 32 fatalities were found to be in occupancies other than hotels or motels. The 32 fatalities occurred in 27 incidents. The 27 occupancies in these incidents should have been more properly categorized as apartments (12), rooming or boarding houses (6), mobile homes (1), 1&2 family dwellings (3), long-term residence for vagrants (3), or other residential properties (2).

One fatal occupancy, the "Texas Hotel" in Corpus Christi, was an establishment where vagrants could stay indefinitely ("for months on end," reported the fire department). Another fatal occupancy, in Liberal, Kansas was called the Super 7-Best Budget motel but was a long-term residence for vagrants; the person who died listed the "motel" as his permanent residence.

Sprinklers

Of the 29 incidents with fatalities that appeared to have been properly classified as being hotels or motels, three were reported in NFIRS as being sprinklered. It was found that two of these three occupancies were not fully sprinklered and it was not possible to validate the extent of sprinkler installation in the third. This study was unable to confirm a single fatality in a fully sprinklered occupancy. This validates the quality and effectiveness of sprinkler design, installation, and maintenance standards.

In one incident, sprinklers were reported to be in the area of origin (a mechanical room in the basement) though the fatality occurred in a non-sprinklered part of the premises. In a second incident, sprinklers were present in the building, but not where the fire or the fatality occurred. The extent of sprinklers could not be confirmed in the third incident, however, sprinklers were reported as operating.

These three incidents involved six fatalities.[4] There were 3,086 hotel/motel incidents in the NFIRS data between 1988 and 1992 in which sprinklers were noted as present, albeit the extent of installation is unknown. The resulting rate for hotel/motel properties reported as sprinklered using the raw NFIRS incident data is 1.9 deaths per thousand fires for the 5-year period from 1988 to 1992.[5] If, however, the same error rate in classifying the occupancies exists in the overall NFIRS data as was found in our sample (that is only 30 of 57 incidents were correctly classified) then the resulting death rate for sprinklered properties could be as high as 3.7 deaths per thousand fires.[6] It should be noted that 66 percent (four of six deaths) of the confirmed NFIRS hotel/motel deaths are the result of one incident. The outcome of one incident does not lend itself to a statistical characterization of the performance of the industry as a whole.

Number of Stories

For fire deaths confirmed to be in hotels or motels, the number of stories in the building was obtained either by the incident report or through the reporting department. Fire and building codes often have different requirements for hotels/motels that are higher than a specified number of stories. The results are contained in Table 6 below.

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[4] We were unable to ascertain at this time whether the victims were initimately involved with the ignition of the fire. Were this the case, a sprinklered room could not have necessarily prevented the fatality.

[5] In the November/December issue of the *NFPA Journal*, the article "The U.S. Experience with Sprinklers: Who Has Them? How Well Do They Work?," cites a death rate of 2.6 deaths per thousand fires for hotels/motels with automatic suppression equipment. We were unable to confirm this number, primarily because this study deals with the 5-year period 1988 to 1992 and the NFPA article uses data for the 10-year period 1982 to 1991.

[6] The error rate for classifying occupancies is based on 30 of 57 incidents correctly classified as hotels -- that is, 53 percent of the occupancies were correctly classified. If this error rate were applied to hotel/motel fire incidents that had sprinklers reported, then only 1,636 (53 percent of 3,086) of the incidents with sprinklers present would be expected to be correctly classified as hotels/motels. The six deaths in these sprinklered properties were confirmed as hotel/motel deaths. The resulting rate is 6 ÷ 1,636 or 3.7 deaths per thousand fires.

Table 6. Number of Building Stories for Fatal Hotel/Motel Fires NFIRS Data 1988 to 1992						
Number of Stories	Fires	Fatalities	Sprinklered Incidents	Sprinklered Fatalities		
				Fully Sprinklered	Partially Sprinklered	Extent Unknown
1	8	9				
2	12	13				
3-4	5	8	2		5	
7-12	2	2	1			1
13-24	1	1				
Unknown	1	1				
Total	29	34	3	0	5	1

The vast majority (25 of 29) of the hotels/motels involved in fatalities had four or fewer stories. Three of the 29 incidents involved multiple loss of life; two incidents resulted in two fatalities each and one incident resulted in four fatalities.

State Fire Marshals

Of the 45 states that provided data for 1992, 29 reported no hotel/motel fatalities and five states had no separate hotel data. The remaining 11 states had 17 fatalities of which 12 were identified through NFIRS. One of these "new" fatalities was from West Palm Beach County, Florida, which did not report to NFIRS in 1992. Two were from New Jersey from non-participating departments. One fatality each was from Minnesota and Tennessee. All of these states participate in NFIRS. With four-fifths of the states reporting 17 hotel deaths, one could extrapolate and estimate that there may have been 21 hotel/motel deaths nationwide.

For 1993, four states reported one fatality each (Michigan, Minnesota, Montana, Utah). Illinois reported 21 in the Paxton Hotel fire; the Paxton Hotel, however, was

described in newspaper articles both as a "single-room occupancy hotel" and as low-cost housing for the poor. The NFPA Fire Investigation Report on the Paxton Hotel fire sheds little additional light on this occupancy question as it states that the Paxton Hotel could also have been classified as a dormitory.[7] It is unclear what occupancy type is correct.

Sample Size and Reliability of Estimates

A major area of concern is the size of the sample of hotel/motel deaths on which overall estimates of hotel/motel fire deaths are made. The essential rationale underlying statistical analyses of fire data is that fires are accidental in nature, depending only on individual's behavior patterns and on the random effects of related physical phenomena contributing to an ignition. Fires, fire deaths, and other related loss measures fluctuate one year to the next. The smaller the number of fires or deaths, the greater this fluctuation. This randomness is inherent in fire data and should be taken into account in any interpretation. The year-to-year fluctuation of the data typically follows the well-known bell-shaped curve called the "normal" distribution[8]. This distribution enables us to make a variety of probability statements about the data. The variability or spread of the data, the standard deviation, is simply the square root of the average of the data set (here hotel/motel fire deaths). In addition one can also state that 68 percent of the data (or the odds of 2:1) will probably be within one standard deviation of the mean, 90 percent of the data (odds of 9:1) will be within 1.645 standard deviations of the mean, or 95 percent of the data (odds 19:1) will be within approximately two standard deviations.[9]

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7 Isner, Michael S. *Summary Fire Investigation Report, Paxton Hotel Fire, Chicago, Illinois, March 16, 1993*, National Fire Protection Association, undated.

8 A more precise statement of the statistical assumptions is that the probability distribution for accidental events (of which fires are included), is known as the Poisson distribution and is well approximated by the normal distribution. If the mean, or average, of the sample is too small (less than 5) the approximation is not satisfactory.

9 A more detailed discussion of estimating the precision of fire statistics can be found in *Fire in the United States*, 1978 Edition, Appendix VI.

We can also calculate the relative error associated with these sample sizes. These statistics apply to any measure, including extrapolations such as national estimates, that uses the data set as its basis.

Based on this knowledge we looked at the various sources of data and the resulting sample size implications. There are several samples to investigate: the raw NFIRS data, the validated NFIRS data, state fire marshal's data (extrapolated as described above to account for all 50 states), and the following additional estimates of samples.

The first estimate is for a "corrected" NFIRS sample that adjusts for the occupancy validation and the under-reporting of hotel/motel deaths from participating NFIRS states. This "corrected" NFIRS sample for five years could then be:

$$71 \text{ fatalities} \times \frac{34 \text{ (occupancy correction)}}{67} \times \frac{17 \text{ (underreporting to NFIRS)}}{12} = 51$$

or about 10 per year.

The second estimated sample is the sum of the validated NFIRS hotel deaths (34), the Data-Times data (10), and the FIDO data, corrected for the double counting of the Fontana Hotel deaths (17) for a total of 61 or about 12 per year. This sample is less rigorous than the previous ones but we include it for completeness.

For ease of comparisons, the sample size results are listed in Table 7.

Table 7. Comparison of Hotel/Motel Deaths Sample Size Statistics				
Sample Set	Sample Size (5 year)	One-Year Average	One Sigma (68 percent) Range and Error	Two Sigma (95 percent) Range and Error
Raw NFIRS data	71	14	10 to 18 error = 27%	7 to 21 error = 52%
Validated NFIRS data	34	7	4 to 10 error = 38%	2 to 12 error = 74%
State Fire Marshal's data		21	16 to 26 error = 22%	12 to 30 error = 43%
"Corrected" NFIRS data	51	10	7 to 13 error = 32%	4 to 16 error = 62%
NFIRS/Data-Times/FIDO data	61	12	9 to 15 error = 29%	5 to 19 error = 57%

As can been seen, all these samples have a range of variability, and, most importantly, have large errors, ranging from 22 to 38 percent for the one sigma requirement, associated with them. The more stringent requirement that 95 percent of the data lie within the calculated range has an even higher error associated with the sample -- 43 to 74 percent. In addition, all the NFIRS data *include* home hotels, excluded by NFPA, which increases the sample size and reduces the relative error. In the worst case, if the "Raw NFIRS data" set were 50 percent of total fires and fatalities, then there would have been 140 fatalities reported over 5 years, or on average 28 per year (with a range of 23 to 33 at the minimum one sigma level and with a relative error of 19 percent). This is the closest we can get to NFPA's estimated 30 hotel/motel deaths. Perhaps the most reasonable estimate is the validated NFIRS data as it comes from one source. Here, if the "Validated NFIRS data" set is half of the total fires and fatalities, there would be an estimate 68 fatalities over the five years or 14 per year (with a range of 10 to 18 at the one sigma level).

Conclusions

1. We can say with reasonable confidence that the NFPA and USFA statistics on fatalities in hotels and motels overstate the hotel/motel problem. Fatalities are still occurring in hotels and motels, but at a rate perhaps thirty to fifty percent lower than what has been published.

2. There are a variety of errors in the NFIRS data, most notably in the occupancy classifications reported for each incident. Any estimate that uses the NFIRS data will, by association, carry these errors. We found the error rate for this type of error to be an astounding 47 percent for the NFIRS hotel/motel fatality data. If the NFPA survey respondents use their NFIRS data to complete the survey form, this substantial error will affect the NFPA estimates.

3. The errors associated with the small sample sizes of hotel/motel fatalities is also a predominate factor in any estimate or extrapolation of hotel/motel deaths. We have shown that this error can range from 22 to 74 percent depending on the sample size and the level of confidence associated with the estimate. Any estimate that maintains a small (less than 10 percent) error, is suspect.

4. According to the published statistics, hotel and motel fire deaths fell from about 100 a year down to about 30 a year in the past decade or so. In fact, it appears that enormous drop of 70 percent is even larger, in the 80 to 90 percent area, with less than 20 hotel fatalities occurring on the average per year. Our best estimate is a 10-18 fatalities per year average during 1988-1992. Depending on how the Paxton Hotel is classified, this average for 1993 could be different.

5. Some of the hotel fatalities are of the type that may be virtually impossible to prevent, such as one in which a woman booked a hotel room and then committed suicide by fire.