Societal Awareness of Fire Risks

An Interactive Qualifying Project

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An Interactive Qualifying Project Report

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Abstract

Every year many social ills affect the welfare of the public of the United States. Data published in the media helps the public understand the relative risks of living in each city. Crime rates, unemployment rates, and high school completion rates are examples of data that are published or broadcast each year. However, city fire death rates are not produced. This project will develop a procedure for calculating fire death rates on a city-by-city basis, and for disseminating comparative data in the media.

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Executive Summary

Throughout the United States comparative city-by-city data on social ills are widely reported in the media. Examples include crime rates, unemployment rates and high school completion rates. Rates of social ills, such as these, help show the public the relative risks of living in each city. City fire death rates, on the other hand, are not produced and have, therefore, not been brought to the attention of the public. The goal of this project was to develop a procedure for calculating city-by-city fire death rates and for disseminating this comparative data in the media.

This study analyzes data from the 58 United States cities with a population of over 300,000 people. Fire death data was obtained from the United States Fire Administration's (USFA) National Fire Reporting System (NFIRS), while population figures were gathered from the United States Bureau of the Census. Fire data was also collected from state fire marshals in a few cases. The step-by-step procedure that we produced to calculate city fire death rates is listed below.

- Collect demographic data and zip codes from the United States Bureau of the Census, and the United States Post Office, respectively.
- Obtain fire deaths for five years from the NFIRS database
- Calculate five year rolling average per million population

Using the procedure, we calculated the five-year rolling average number of fire deaths per million population for 1990 thru 1995. We also determined the standard deviation of each city's rates so that estimates of future rates can be made. Through our research we found that the NFIRS database is not complete. Data for 1990-1995 was not available for all 58 of the cities in our study. Some cities did not report any fire death data, while other cities only reported data for one or two of the years; as a result, our

procedure was only used for 46 cities. Table 1 and table 2 show the highest ten and lowest ten city fire death rates based on a five-year rolling average. For cities that only had data for a few years, the rolling average was calculated based upon the number of years that it had participated. For example, if a city reported for only two years, the average fire death rate that we calculated is based on a two year rolling average.

Table 1:

Highest Ten Rates
1990-1995
Fire Deaths per Million Population

Rank	City	Rate
1	Baltimore, MD	52.5
2	Detroit, MI	49.4
3	Cincinnati, OH	32.4
4	Nashville, TN	27.0
5	Washington DC	24.5
6	Chicago, IL	24.0
7	Portland, OR	23.5
8	Toledo, OH	22.5
9	New York, NY	21.9
10	Atlanta, GA	21.3

Table 2:

Lowest Ten Rates
1990-1995
Fire Deaths per Million Population

Rank	City	Rate
46	Indianapolis, IN	1.3
45	New Orleans, LA	2.1
44	Houston, TX	2.5
43	Oakland, CA	2.7
42	San Jose, CA	3.0
41	Seattle, WA	3.0
40	Honolulu, HI	3.4
39	Milwaukee, WI	3.4
38	Long Beach, CA	3.9
37	San Diego, CA	4.0

Since the participation of each city varies, a completely accurate ranking of all cities is difficult. However, fire department participation in the NFIRS programs has grown every year, in fact it is now much more complete then it was in 1995. We used data from 1995, because we could not gain access to post 1995 data. It is the goal of the USFA to have every fire department participating in the NFIRS program. As the database becomes more complete in the future, the procedure that we developed can be used to calculate annual city fire death rates with useful accuracy.

City by city fire death rates would be very beneficial to society. The data could be used for a wide variety of purposes, such as evaluating city fire prevention programs.

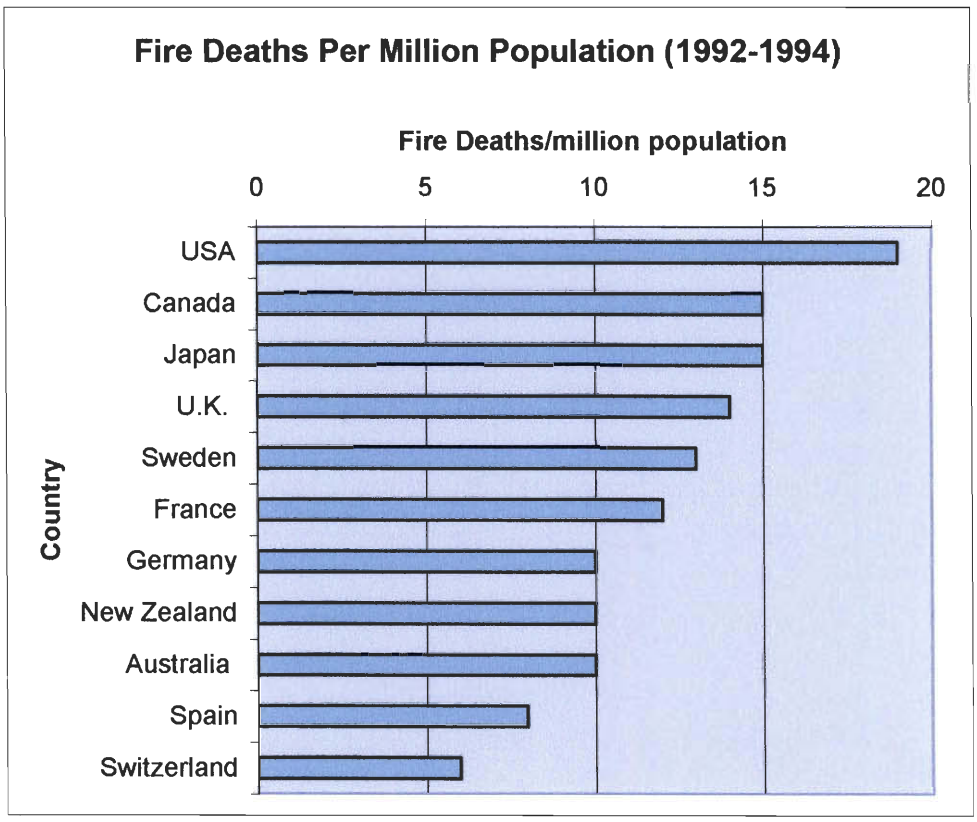
Cities with higher fire death rates may consider comparing their fire prevention methods to cities that have lower fire death rates. By publishing the rates through the media, the public will become more aware of the fire risks of each city. Media coverage would also make the public more aware of the ongoing fire problem in the U.S.

Section 1.2 of this project states that the goal of an Interactive Qualifying Project is to relate technology to society and to help students to better understand their role in society through real world experience. Disseminating city fire death rates in the media will relate the technology of fire protection to society by raising awareness of fire risk to the public. We have also produced a report that is very similar to reports that are published by fire protection organizations. Therefore, we have gained the valuable experience of working in a professional environment.

1.0 Introduction

Currently, there is a national fire problem in the United States. The threat of fire is real and dangerous yet is not fully realized in modern society. Many fire related deaths and injuries, as well as property damages and property losses result from fires each year. (17) Although the fire problem in the U.S. has improved throughout the late 1990's (6), the fire death rates of the United States are still higher than rates of many other industrialized countries. Figure 1 shows the fire death rates of the US and 10 other nations. (43)

Figure 1: International Fire Death Rates



Source: Regulatory Reform and Fire Safety Design in the United States

The US has more fire deaths per million population than many other industrialized nation. Americans, however, have no way of knowing how safe their communities are compared to other communities. Rates help show the public the risk of living in certain communities. Even though national and statewide fire death rates are published, city-by-city fire death rates per million population are not produced. Therefore, the public is not aware of which cities pose the most threat to fire loss.

Throughout the United States, city-by-city rates are calculated to help show the public the risks of many social ills. Examples include crime rates, unemployment rates, and high school graduation rates. These rates help the public understand which cities have the lowest and highest risks. For example, if given a choice, people might rather move into an area of low crime or low unemployment rates. Government agencies also examine the different rates of cities to target areas of high risk that might need government assistance.

City rankings of crime, unemployment, and graduation rates are published throughout the United States each year. For instance, since 1995 Morgan Quitno Press has used data from the Federal Bureau of Investigation's (FBI) annual *Crime in the United States* report to produce city crime rates for its own report, entitled *City Crime Rankings*. (34) The following tables, extracted from the rankings in the 8th edition of *City Crime Rankings*, show the ten highest and ten lowest crime rates of cities with a population over 75,000 in the year 2000. The rates are given in crimes per million people.

Table 3:

Highest Ten Rates
2000
Crimes per Million Population

Rank	City	Rate
1	St. Louis, MO	1482
2	West Palm Beach, FL	1400
3	Atlanta, GA	1313
4	Tuscaloosa, AL	1293
5	Miami Beach, FL	1197
6	Chattanooga, TN	1178
7	Orlando, FL	1173
8	Tampa, FL	1094
9	Kansas City, MO	1052
10	Topeka, KS	1035

Source: Morgan Quitno Press

Table 4:

Lowest Ten Rates
2000
Crimes per Million Population

Rank	City	Rate
327	Newton, MA	132
326	Mission Viejo, CA	143
325	Simi Valley, CA	144
324	Thousand Oaks, CA	159
323	Amherst, NY	189
322	Santa Clarita, CA	196
321	Brick Township, NJ	202
320	Sunnyvale, CA	203
319	Daly City, CA	210
318	Canton Township, MI	217

The two tables, for example, show that much the risk of a crime occurring in St. Louis is over ten times greater than in Newton.

News reports regarding crime rates are published in newspapers and broadcast on television. For example different city crime rates were discussed in an article published in *USA Today* on May 18,1998. The article states "murders dropped 11% in cities with populations above 1 million people, and 14 % in cities with populations between 250,000 and 499,999 people." (16) The article also states that "the number of rapes reported to police dropped only 1 % nationwide, and actually went up in smaller cities and towns" (Appendix A)

The media also reports on unemployment rates and high school graduation rates on an annual basis. The Bureau of Labor Statistics (BLS) produces city unemployment rates that get published by the media every year. (28) Rates for the 50 largest cities range

from 2.2% of the labor force to 12.9 %. Tables 5 and 6 show the BLS's ten lowest unemployment rates in the year 2000 for the fifty largest cities.

Table 5:

Highest Ten Rates
2000
Unemployment Rate as % of Labor Force

Rank	City	Rate
1	Fresno, CA	12.9
2	Cleveland, OH	8.7
3	Baltimore, MD	8.1
4	El Paso, TX	7.9
5	Miami, FL	7.7
6	Milwaukee, WI	6.7
7	Detroit, MI	6.6
8	Philadelphia, PA	6.1
8	Los Angeles, CA	6.1
10	District of Columbia	5.8

Source: Bureau of Labor Statistics

Table 6:

Lowest Ten Rates
2000
Unemployment Rate as % of Labor Force

Rank	City	Rate
50	Austin, TX	2.2
50	Meza, AZ	2.2
50	Virginia Beach, VA	2.2
47	San Jose, CA	2.3
46	Charlotte, NC	2.7
46	Oklahoma, OK	2.7
44	Columbus, OH	2.8
44	Hempstead Town, NY	2.8
44	San Francisco, CA	2.8
41	Boston, MA	2.9

Stories regarding unemployment rates are also published and broadcast through the media. A November 14, 2001 report from News 12 The Bronx states that "According to the published reports, a study by the Manhattan Institute and the Black Alliance for Education Options put New York's high school graduation rates behind most of the major U.S. cities. (9)" This example compares the graduation rates of New York to the rest of the U.S., so that the public can become aware of the graduation risks of living in New York. Appendix B shows the broadcast report. Many similar stories concerning crime and unemployment are also published throughout the U.S. each year.

Many city-by-city rates are calculated and published each year, which helps the public realize the magnitude of various social ills. However, fire death rates per city are not produced by anyone. Newspaper headlines routinely print stories about

unemployment or crime rates, but very rarely will there be stories relating to fire death rates. While state fire death rates are produced, city fire death rates are not. Therefore, there is currently no way to compare the fire death risks between U.S. cities. Consequently the media does not report any fire death rates and the public has no way of knowing.

1.1 Project Goal

The purpose of this project is to develop a procedure for calculating fire death rates for the major cities of the United States, and to encourage the flow of city fire death rates to the media and the public. Once the procedure is established, it can be repeated annually. We will also produce a report, based on our procedure, containing the fire death rates of the major cities. By publishing and reporting the results through the media, the rates produced will help raise public awareness of the fire risks involved with living in each city. The goal is to have fire death rates published and broadcast as regularly as rates of other social ills. Media coverage will not only identify the areas of fire risk, but will also bring more attention to the ongoing fire problem of the U.S.

1.2 Goal of an IQP

The IQP, or Interactive Qualifying Project, is typically a junior year project completed in teams of two to four students. The IQP is "designed to address the societal impacts of a technological development or the converse."(50) It is a project that must relate technology to society and aims to help students to better understand their role in society through real world experience. This project makes a good IQP, because it relates the technology of fire protection and fire statistics to society, by raising awareness of these issues to the public and the media. This project is also a good example of a real

world experience, because it is very similar to a research project that would be completed by working professionals.

1.3 Value of Project

This project will help create an awareness of the fire problem to the public and leaders of cities and states. These are the people who have the power to make substantial difference in policy. If the general public is aware of the problems, they can also undertake major steps towards better fire safety practices. The general public, their governing officials, and the media are the primary audiences that will most benefit from the project. The public is the audience who is most affected from the results of the project. The media has the power to make the public aware of the results, while the public officials have the ability to do something to help improve the city or state that they oversee. For example, if city crime rates are higher than normal for a specific city, the government officials work with the police force to try to stop the spread of crime. The publication of city fire death rates could have the same results. Better-trained fire fighters and better forms of fire protection could be used in cities that have high fire death rates to help prevent future deaths.

1.4 Project Outcome

The final outcome of this project is the development of a procedure that will allow others to calculate fire death rates for U.S cities. The created procedure is documented in our report so that it can be reproduced year after year. We also used the procedure to determine and report the rates. Tables are used to show the different fire death rates of each city. Maps and graphs are also used to describe our findings. Personal outcomes from this project include a better understanding of our role in society through a real world

experience. We will also become more aware of the way societal problems are handled. Lastly, we will gain the experience of working in a professional atmosphere.

1.5 Basic Procedure

To obtain the results for this project, a procedure must be created and followed. The project began with the initial literature research into the background of fire related data. This was followed by research into similar data sets in order to obtain a perspective on how similar statistical analyses are created. After the initial research is done, research was done on statistical methods, in particular the ones used in the similar data sets in order to determine a suitable method for a fire death rate analysis. It was determined that fire death rates would be calculated based on a population of one million. We also calculated variance and 95% confidence levels for the data sets for each city which can be used to estimate future fire death rates of each city.

After the completion of the research, we collected data. We determined which cities would be studied, and we collected their zip codes. With this information, the number of deaths in each city was extracted from the National Fire Incident Reporting System (NFIRS) database. The United States Fire Administration collects fire data into the NFIRS database so that fire statistics can be produced. The database is explained in detail on pages 11 and 12 of this report. By searching the database for particular zip codes, we found data files for each fire in each city. We then searched the city fire incidents and found the number of fire deaths for each city. The number of fire deaths, populations of each city, and statistical methods were then used to create the average fire death rates for each city. These rates are represented in graphs and charts to give a physical view of the findings.

2.0 Literature Review

Throughout the United States, statistical research is performed to determine many fire statistics, such as number of fires, deaths, injuries and dollar losses. The National Fire Protection Association (NFPA) and the United States Fire Administration (USFA) both collect data pertaining to fire incidents each year. The NFPA is a nonprofit international membership organization, which studies and analyzes fire data based upon a yearly survey. The USFA, a department of the independent agency of the federal government called the Federal Emergency Management Agency (FEMA), designed the National Fire Incident Reporting System (NFIRS) database. The NFIRS database is a collection of data from fire department reports. (26) Although both organizations use their data to calculate many rates, they do not produce city-by-city fire death rates.

Before discussing the major issues regarding the fire problem, it is essential to understand the importance of the national standard of reporting fire data, which is called the NFPA 901: Standard Classifications for Incident Reporting and Fire Protection Data. In order to develop a uniform approach to classifying fire data, the NFPA Technical Committee on Fire Reporting created a national reference standard known as NFPA 901. NFPA 901 establishes the common language that allows for large-scale fire data analysis. (40) The goal of NFPA 901 is to have all fire departments throughout the U.S. using the same terminology and definitions, therefore resulting in uniform classifications.

NFPA 901 codes provide very useful information for analyzing the fire problem. Some classifications describe the property and structure before the fire occurred, while others describe how and where the ignition took place. Injuries, deaths, and monetary loss are also data elements covered by NFPA 901. The many codes and classifications

help describe every detail of reported fires. (40) Appendix C shows an example NFIRS form. Table 7 shows example codes for extent of flame damage, which is located in line U of the example form. (33)

Table 7: Extent of Flame Damage

Categories for Extent of Flame Damage	Code
Confined to Object of Origin	1
Confined to Part of Room or Area of Origin	2
Confined to Room of Origin	3
Confined to Fire-rated Compartment of Origin	4
Confined to Floor of Origin	5
Confined to Structure of Origin	6
Extended Beyond Structure of Origin	7
Undetermined/Not Reported	0

Source: Fire Data Analysis Handbook

The codes make it possible to give very specific details of a fire in a smaller compact computer report. (33)

The main objectives of NFPA 901 are listed in Section 1.3 of the code and are as follows. (38)

(1) To provide for the collection of data required for legal record purposes and control of the fire problem
(2) To provide local fire service management with information to indicate trends; to measure the effectiveness of fire prevention, fire suppression, and emergency mitigation procedures currently being used; to evaluate the impact of new materials and methods; and to indicate those areas that could require further attention
(3) To provide a pre-fire inventory of property in a fire service district so that future needs for fire protection resources and codes or regulations can be anticipated and potential problems corrected before a fire
(4) To provide uniform data to regional, national, and international fire and emergency organizations for the following aims:
    a. To make the full extent of the fire and emergency problem known
    b. To reveal facts that require action on these levels
    c. To guide the effective development and administration of codes and standards

d. To guide fire prevention, fire protection, emergency medical treatment, and hazardous materials handling research

2.1 Sources of Fire Data

•National Fire Protection Association (NFPA)

Every year the National Fire Protection Association surveys fire departments around the U.S. to gather data regarding the fires that have occurred. The results are pooled together in the form of a database. Currently the computerized database includes data from over 30,000 fire departments. A stratified random sample of 3,000 departments based on the size of the population that the departments protect is then taken by the NFPA. Since smaller departments do not always respond to the survey, the NFPA will often call those departments and ask for data so that they are represented in the survey. This sample is used to produce estimates on numerous fire statistics such as total number of fires, fire deaths, and total property losses. (26)

•NFPA's Fire Incident Data Organization (FIDO)

The NFPA also oversees the FIDO system. FIDO is an NFPA database that collects specific information about large-scale fires. The information used in the FIDO database is taken directly from the NFPA survey; the only difference is that FIDO only covers larger fires. When a fire causes three or more civilian deaths, one or more firefighter deaths, or over $5,000,000 in property loss the incident is recorded in the FIDO database. Since its establishment in 1971, the database has collected over 66,000 fires. The key aspect of FIDO is that the information provided is very detailed. It contains more specific information about incidents than any other database. (40)

•National Fire Incident Reporting System (NFIRS)

The National Fire Incident Reporting System is currently the largest database of fire data in the United States. Every year roughly one million new fires are added to NFIRS. (15) The goal of the NFIRS system is to have every fire incident in the U.S. recorded in one uniform way. The NFIRS database uses the definitions and standards outlined by NFPA 901. (15) Similar to the NFPA survey, NFIRS is used by organizations and individuals to study the US fire problem.

When a fire occurs, a member of the responding fire department completes an incident report. Appendix C shows the format of a basic incident report.(40) Fire departments that participate in the NFIRS program use similar or modified incident reports that include the same information. An example Massachusetts's incident report is shown in Appendix D. These reports, which also consist of civilian and fire personnel casualty reports, are then sent to state NFIRS coordinators or state fire marshals, where they are compiled into a state database. State databases are then electronically transmitted by the coordinators to the USFA who store them in the national NFIRS database. (26) Regardless of the nature or severity of the fire, all of the data is compiled into the database.

Table 8 shows the number of departments participating in each state for 1998.

Table 8: Fire Department Participation in NFIRS in 1998

State	No. of Participating Fire Departments	No. of Fire Departments in State*	Fire Departments Reporting (percent)
Alabama	1	1,100	<0.1
Alaska	93	320	29
Arizona	0	350	0
Arkansas	439	985	45
California	249	1,186	21
Colorado	0	380	0
Connecticut	179	330	54
Delaware	0	64	0
District of Columbia	1	1	100
Florida	305	672	45
Georgia	127	750	17
Hawaii	3	4	75
Idaho	157	250	63
Illinois	823	1,199	69
Indiana	451	952	47
Iowa	557	870	64
Kansas	501	666	75
Kentucky	552	813	68
Louisiana	266	604	44
Maine	39	463	8
Maryland	331	365	91
Massachusetts	328	367	89
Michigan	907	1,079	84
Minnesota	641	793	81
Mississippi	0	754	0
Missouri	0	895	0
Montana	243	400	61
Nebraska	226	480	47
Nevada	13	210	6
New Hampshire	93	242	38
New Jersey	305	810	38
New Mexico	0	366	0
New York	1,495	1,800	83
North Carolina	0	1,316	0
North Dakota	0	388	0
Ohio	1,064	1,240	86
Oklahoma	87	883	10
Oregon	0	349	0
Pennsylvania	0	2,164	0
Rhode Island	0	82	0
South Carolina	141	640	22
South Dakota	230	359	64
Tennessee	196	662	30
Texas	509	2,300	22
Utah	169	250	68
Vermont	136	243	56
Virginia	263	596	44
Washington	58	650	10
West Virginia	433	446	97
Wisconsin	176	880	20
Wyoming	92	165	56
Total	12,879	34,133	38

* Data on the number of fire departments were provided by each State Fire Marshal Office or equivalent responsible organization.

Source: USFA's 12th edition of *Fire in the United States.*

About 47 % of the fire departments in the participating states reported data, and 38 % of all fire departments in the US participated in the NFIRS program as of 1998. (20) The 1998 participation data is the most present available data reported by the USFA. According to a conference call to members of the USFA, currently fire departments in every state except Arizona participate in the NFIRS program. According to the USFA, Arizona does not participate because of the lack of NFIRS resources available to it (Appendix E). The Arizona state fire marshal also reported to us that Arizona does not collect any fire death data on a city basis. Figure 5 on page 49 of Section 5.0 shows the participation status of the cities in our study.

•National Center for Health Statistics (NCHS)

The NFPA sometimes uses data from the NCHS to use in its reports. The NCHS is the principal health statistics agency of the Federal Government. The NCHS uses information from death certificates to account for fire-related deaths throughout the United States.

When a person dies, local medical authorities prepare his/her death certificate. The certificate is coded by basic definitions established by International Classification of Diseases. (38) The NCHS gathers death certificate information from state health departments and puts them into a database. This database is then used for analysis and study.

Deaths related to fires are listed under the International Classification of Diseases codes E890-899. These codes include structure fires, clothing and material fires, controlled fires, and other fires. Since a death certificate represents every death, the database is a useful tool for information.

2.2 Fire Data Analysis

Both FEMA and the NFPA combine their data with population data from the U.S. Bureau of the Census to calculate fire statistics and rates. In some cases, both FEMA and the NFPA also use the NCHS death certificate database as a source of fire death data. FEMA will often use other sources, such as state fire marshals and federal databases on automobile crash deaths to account for any fire related deaths that the NCHS might have missed. (36)

The NFPA's survey of fire departments includes both large and small departments, so that there is an accurate representation of each in the final results. (40) The survey of the fire departments collects reports that contain information on many key aspects of the fire problem. Civilian deaths and injuries, total number of fires, and the total number monetary value of fires are reported on a national, regional, and state level. Rates are then calculated separately for each of the major property use section described by NFPA 901. Also included in the survey is the number of injuries and deaths of firefighters. This data is then classified by the nature of the injury and the type of duty being performed. The reports also specify the type and population of the community and any important information regarding multiple death fires. (26)

According to the USFA, larger cities generally report more regularly than smaller cities. Since larger fire departments have been proven to use the NFIRS system regularly, the data they report to NFIRS is a better representation of the fire problem than the data reported by smaller departments. For our study, we are focusing on the 58 U.S. cities with a population of 300,000 or greater. Other relative fire analysis information is discussed in the statistical methods section of this report.

2.31 NFPA

Although the NFPA does not currently publish city rates, they do produce many reports and documents discussing national, state, and regional fire statistics. The organization publishes the *NFPA Journal* every two months and *U.S. Fire Death Patterns by State*. Both the journal and the report give fire statistics of the U.S.

•*NFPA Journal*

Every two months the NFPA publishes its journal. Two key reports are published annually in the journal. These reports "Fire Loss in the United States" and "United States Fire Fighter Injuries" are published respectively in the Sep/Oct and Nov/Dec issues. The first report describes many aspects of the results of the NFPA survey for the previous year. Included are estimates on the number of fires, deaths, injuries, and dollar losses per capita of the nation. (8) Table 9 shows a few of the rates that were published in the 2001 Sep/Oct NFPA Journal. (8)

Table 9: Several Regional Fire Statistics of the United States

Region of the U.S.	Number of Fires per Thousand Population	Civilian Deaths per Million Population	Civilian Injuries per Million Population	Property Loss per Capita
Nationwide	6.2	14.8	81.6	$40.90
Northeast	6.2	17.3	111.7	36.5
Northcentral	6.4	15.6	92.1	36.8
South	7.2	17.7	70.5	42.2
West	4.5	7.0	62.2	46.2

Source: Fire Loss in the Unites States 2001

By comparing the rates of each region, one can see that there is much less risk of a fire or civilian fire death occurring in the west than in any other region. "U.S. Fire Fighter

Injuries", on the other hand, concentrates solely on any deaths or injuries of firefighters. Both reports give useful information on the fire problem of the U.S.

•*U.S. Fire Death Patterns by State*

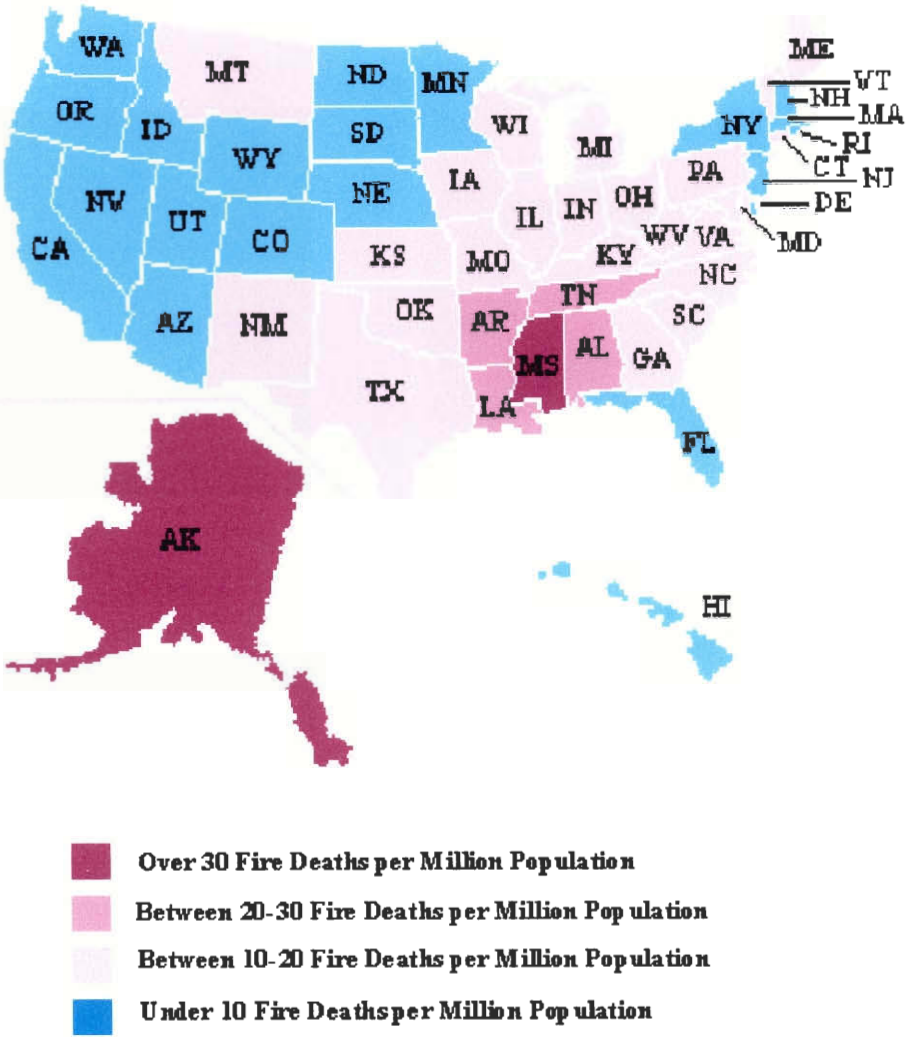
The NFPA's report *U.S. Fire Death Patterns by State* is a study based on the death certificate database of the National Center for Health Statistics (NCHS). The report lists the number of fire deaths and the number of fire deaths per one million people for each state. Table 10 lists the rates and rankings published in this report, while Figure 2 gives a graphical depiction of the results.

Table 10: 1998 State Fire Death Rates per Million Population and National Rankings

National Ranking	State	Rate Fire Deaths per Million Population	National Ranking	State	Rate Fire Deaths per Million Population
1	Mississippi	36.3	26	Maryland	10.5
2	Alaska	30.9	26	Maine	10.5
3	Arkansas	27.6	28	Connecticut	10.4
4	Tennessee	23.6	29	Ohio	10.1
5	Louisiana	23.1	30	New York	9.7
6	Alabama	21.4	30	Washington	9.7
7	West Virginia	19.3	32	Nebraska	9.6
8	Vermont	18.6	33	South Dakota	9.5
9	Oklahoma	17.3	34	North Dakota	9.4
10	South Carolina	17.2	35	Nevada	8.6
11	Georgia	16.5	36	Minnesota	8.5
12	North Carolina	15.5	36	Massachusetts	8.5
12	Pennsylvania	15.5	38	Florida	8.2
14	Indiana	14.9	39	Arizona	7.9
15	Kansas	14.8	40	New Jersey	7.6
15	Montana	14.8	40	Oregon	7.6
17	New Mexico	14.4	42	Idaho	7.3
17	Michigan	14.4	43	California	7
19	Virginia	13.8	44	New Hampshire	6.8
19	Missouri	13.8	45	Delaware	5.4
21	Iowa	13.3	46	Colorado	4.8
22	Texas	13.2	47	Utah	4.3
23	Kentucky	13	48	Wyoming	4.2
24	Wisconsin	12.1	49	Hawaii	3.4
25	Illinois	10.8	50	Rhode Island	1

Data based on NCHS death certificates, E-codes 890-899, U.S. Census Bureau population data
Source: U.S. Fire Death Patterns by State 2001 (NFPA)

Figure 2. 1998 State Fire Death Rates
Rates are in Fire Deaths per Million Population



Source: U.S. Fire Death Patterns by State 2001 (NFPA)

The rates show that the southeastern area of the U.S., consisting of Tennessee, Alabama, Mississippi, Arkansas, and Louisiana, has the highest risk of fire deaths. Western states, on the other hand, have mostly low fire risk. (36) City-by-city rates, however, are not calculated in this study.

2.32 USFA/FEMA

The most important USFA publications with respect to rates are *Fire in the United States* and *International Comparison of Fire Statistics*. Although one report is national and one is international, both reports give good examples of fire death rates.

•*Fire in the United States*

The USFA publishes *Fire in the United States* annually. This report describes, on a statewide basis, all of the information gathered from NFIRS the year before. Although no city-by-city rates are calculated, the USFA does calculate many state fire rates. Topics include fire deaths, injuries, and dollar loss. Rates of all three of these factors are calculated for each state. State profiles regarding the fire problem are also included in the report. These profiles contain the number of state fire deaths as well as the states fire death rates and rankings among the nation. Each profile also includes tables that show the causes of fires and fire deaths. (17) A chart of state fire death rates is also provided in the report and is shown in table 11.

Table 11: 1998 State Fire Death Rates per Million Population and National Rankings

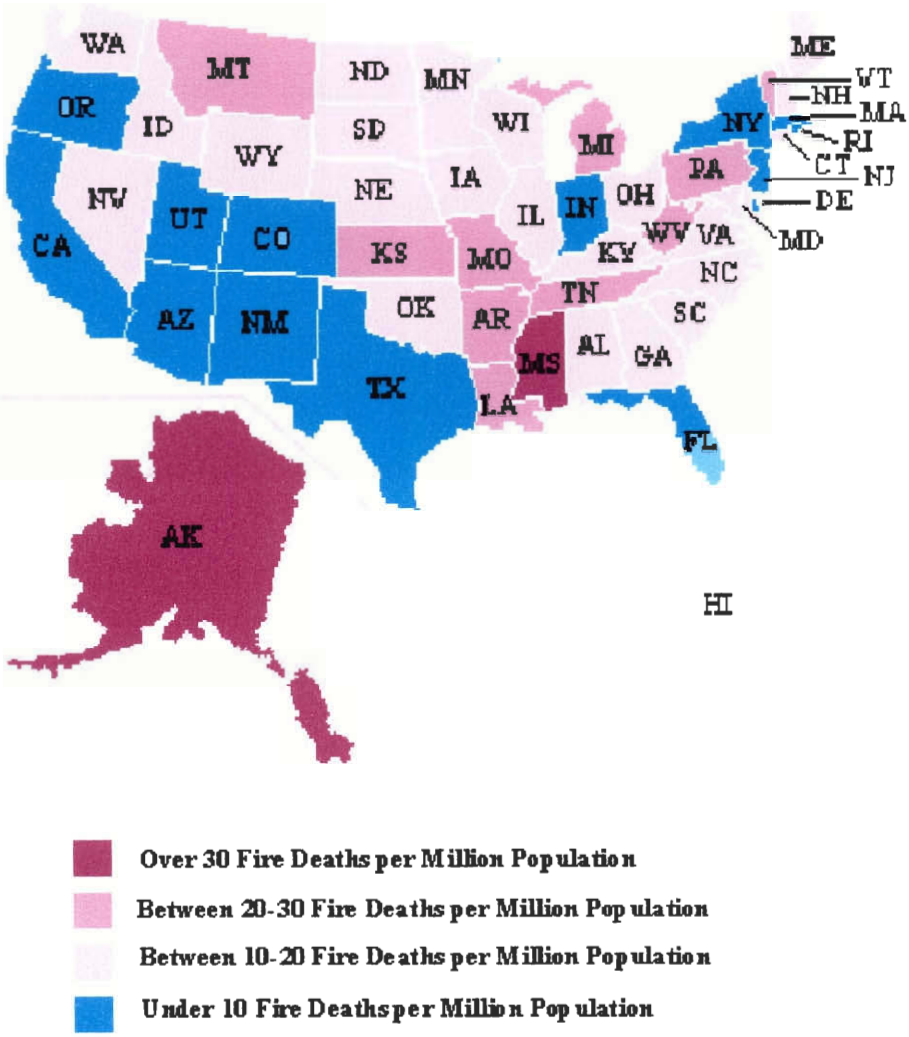
National Ranking	State	Rate Fire Deaths per Million Population	National Ranking	State	Rate Fire Deaths per Million Population
1	Alaska	39	26	Wyoming	14.6
2	Mississippi	38.2	26	Nevada	13.8
3	Arkansas	29.5	28	Ohio	13.7
4	Missouri	25.6	29	Virginia	13.3
5	Vermont	25.4	30	Washington	12.8
6	Montana	25	30	Wisconsin	12.4
7	West Virginia	24.8	32	Maine	12
8	Tennessee	23.6	33	New Hampshire	11.8
9	Louisiana	23.2	34	Connecticut	11.6
10	Kansas	22	35	Minnesota	11
11	Michigan	21.7	36	North Dakota	11
12	Pennsylvania	20.4	36	Hawaii	10.9
13	Alabama	19.5	38	Massachusetts	9.6
14	Dist. Of Columbia	19.2	39	Delaware	9.4
15	Georgia	18.3	40	Florida	8.9
16	Iowa	18.2	40	New York	8.8
17	South Carolina	18	42	Indiana	8.6
18	Oklahoma	17.7	43	Oregon	8.5
19	North Carolina	17.2	44	New Mexico	8.1
20	Kentucky	16.5	45	New Jersey	8
21	South Dakota	16.4	46	Arizona	7.7
22	Illinois	15.7	47	Utah	7.6
23	Idaho	15.4	48	Texas	7.3
24	Maryland	15.2	49	Colorado	6.8
25	Nebraska	15.1	50	California	6
			51	Rhode Island	1

Rank Order of States by Civilian Fire Deaths per Capita
Data from State Fire Marshal Offices or Equivalents
Source: Fire in the United States 1998 (USFA)

Figure 3 shows a graphical explanation of the state fire death rates, so that one can more clearly see where the areas of high and low risk are located.

Figure 3 1998 State Fire Death Rates

Rates are in Fire Deaths per Million Population



Source: Fire in the United States 1998 (USFA)

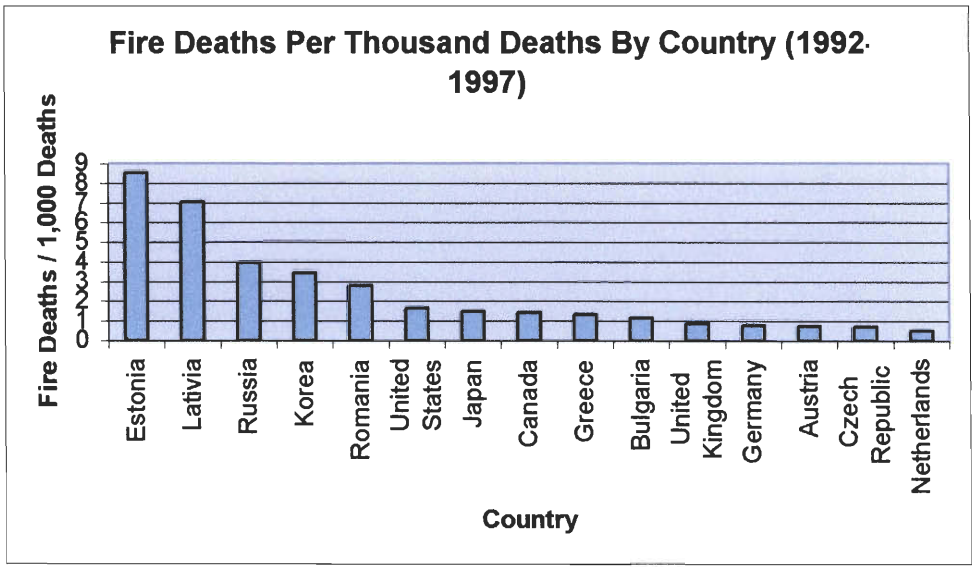
The NFPA and NFIRS maps show that many of the state fire death rates are very similar. Mississippi, Alaska, Arkansas, Tennessee, Louisiana, West Virginia, and Vermont are all ranked in the top ten for both studies. The rate per million population is however, higher in the NFIRS study than in the NFPA study. For example, the NFIRS fire death rate for Mississippi is 38.2 while it is only 36.3 in the NFPA study. Many of

the other states have similar rankings in both studies, with a higher fire death rate in the NFIRS study.

•International Comparison of Fire Statistics (1991-1998)

This study, prepared by the USFA, compares fire death rates on an international level. Some countries, such as Australia for example, use databases that are very similar to NFIRS (4). The similar system allows for easier comparison between countries. Data for countries in this report was taken from different international publications. These publications consist of *World Fire Statistics at the End of the Twentieth Century*, *World Fire Statistics Centre Bulletin*, *Mortality Rates*, and many NFPA reports. *International Comparison of Fire Statistics* concludes that the United States fire rates have declined from 1991 to 1998, but the rates still remain higher than rates of comparable industrialized countries. (6) Figure 4 shows the results.

Figure 4



The fire death rate of the U.S. is considerably larger than that of other countries such as the Czech Republic and Netherlands. Therefore, there is much more of a risk of dying in a fire in the U.S. than in many other industrialized nations.

2.33 TriData Corporation/Philip Schaenman

Philip Schaenman is the founder and president of TriData Corperation, a group that specializes in studies of fire protection. (41) TriData provides analysis and studies of fire management throughout the U.S. TriData also helps the NFPA and USFA produce many reports. Although there are many important reports published by Schaenman and TriData, only one report will be discussed.

•*An NFIRS Analysis: Investigating City Characteristics and Residential Fire Rates*

The goal of this study was to relate residential fires to characteristics of specific cities. The cities use in the study were:

Baltimore City, MD
Baltimore County, MD
Boston, MA
Buffalo, NY
Cleveland, OH
Columbus, OH
Dallas, TX
Denver, CO
El Paso, TX
Fort Worth, TX
Houston, TX
Jacksonville, FL
Los Angeles County, CA
Memphis, TN
Montgomery County, MD
Nashville, TN
New Orleans, LA
Norfolk, VA
Oklahoma City, OK
Portland, OR
Rochester, NY
San Antonio, TX
San Diego, CA
San Francisco, CA
Virginia Beach, VA
Washington, DC
Worcester, MA

The study concentrated on eight main factors of fire: arson, children, smoking, heating, cooking, electrical problems, appliances, and open flames. Climate and age of population were also discussed as possible factors. "The results of this analysis showed that certain city characteristics were significantly related to residential fire rates for seven out of the nine causes of fires. The amount of the difference explained by city characteristics ranged

from 70 percent for arson fires to 27 percent for open flame fires." (15) Although this report studied fires in many of the cities that we have involved in our analysis, it does not discuss fire death rates. However, the results of a study like this are very important because it helps target the conditions that might lead to fire incidents. Once aware of a fire problem, a city can put extra time and effort into prevention. (15)

2.4 Rates of Other Social Ills

City-by-city rates are produced throughout the United States for many other social ills. For example, crime rates, unemployment rates, and high school graduation rates are published and featured by the media each year.

2.41 Crime Rates

The Uniform Crime Reporting System (UCR) operated by the Federal Bureau of Investigation (FBI) is used as the standard database system for collecting crime data. The UCR system concentrates solely on the information from police reports. Around 94% of all Americans lived in an area that participated in the UCR program in the year 2000. (34) Crime incidents are broken down into specific categories so that the public can observe the risk of many different types of crime. Assault, robbery, and rape are some of the examples of offenses that are covered by crime statistics. (48)

When a crime is reported, the local police department writes up a report describing the details of the crime. The department converts the data into a form that is compatible with the UCR system. Once the reports are uniform, they are sent to the Federal Bureau of Investigation (FBI). The FBI analyzes the data and publishes the results in an annual report titled *Crime in the United States*. (48) The report enables the public and media organizations to become aware of the crime risk involved with living in

each city. The report lists the number of specific crimes that occurred on a national, state, and metropolitan level. However, *Crime in the United States* does not rank cities by their crime rates.

Although the UCR database contains useful data for calculating crime rates, the FBI does not recommend the use of the database to calculate crime rates or rankings. (34) The FBI believes that "These crude and/or incomplete analyses have often created misleading perceptions which adversely affect geographic entities and their residents." (46) The FBI also feels that many important factors that influence crime rates are often overlooked when compiling rankings. These factors consist of: (46)

- population density and degree of urbanization of the locality and its surrounding area;
- variations in composition of the population;
- the number of residents versus the "policing population," i.e., residents plus daily commuters, transients, tourists, shoppers, etc.;
- economic conditions;
- modes of transportation and highway systems;
- cultural conditions;
- family conditions with respect to divorce and family cohesiveness;
- climate;
- effective strength of law enforcement agencies;
- administrative and investigative emphases of law enforcement;
- policies of other components of the criminal justice system, i.e., prosecutorial, judicial, correctional, and probational.

Despite the FBI's warning, many crime data users produce rankings of city crime rates. Many media organizations produce annual crime rates. Morgan Quitno Press, for example, publishes annual city-by-city crime rankings. Tables 4 and 5 on page 3 of this report show the top ten and bottom ten city crime rates. They justify their rankings by focusing exclusively on rankings, not on the reasons behind the differences of the rates. In the annual publication *City Crime Rankings*, Morgan Quitno Press not only publishes city crime rates for every city over 75,000 population, but they also publish a list of

America's safest city awards. The safest city awards are based upon the comparison of the cities murder, rape, robbery, aggravated assault, burglary and motor vehicle theft rates to the national average of those rates. (34) According to the report, Amherst, New York is the safest city while Detroit , Michigan is the nation's most dangerous city.

2.42 Unemployment Rates

Every month the U.S. Census Bureau, an organization of the U.S. Department of Commerce, and the Bureau of Labor Statistics, an organization of the U.S. Department of Labor, perform a sample survey entitled the Current Population Survey (CPS). The goal of the CPS is to determine the unemployment status of the country. A sample of 60,000 households is chosen in such a manner that it is representative of the whole U.S. population. (32) The top ten and lowest ten unemployment rates of the 50 largest cities are shown in tables 5 and 6 of this report.

2.43 High School Completion Rates

The National Cooperative Education Statistics (NCES) system helped develop the Common Core of Data (CCD) as a database for national high school dropout data. Since completion rates are calculated from dropout data, the CCD can be used to calculate both completion rates and dropout rates. The CCD has established a basic definition of a dropout. (2) If a student leaves high school without a diploma and he/she does not transfer or return to school by October 1st of the following year, the CCD classifies him/her as a dropout. (14) Based upon this definition, schools send their number of dropouts to the state department of education. The state departments then send dropout data to the CCD where it is processed by the NCES, which uses the data to produce city and state completion rates. (14)

NCES combines data from the Current Population Survey and the CCD to establish average state and city completion rates. Rates are also produced for the District of Columbia. The average completion rate is defined as the proportion of high school students who leave school with a diploma or another completion record, such as a General Educational Development (GED) test, weighed against the number of all students who leave school. (42) Table 12 shows the ten highest and ten lowest graduation rates.

Table 12: 2000 Graduation rates as percentage of population

Ten Highest Graduation Rates		Ten Lowest Graduation Rates	
Breckenridge, CO	99%	Malibu, CA	N/A
Dublin, OH	98%	El Monte, CA	44%
Chevy Chase, MD	98%	Brownsville, TX	45%
Cedar Rapids, IA	98%	Hialeah, FL	46%
Highlands Ranch, CO	98%	Miami, FL	48%
Kingwood, TX	97%	Baldwin Park, CA	51%
Lake Oswego, OR	97%	La Puente, CA	51%
Scarsdale, NY	97%	Madera, CA	53%
Eden Prairie, MN	97%	Ridgeway, SC	53%
Weston, MA	97%	Richmond, TX	54%

Source: Moving.com

2.5 Statistical Methods

•Fire Death Rates

Both the NFPA and USFA use regression analysis to calculate their fire rates. Regression analysis creates a line of "best fit" within a data range. This line will reduce the spread of the data, but will not portray the actual data as well. The line of best fit reduces points that may lie well outside of the data range. In studies where regression is

used, socioeconomic conditions are taken into account. The linear regression helps portray certain spots where there may be a concentration of data, perhaps deaths, or firefighter injuries on a consistent basis. A national estimates approach is also used by both organizations to create estimates for specific parts of the fire problem, such as type of ignition and type of structure. (26)

The purpose of this study is to create a procedure for calculating city fire death rates; it is not the intention to produce rates based upon socioeconomic factors or rates based upon specific parts of the fire problem. Taking this into account, regression analysis will eliminate data that is not necessary to eliminate.

•Crime Rates

Crime rates are usually represented by crimes per thousand people. Crime data users interpret the data in the FBI's *Crime in the United States* report and publish their own rates and rankings. (46) Population figures are provided by the U.S. Bureau of the Census. (48) The rates are simply calculated by dividing the number of crimes committed, for a specific offense, by the population of the city and multiplying the result by 1,000 persons. This is much more similar to the study of city fire death rates, where method of death is not important, but the number of deaths is. According to the FBI, "UCR data is based on the actual counts of offenses reported by law enforcement jurisdictions." (46) The FBI believes that all criminal incidents are accounted for by the UCR survey.

•Unemployment Rates

In order to reach accurate representations, the CPS follows a specific method in selecting samples. The 3,141 counties, including several large cities, of the U.S. are first

classified into 1,973 geographic regions. Then, the U.S. Census Bureau chooses a sample of 754 of these regions to correspond to each state. Each one of these areas is broken down into groups of 300 households, and these 300 households are subdivided into groups of 4 households. Census Bureau employees interview one out of these 4 households for four consecutive months each year. Every quarter year, a different household is interviewed so that all 4 households are represented throughout the year. (28)

Since the CPS only produces unemployment estimates of the entire country, a program was needed that could determine rates of specific regions, such as cities and counties. Therefore, the BLS developed a Federal-State system called the Local Area Unemployment Statistics (LAUS) program. The LAUS program uses data from the CPS along with regression techniques to estimate unemployment rates. The regression analysis is based on past and present data taken from the CPS, the Current Employment Statistics (CES) program, and state unemployment insurance (UI) systems. The CES is a BLS survey of nonfarm payroll employment, while state UI systems display how many people are receiving unemployment benefits. The LAUS program calculates annual estimates of cities and metropolitan areas. The CPS and LAUS estimations are 90 to 100 % accurate. (31)

•High School Completion Rates

Two different methods are used to calculate graduation rates. The longitudinal completion rate is the more accurate of the two. This method uses the number of graduates obtained by the CCD Local Education Agency Universe Survey, which is a CCD database that includes graduation and dropout data of local school districts. In

order to calculate the longitudinal rate, the dropout rates of the previous four years are needed, because the equation involves a moving average. (2) The formula for this method is

$$c_{st}^{long} = \frac{g_{st}}{g_{st} + d_{st}^{12} + d_{s(t-1)}^{11} + d_{s(t-2)}^{10} + d_{s(t-3)}^{9}}$$

g_{st}= number of graduates at year t
d_{st}^{12} = number of dropouts in grade 12 at year t
d_{st}^{11} = number of dropouts in grade 11 at year t
d_{st}^{10} = number of dropouts in grade 10 at year t
d_{st}^{9} = number of dropouts in grade 9 at year t
t = year

The other method, the synthetic completion rate, uses information from only one year. Although much more simple to calculate, this method should only be used when dropout data and student populations are regular over a four year span, because all of the data is only taken from one year. (2) The synthetic completion formula is:

$$c_{st}^{syn} = \frac{g_{st}}{g_{st} + d_{st}^{12} + d_{st}^{11} + d_{st}^{10} + d_{st}^{9}}$$

2.6 Inaccuracies of Data

•Fire Data

There are a few reasons why fire data might not be accurate. Size of the data set, catastrophic fires, and classification problems are all factors that could influence the accuracy of fire data. The lack of fire department participation in the NFIRS program could also cause inaccurate fire data.

Smaller cities generally have fewer fires and fire deaths than larger cities. Since only a small number of fire deaths may occur within a given time interval, smaller cities may have less statistical precision in their data. Some instances may go unreported,

making the data set even smaller. Since working with a small data set increases inaccuracy of data, smaller cities may have inaccurate fire data. (26)

Catastrophic fires could also cause inaccuracy of fire data. If a catastrophic fire occurred in any city, there could be a significant increase in the number of fire deaths. This could cause a misrepresentation of the actual fire data in a particular area. (Appendix F)

Classification questions could also cause imprecision of data. For example, if a fire occurred as the result of an automobile crash, the incident could be considered a fire incident or a vehicle crash. Another example is the case of arson. If a fire is started by arson, a resulting death can be classified as a fire death or a homicide. (36)

Another factor that influences the accuracy of fire data is the participation or lack of participation of fire departments. (26) If every fire department in the U.S. participated in the NFIRS program, then there would be a complete data set that could be close to 100% accurate. However, not all departments participate. Therefore the lack of complete national participation affects the accuracy of fire data.

•Death Data

There are questions with the accuracy and limitations of the NCHS database. Classification of deaths is an important factor because causes of death are not always very specific. Once again, a death caused by an automobile fire might be considered a fire death or a vehicle accident death. For this reason, transportation deaths are not included in the database. Arson deaths are also not covered by the NCHS because they are considered homicides. (38)

Another problem that occurs when analyzing death certificates relates to the fact that a certificate does not specify where the fire occurred that took the persons life. The certificate lists the residence of the deceased and where they died, but neither of those places is necessarily where the fire took place. A large majority of the number of deaths obtained from death certificates did, however occur in the same city where the fire occurred. (38)

•Crime Data

Some major limitations exist that influence the accuracy of crime rates. The process of changing reports into the UCR format remains optional for police departments meaning that some departments keep non-standardized data in their reports on file. Since the UCR system only works with compatible data, it lacks every reported crime incident for all police departments. Also, classification discrepancies can pose limitations to the accurate analysis of crime rates. If more than one crime occurs in the same incident, the most severe crime is usually the only one recorded. For instance, assault and robbery are listed as separate classifications so when they take place within the same incident the report might only list one of them as the offense. (48)

•Unemployment Data

Although unemployment rates are produced by survey analysis, they are not 100 percent accurate due to the fact that it is difficult to survey the entire population in any given region. However, studies have shown that the LAUS and CPS programs do calculate unemployment rate estimates within 90 to 100 percent accuracy. This means that the resulting error is insignificant in the determination of the unemployment figures for any specific region. (45)

•High School Dropout Data

The CCD may establish uniform definitions for an incomplete high school education but limitations still exist. First, not all states follow the methods and definitions provided by the CCD and not all states report data to the CCD. Therefore, the NCES cannot use data from these regions. (42) A factor that may inflate the high school drop out data is the number of students who drop out of school between July 1st and October 1st. These students are included as dropouts but are not listed as being enrolled. (14) Also, some states lack a method of tracking transfer students resulting in them appearing within the data as dropouts and thusly increasing the dropout numbers. (42)

•Summary

As previously illustrated, any type of statistical analysis has its limitations. While the collection of unemployment data and crime data are the most accurate of the examples mentioned, there are definitional flaws or statistical inaccuracies when computing high school completion rates and fire death rates. The major inaccuracy of fire data is that smaller cities do not always report fire deaths. Since we know that larger cities generally report more data to NFIRS than smaller cities, our study concentrates solely on the largest U.S. cities.

2.7 - Media

One way to increase awareness of fire risks is to make results from this project available to the public through the media. Media resources such as newspapers, television broadcasts, and journal articles serve as the main information highways for the public today. Periodic newscasts aired daily, inform of current events locally and

nationally. Magazines and documentaries promote news and ideas to the public on a non-daily basis. There are many steps involved in the progression of an event taking place and a media resource publicizing it.

When a particular non-profit organization, such as the NFPA, does a study (such as analysis of fire death rates in a state-by-state manner) they release the information to the press via a press release or a press briefing. (Appendix G) This can be done either via videotape or live. Sending the information over the Associated Press wires that are accessed through the Internet can accomplish this as well. The wires are a twenty-four hour news source. Information is sent to these wires to be posted for reporters or the public to access. These wires also send the information to major outlets such as "USA Today," "The New York Times," "The Boston Globe," and other major newspapers. Once the information has gotten to the press it next must be analyzed by a journalist. A journalist will conduct their own research, perhaps go back the source and ask questions, or bring in outside agencies to further extrapolate the data. Using this same example, the newspaper could bring in an outside agency, such as the Morgan Quinto Agency, and create a city-by-city fire death rate report from the data released. Once the information is released to the press, it may deploy out in many different directions.

In a recent report in the "Los Angeles Times", a study was done in order to determine what information was currently being reported on television. The report determined that "Local television news programs distort their coverage of traumatic deaths and injuries emphasizing violence and giving viewers an unbalanced portrayal of the risks they face in everyday life, according to a new study by UCLA researchers." (39) In summary the report made evident that fact that murders, violence, suicides and other

social events may outweigh the "thrill" or "effect" of televising more fire related events. Media coverage of such stories help make the general public aware of the many social ills that affect society.

Unemployment rates are another important statistic that is highly publicized in the media due to the fact that these rates are a direct reflection of how the economy is progressing or regressing. The higher the unemployment rates the worse the economy is doing and vice versa. The economy is important enough and influential enough that the public constantly remains interested when it is publicized and broadcasted. Someone may live their entire life without ever being involved in or affected by a serious crime or a deadly fire, however every day of their life is affected by the economy and its outcomes. Unemployment rates are reported on a normal basis as well. Massachusetts sends out a press release to local newspapers and reporters once every month with local unemployment rates as well as state and national rates. (14)

High school completion rates are another statistic that is often reported in the media. This is similar to unemployment rates in that it is something that affects many people. Completion rates can be a direct reflection of the schooling system in a particular area. These are not reported as often as the unemployment rates for obvious reasons, but they have a very similar effect. The Manhattan Institute and Black Alliance for Education Options put New York's high school graduation rates behind most major U.S. cities. These conclusions were drawn from published reports and reported on "News 12 The Bronx." (Appendix B) This is another example of the media spreading information regarding social ills to the public.

The media represents a uniquely powerful way to get fire and fire safety information to the public. The process of sharing United States Fire Administration data with local media outlets has been recently formalized in an effort called "Quick Response Unit" (QRU). When a serious fire related incident occurs, the QRU faxes fire information based on NFIRS and other data sources to the local newspaper. Even with this information, still no city-by-city comparisons are formulated.

The goal of this project is to develop a procedure for calculation of city-by-city fire death rates. Similar to high school completion rates, unemployment rates, and crime rates, city fire death rates will need to utilize the media as the main tool to informing the public of the findings.

2.8 City Fire Death Rates

The previously mentioned reports show regional, state, and international fire death rates. However, the publications do not list city-by-city fire death rates or rankings.

A few different city rates, such as total alarms, total fires, building fires, and false alarms were produced and published by the NFPA until 1970. The following table (Table 13) shows an example of the rates produced by the NFPA in 1969 for the participating cities of Maine. (18)

Table 13: Fire Rates per Thousand Population for Cities of Maine

City	Total Alarms	Total Fires	Building Fires	False Alarms	Population in 1,000's
Auburn	23.7	7.3	2.1	0.9	26
Bangor	21.8	11.8	6.1	3.6	40
Brunswick	9.6	6.2	2.8	0.3	25
Lewiston	6.4	6.4	3.4		43
Portland	47.4	20.9	6.5	5	72.6
South Portland	41	23.8	5.7	4.8	24
Waterville	21.8	11.4	5.8	1.1	20

Source: 1970 NFPA Fire Journal

Although these rates were published annually from 1940-1970, city fire death rates were never published in the Fire Journal. It was difficult to achieve the precision needed to release the rates. The NFPA, however, did not report confidence levels on the rate data. Dr. Hall, of the NFPA, stated, "as far as I know, no one was publishing single year fire death rates for individual cities, then or at any other time". (Appendix F)

It is not entirely clear why city-by-city fire death rates were not published along with the other rate data in the 1940-1970 period. Schaenman made some attempts to explain annual fluctuations in city-by-city fire incident rate data and reports it in his *Procedures for Improving the Measurement of Local Fire Protection Effectiveness*. "The most important conclusion from this attempt was that the annual fluctuations in the rate of reported building fires within individual cities from 1960-1970 seemed too large and too random in too many cities to be explained by changes in the socioeconomic and building characteristics considered or indeed in any characteristics conceivable." (37) Schaenman's statement shows that it is difficult to explain why fluctuations of rates occur, however, his report does not conclude that the fluctuations are unreal.

John Hall reports that during the NFPA studies of the 60's and early 70's, some cities stopped sending in data to the NFPA. He believes cities stopped reporting because they believed that the fire data might make them look bad without an explanation of why. According to them the data did not account for any special circumstances of the city. Higher poverty levels would raise fire death rates, regardless of a high quality fire department. Also, if a city hospital covered a multi-state region, the fire deaths that occurred in the hospital might count against the hospital's city, not the city that the fire

took place.(Appendix F) Again, these factors cause a problem in determining why fire rates oscillate, but they do not necessarily cause a problem in determining rates.

From 1940-1970 there was no National Incident Reporting System. Every state and often every fire department used its own reporting methodology. The NFIRS database now makes it possible to gather the fire data needed to perform a city-by-city analysis. Every year, more departments participate in the NFIRS program, making data more robust.

The purpose of our study is to develop a procedure for creating comparative city fire death rates. We are not seeking to explain why there are fluctuations in rates or what factors cause these fluctuations. We previously mentioned that the FBI feels that many important factors that influence crime rates are often overlooked when trying to explain rankings. (46) These factors are listed on page 25 of this report. Hall also argues that city fire death rates should not be produced because they cannot be explained by the many factors causing the rates. These factors are very similar to the factors listed by the FBI. Organizations, on the other hand, still produce crime rates. Morgan Quitno Press for example, produces rates without discussing the factors that cause the differences of rates. (34) We are performing the same type of study as Morgan Quitno. We are simply calculating city-by-city fire death rates without discussing the many circumstances and reasons behind them. Statistical deviations and confidence levels are also calculated as an added feature, for use in estimating future performance based on the past.

Section 3.0 - Methodology

In order to obtain a general overview of the types of data available for this project, thorough examination of the production of fire data was completed. Next, investigation into many statistical approaches used to measure unemployment rates, crime rates, and high school completion rates were studied. The analyses used included frequency histograms, scatter plots, and tables. Through this examination, similarities between the analysis of these data sets and the analysis of the fire data were uncovered. The data for all four data sets were population-based data, meaning that the results correlated with the population of the city. After this discovery, these statistical relationships allowed for the methods developed to analyze the fire data for the creation of a city-by-city analysis.

Once a general method for putting together a city-by-city analysis of fire death rates was apparent, the different statistical methods to compile and compare data sets needed to be learned. These methods include confidence levels, and the methods for creating the charts and graphs pertinent to the data. In order to accomplish this, book research, interviews with professors, and practicing statistical applications with the other data sets and the fire data were completed. Next, this information was compiled into a single document displaying the learning of the statistical methods necessary, a background on fire and fire statistics, and the procedure for completion of this project.

The next major development of the analysis required retrieval of the number of fire deaths in each city and the population of the city. The fifty-eight most populated cities in the United States (population greater than 300,000) were selected from the United States Bureau of the Census data. (http://www.census.gov) the number of fire deaths per city is a statistic that must be found in the National Fire Incident Reporting

System's (NFIRS) database, which is sorted by zip code. This database is a voluntary system where local fire departments report their fire statistics. Numbers up to a five-year period were collected. In order to decipher each city's zip code, information from the United States Postal Service was used. (http://www.usps.gov) Since the NFIRS database is voluntary, it is realistic that some data belonging to a particular city may be missing data.

Now that all the necessary information is collected it will be written into a report type document containing plots, and tables. These statistical analyses will illustrate the intensive studies, research and comparisons obtained in this project.

The procedure developed will explain each step needed to collect data, analyze, present graphically, and disseminate to the media. The following summarizes what the group did in order to obtain the background data for this project. This is followed with a step-by-step procedure for calculating fire death rates on a city-by-city basis located on page 44.

3.1 Tasks and Task Chart

The task chart, table 14, is a chart that skeletons the progress and tasks done for the project. The chart is divided into four main parts. Section 1 is the tasks for the learning of background information, such as information about other social ills, fire data, statistical methods, and media information. Section 2 is the proposal of the project. Section 3 of the task chart is the actual procedure for calculating fire death rates. This is a step-by-step guide for the calculation of these rates and the goal of the IQP. Section 4 is the culmination of all three of the previous sections.

Section 1 – *Background Research*

Task A - *Collecting Fire Data*

The two existing databases of fire deaths in the country are the NFPA database and the NFIRS database. The NFPA database uses stratified random sampling to correlate their city-by-city and state-by-state fire data. This involves dividing the population into homogeneous subgroups and then taking a simple random sample in each subgroup. Constructing an analysis in this manner can be helpful when looking for causes of fires and finding places where a fire may start. The NFIRS database does not, however, divide their fire data into any type of subgroup. If a fire death occurs, it is simply reported to the NFIRS database and put on record. Therefore, for this project, the NFIRS database is a better source for simple calculation of fire death rates. Worcester Polytechnic Institute has an NFIRS database up to the year of 1995. As a result the data from 1991-1995 was used. Data is only available up to 1998 nationally. In addition to using the two databases, direct contact with NFIRS representatives in each state requesting the number of fire deaths in a particular city was used.

Task B - *Collecting Demographic Data*

In order to collect the data necessary, in this case the populations of the cities, the lists of data provided by the United States Bureau of the Census were used. A Census is taken every ten years, and a projection is given for the years in between. From this spreadsheet the population can be taken for each year the study was done. The NFIRS database is

based on zip codes and each city's zip code can be obtained from the United States Post Office. Using this database, the number of fire deaths per city was collected.

Task C – *Statistical methods*

Comparison rates are calculated using the number of fire deaths (provided by the NFIRS database) and the population data (provided by the United States Bureau of the Census) for any given city. The average number of fires per city (the mean), for a five year time period is the prospective end result. The reasons behind the five-year time period are that it gives more data to work with and to compensate for volaility.

Task D - *Other Social Ills*

After the collection of the fire data for this project was completed, data of similar social ills was studied and analyzed. Studies are done for everything from high school completion rates to abortion rates. Reports, such as these, containing information on a state-by-state or city-by-city basis were used as a basis for this project. Where the data was collected from, how accurate the data and the results are, the methods for displaying results, and the general statistical methods used to gather the reports were taken into consideration for this project. Studying the other reports lead to the methods for summarizing and reporting the fire data obtained.

Task E – Media

When the project is completed, it must be disseminated to the media. The media is the main link from the information from this project to the public. In order to get it to

the public, the findings of the project will be sent to various media outlets such as the Associated Press Wire, and various local newspapers and newscasts.

Section 2 – The Proposal

Upon the completion of the background research, a project proposal was written outlining the research done, and what the goal of the project will be. This proposal included an introduction that introduced the reader to the problem, a literature review, which gave the background information, and a methodology that displayed the method to be used to complete the project.

Section 4.0 – The Procedure

Upon the completion of this background research, a step-by-step guide for calculating fire death rates on a city-by-city basis was created as outlined in this section. It describes in detail how to collect the data, what statistical methods to use, how to disseminate the findings to the media and is followed by an example report of findings. The following is a step-by-step guide for calculating fire death rates using a five-year rolling average.

Task A - *How to collect demographic data*

- *United States Bureau of the Census*

In order to do a city-by-city analysis the population of the cities must be obtained. This information is obtained from the United States Bureau of the Census on the World Wide Web at http://www.census.gov. An example data set for this may be all the cities with a greater population than 300,000. This gives roughly 58 cities to use.

- *United States Postal Service*

For each city, all of the zip codes pertaining to the city are needed to obtain fire death information. The zip codes can be found on the World Wide Web from the United States Postal Service at http://www.usps.gov. The zip codes and city populations should be tabulated into a spreadsheet for reading purposes.

Task B - *How to collect Fire Death Data*

- *The NFIRS database*

The NFIRS database is the main source of information for fire deaths in a particular city. It can be obtained by contacting the USFA on the World Wide Web at http://www.fema.gov. Zip codes for each particular city are then input into the database and the number of fire deaths in each zip code is the output. These outputs are then added up for all the zip codes of a particular city and this is the number of fire deaths for that particular city.

- *State NFIRS Program Managers*

State NFIRS program managers are the other point of contact. Contact information can be obtained on the World Wide Web at http://www.nfic.org. These state program managers have accessible NFIRS data for each city within their own state. Contacts with them double check the NFIRS data obtained from the database.

Task C - *How to calculate comparison rates*

- *Five year fire death rates*

To calculate the fire death rates, the fire death rate was calculated for each city per million population first. This was done with the simple ratio of

Fire deaths/population = fire deaths/1 million population and was done for a five-year time interval, from 1991-1995. The mean value for the five-year time span was then calculated. In addition to calculating the current rates, future rates can be projected using the confidence intervals from the statistical methods section.

Task D – *Media Strategies*

The media acts as the most important communication network for the public. Many methods for the output of news and information include magazine articles, newspapers, journals, books, and television broadcasts. This is critical for this IQP because the results can be released into the social community of the United States in numerous ways. The information obtained from this report can be disseminated to the media through various outlets. Like crime rates, high school completion rates, and unemployment rates, once calculated, a report can be sent to various media outlets such as Associated Press News Wire, where it will be distributed to the main media outlets. This can be done at http://www.ap.org. Sample press releases can be found in Appendix G and I. The release gives a general overview of what was done, and who to contact with questions. A press conference can be arranged and the information can be made public through this outlet. These are the two methods to be used to make information from a study like this to be made public.

Section 5.0 - Outcomes

The final outcome of this project is the procedure that allows for the calculation of fire death rates for U.S cities, shown in Figure 6. This original procedure was documented to enable the user to produce credible city-by-city death rate comparisons year after year. Tables show the different fire death rates of each city and graphs are also used to describe the findings. The final product, the procedure for the creation of city-by-city fire death rate comparison, found in Section 4.0, can be released to the press in the form of a report in order for the public to view the results.

From a public standpoint, this project has many important benefits. For the first time city-by-city fire death statistics can readily be made available to the public. Statistical analysis has been done for many other social ills on a city-by-city basis but it has not been done on fire data. In addition to increased awareness of the total number of fire deaths occurring in the nation, the public will be able to view where these fires are occurring. Similar to the way crime rates, and high school completion rates are used, fire death rates will be accessible to the public, thus increasing awareness. Throughout this project we have learned multiple things that will benefit in the professional office. We gained a better understanding of society, in particular, fire in society. This is the main goal of the IQP; to enable the student to relate the technology that he or she is studying, in way to benefit society. In addition we learned how to plan a big project over a long period of time. This included schedule planning, and time management.

5.1 - Discussion of Results

The overall fire death rate reflects the deaths from fires of all different causes. As indicated in Table 1 Baltimore, MD has the highest fire death rate (52.5) among cities with a population greater than 300,000. Contrary to Baltimore, Indianapolis, IN has the lowest fire death rate (1.3).

Table 1:

Highest Ten Rates
1990-1995
Fire Deaths per Million Population

Rank	City	Rate
1	Baltimore, MD	52.5
2	Detroit, MI	49.4
3	Cincinnati, OH	32.4
4	Nashville, TN	27.0
5	Washington DC	24.5
6	Chicago, IL	24.0
7	Portland, OR	23.5
8	Toledo, OH	22.5
9	New York, NY	21.9
10	Atlanta, GA	21.3

Table 2:

Lowest Ten Rates
1990-1995
Fire Deaths per Million Population

Rank	City	Rate
46	Indianapolis, IN	1.3
45	New Orleans, LA	2.1
44	Houston, TX	2.5
43	Oakland, CA	2.7
42	San Jose, CA	3.0
41	Seattle, WA	3.0
40	Honolulu, HI	3.4
39	Milwaukee, WI	3.4
38	Long Beach, CA	3.9
37	San Diego, CA	4.0

According to the USFA, currently every state, except Arizona, participates in the NFIRS program. However, this does not mean the database is complete. There are many states that only a certain amount of the fire departments in the state participate. This makes for a database that is not quite complete yet. Figure 5 lists the fifty-eight cities with a population greater than 300,000 citizens, along with the number of years of fire death data available. It was found that of the fifty-eight cities, forty-six reported fire data for at least one year from 1991-1995. If a city only has two years worth of fire death data available, the average was calculated solely based on the data available for each city.

From this data, Figure 6 gives the fire death rates of all 58 cities, with the 12 not reporting located at the end of the chart.

Figure 5 – NFIRS Participation

City	Population	Years Participating	City	Population	Years Participating
New York NY	7746511	5	Portland OR	519621	5
Los Angles CA	3713238	3	Cleveland OH	505962	5
Chicago IL	2866191	5	Tucson AZ	500992	0
Houston TX	1920350	5	Oklahoma City OK	488431	4
Philadelphia PA	1451520	0	New Orleans LA	471134	1
Phoenix AZ	1300786	0	Kansas City MO	447921	0
San Diego CA	1266132	3	Virginia Beach VA	446431	5
San Antonio TX	1193440	5	Long Beach CA	444563	4
Dallas TX	1119580	5	Albuquerque NM	439724	1
Las Vegas NV	1020055	0	Atlanta GA	422266	3
Detroit MI	972390	5	Sacramento CA	415818	4
San Jose CA	888632	3	Fresno CA	413000	3
Honolulu HI	883621	3	Omaha NE	397243	5
Indianapolis IN	768124	2	Mesa AZ	396003	0
Austin TX	611561	5	Tulsa OK	392102	5
Milwaukee WI	584763	1	Miami FL	390540	0
Washington DC	572059	4	Oakland CA	373215	1
Boston MA	570888	5	Colorado Springs CO	371363	0
Seattle WA	550005	3	Minneapolis MN	364049	5
San Francisco CA	763146	4	Wichita KS	339907	5
Jacksonville FL	735992	3	Pittsburgh PA	351769	0
Columbus OH	676701	5	Saint Louis MO	341708	0
Baltimore MD	647955	5	Cincinnati OH	333750	5
El Paso TX	637462	5	Arlington TX	324533	3
Memphis TN	628851	5	Santa Ana CA	316070	3
Charlotte NC	625371	0	Toledo OH	310586	5
Nashville TN	533484	5	Buffalo NY	308288	3
Denver CO	529978	5	Tampa FL	307747	0
Fort Worth TX	522612	5	Anaheim CA	307240	2

SOURCE – NFIRS DATABASE

With the data available interpretations can be made as to how many fire deaths a city might expect in the future based on data from the recent past. Standard deviation, variance, and confidence intervals are all important tools of statistical analysis. Standard deviation and variance determine the spread of the data about the mean value. Figure 8 shows the cities in order of highest to lowest variance. Confidence levels determine an

interval that the fire death rate could be in between in the future. In a 95% confidence interval for fire death rates, one is 95% confident the fire death rate will be in the interval the following years. Some cities have varied fire deaths from year to year thus creating a larger confidence interval, as evident in Baltimore, MD, in figure 9. While cities such as New York, NY has data not as varied creating a smaller confidence interval. The variance and confidence levels can be found in Figures 7 and 8 on pages 52 and 53 respectively. The variance in Baltimore's death data is the highest, it is up close to 25, while their confidence level is from 30-110, which is expected with such a high variance.

The goal of this project, however, was to create a procedure to make public the fire death rates of the large cities of the U.S. With the help of statistical methods and the NFIRS database, it was made possible. With the release of fire death rates on a city basis, the general public will now be aware of where people are dying due to fire on a more localized level, similar to crime rates, high school completion rates, and unemployment rates.

Figure 6 Five Year Average of Fire Death Rates

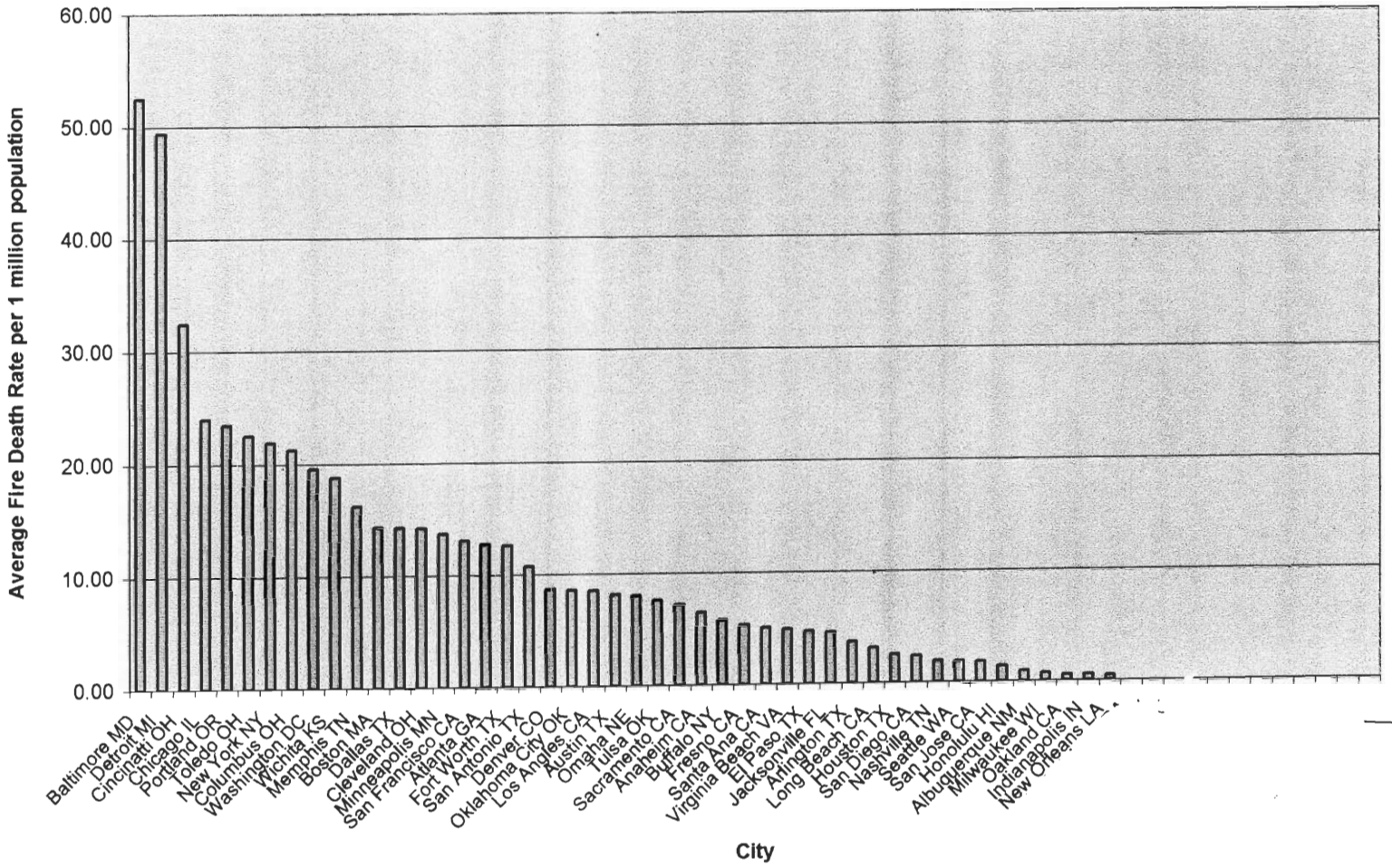


Figure 7 Variance

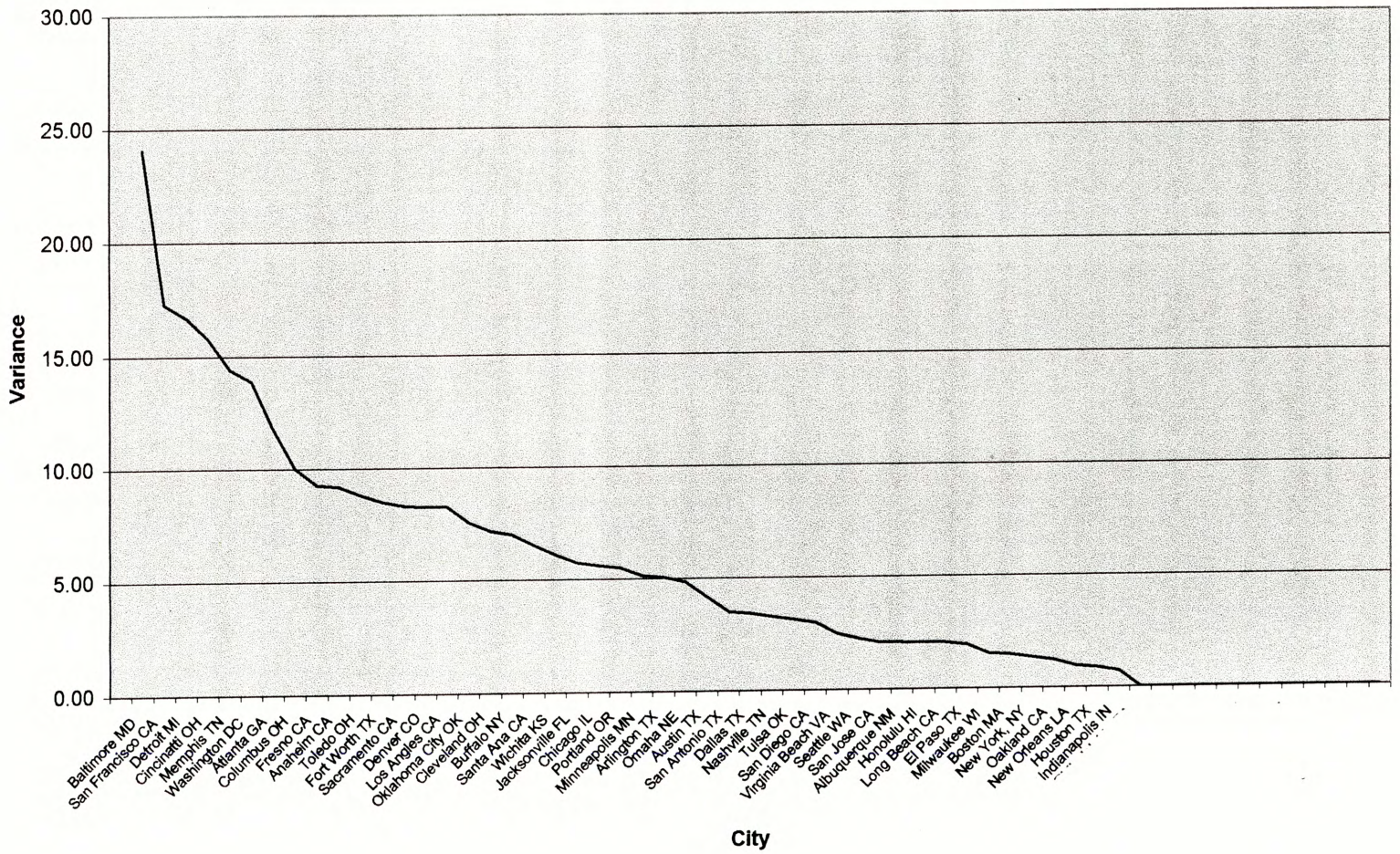
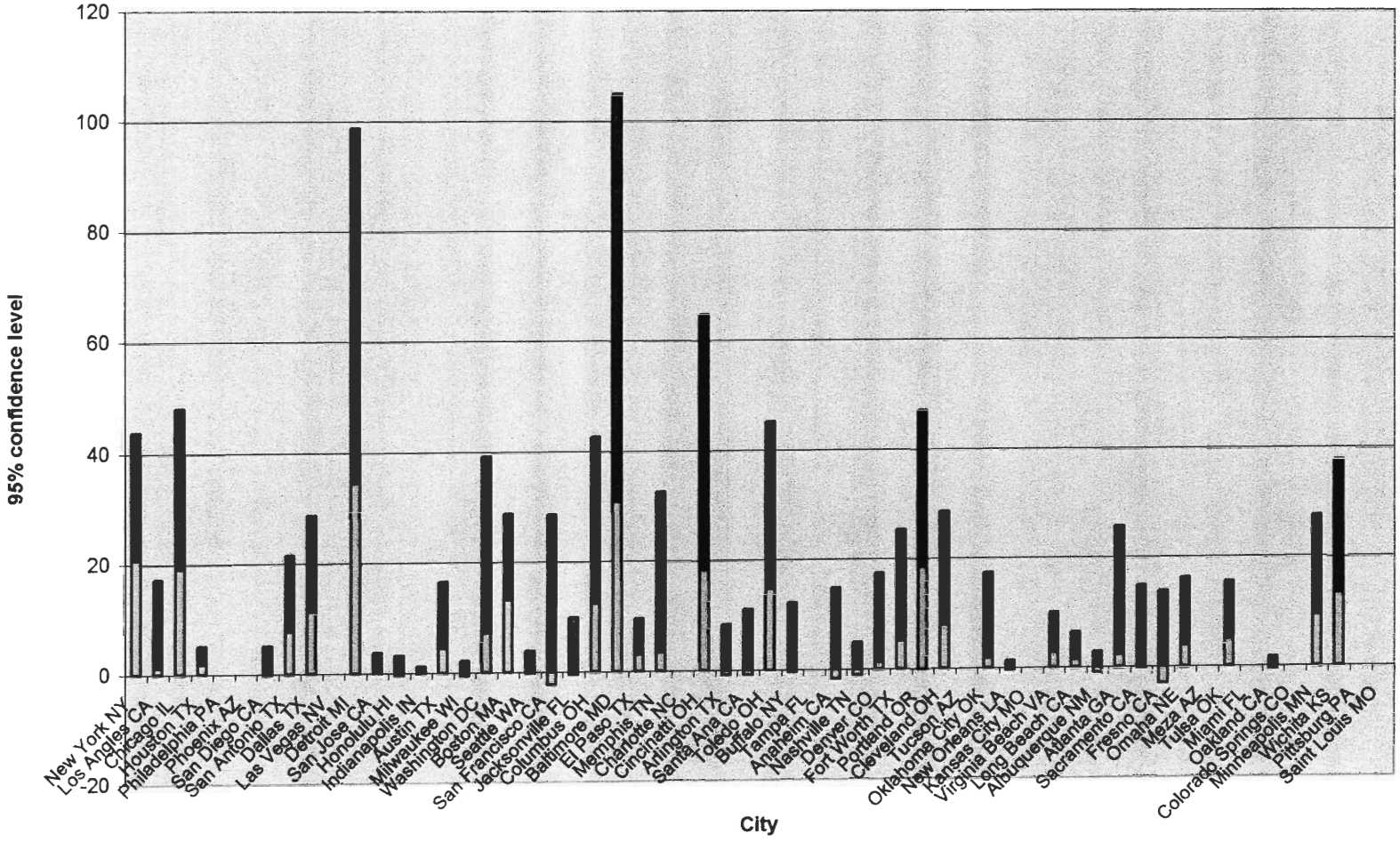


Figure 8 95% Confidence Level



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Appendix A

USA Today Article on Crime Rates

Appendix B

News 12 Report on Graduation Rates

Appendix C

Sample NFIRS Form

BASIC INCIDENT REPORT

902F

Fill In This Report In Your Own Words _____ Fire Department ☐ Revised Report

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y

COMPLETE ON ALL INCIDENTS

FD ID	Incident No.	Index No.	Mo.	Day	Year	Alarm Time	Time on Scene	Time Last Unit Clear

Location/Address	City/Town	Zip Code	Property No.

Occupant Name (Last, First, MI)	Telephone No.	Room or Apt.

Owner Name (Last, First, MI)	Address	Telephone No.

Method of Alarm to Fire Department	Type of Incident

Type of Action Taken	District	Shift	No. Alarms	Mutual Aid ☐ Rec'd ☐ Given ☐ N/A

General Property Use	Specific Property Use	County	Census Tract

No. Injuries* Fire Service	Other Emerg.	Civilian	No. Fatalities* Fire Service	Other Emerg.	Civilian

No. Fire Service Personnel Responsed	No. Engines Responded	No. Aerial Apparatus Responded	No. Other Vehicles Responded

COMPLETE IF FIRE TYPE OF INCIDENT (TI) 10-19

ON ALL FIRES TI 10-19

Condition of Fire upon Arrival of First Unit	Time from Alarm to Agent Application	Area of Fire Origin

Equipment Involved in Ignition	Year	Make	Model	Serial No.

Form of Heat of Ignition	Material First Ignited Form/Use	Type

Ignition Factor	Method of Extinguishment

Property Damage Classification	No. Buildings Damaged	Termination Stage

FOR STRUCTURE FIRE TI 11-13

Construction Type	No. of Stories	Level of Origin

Structure Status	No. of Occupants at Time of Incident

Material Generating Most Flame Form/Use	Type	Factor Contributing to Flame Travel

Material Generating Most Smoke Form/Use	Type	Avenue of Smoke Travel

Detector Type	Detector Power Supply	Detector Performance

Sprinkler System Performance	No. of Sprinkler Heads Operated

Extent of Flame Damage	Extent of Smoke Damage	Extent of Extinguishing Agent Damage

Mobile Property Type	Year	Make	Model	Serial No.	License No.

TI 12-14

No. of Private Acres Burned	No. of Federal Acres Burned	No. of Other Public Acres Burned

TI 15

Member Making Report	Date	Officer in Charge (Name, Position, Assignment)	Date

COMPLETE ON ALL INCIDENTS

Remarks:

☐ Remarks continued on reverse side.

*A Form 902G must be completed for each Fire Casualty.

This form is for use with NFPA 902M, *Field Incident Manual*. Users should also refer to NFPA 901, *Uniform Coding for Fire Protection*, for information on fire reporting systems and classifications for information entered on this form.

FIG. 10-2A. Basic incident report form recommended by NFPA's Technical Committee on Fire Reporting.

Appendix D

Sample MFIRS Form

MASSACHUSETTS FIRE INCIDENT REPORT

DEPARTMENT OF PUBLIC SAFETY — OFFICE OF THE STATE FIRE MARSHAL
1010 Commonwealth Avenue — Boston, Massachusetts 02215

Massachusetts Fire Incident Reporting System

(A) 10 FDID# 13281 | Department: Springfield | Revised Report: | FORM FP-32

Incident # 953146 | If Exposure Fire Only: | DATE 4/12/95 | Day Of Week: 1 Sun 2 Mon 3 Tue 4 Wed 5 Thu 6 Fri 7 Sat — 1 | Alarm Time 02:24 | Arrival Time 02:26 | Back in Service 03:13

(B) SITUATION FOUND: 11 Structure fire; 13 Vehicle fire; 14 Brush, grass, leaves; 15 Trash, rubbish; 16 Explosion. No after fire; 17 Outside spill with fire; 18 Other fires not classified; 47 Chemical spill; 44 Power line down; 45 Arcing electric equipment. SEE MANUAL FOR OTHER CALLS: 13

ACTION TAKEN: 1 Extinguishment; 2 Rescue or Assistance; 3 Investigation only; 4 Remove Hazard; 5 Stand by; 6 Salvage; 7 Ambulance; 8 Fill in Move up — 1

MUTUAL AID: 1 Rec'd; 2 Given; X N A

(C) FIXED PROPERTY USE (Occupancy): Mall Parking Lot — 965 | IGNITION FACTOR: Suspicous — 21

(D) CORRECT ADDRESS (Up to maximum of 21 characters): 1240 Main Street | ZIP CODE 01107 | CENSUS TRACT 803000

(E) 11 OCCUPANT NAME (LAST, FIRST, MI): Unoccupied | TELEPHONE: | ROOM or APT.:

(F) 12 OWNER NAME (LAST, FIRST, MI): Tiffins, Leonard M. | ADDRESS: 162 Elm Street | TELEPHONE: 413-783-2799

(J) 13 METHOD OF ALARM: 1 Telephone direct; 2 Municipal alarm system; 3 Private alarm system; 4 Radio; 5 Verbal; 6 No alarm recd; 7 Tie-line (911); 8 Voice signal municipal alarm signal; 9 Not classified above; 0 Undetermined or not reported — 4

CO INSPECTION DISTRICT: 2 | SHIFT: 3 | NO. ALARMS: 1

(H) NO. FIRE SERVICE PERSONNEL RESPONDED: 7 | NO ENGINES RESPONDED: 1 | NO. AERIAL APPARATUS RESPONDED: 1

HAZARDOUS MATERIAL PRESENT? YES NO X | SUBSTANCE: | Special Equipment Used? | NO TANKERS RESPONDED: 0 | NO. OTHER VEHICLES RESPONDED: 0 | USE FP 33 FOR ALL CASUALTIES

(I) 20 FIRE SERVICE NUMBER OF INJURIES: 0 | NUMBER OF FATALITIES: 0 | OTHER NUMBER OF INJURIES: 0 | NUMBER OF FATALITIES: 0 | RESCUES: 0

(J) MOBILE PROPERTY TYPE: 11 AUTO, VAN; 12 BUS; 13 MOTORCYCLE; 21 TRUCK OVER 1 TON; 22 TRUCK UNDER 1 TON; 41 BOAT, UNDER 65; 08 NONE — 11

VEHICLE STOLEN? Yes [X] No [ ]

ESTIMATED TOTAL DOLLAR LOSS: 14,000. | Insurance Co.: Allstate | Total Insurance: $? | Claim Paid: $

30 | YEAR | MAKE | MODEL | COLOR | LICENSE NO. | VIN#
1992 | Chev | Cam | Red | 426DJL | 1G1AB6899BY163635

40 IF EQUIPMENT INVOLVED IN IGNITION | YEAR | MAKE | MODEL | SERIAL NO.
N/A

(K) COMPLEX: Shopping — 58 | AREA OF ORIGIN: Passenger Area — 81 | EQUIPMENT INVOLVED IN IGNITION: None — 98

(L) FORM OF HEAT IGNITION: Match — 45 | MATERIAL IGNITED: Accelerant | FORM: Accelerant — 86 | TYPE: Gasoline — 23

(M) METHOD OF EXTINGUISHMENT: 1 Self extinguished; 2 Make shift aids; 3 Portable extinguisher; 4 Automatic ext. system; 5 Pre-connect hose, tank only; 6 Pre-connect hose, hydrant draft standpipe; 7 Hand-laid hose, hydrant draft standpipe; 8 Master stream device — 5

LEVEL OF FIRE ORIGIN: 1 Grade level to 9 ft.; 2 10 to 19 feet; 3 20 to 29 feet; 4 30 to 49 feet; 5 50 to 70 feet; 6 Over 70 feet; 7 Objects in flight; 8 Below ground level; 9 Not classified above; 0 Undetermined — 1

Number of Stories: 1 1 story; 2 2 story; 3 3 to 4 stories; 4 5 to 6 stories; 5 7 to 12 stories; 6 13 to 24 stories; 7 25 to 49 stories; 8 50 stories or more

CONSTRUCTION TYPE: 1 Fire resistive; 2 Heavy timber; 3 Protected noncombustible; 4 Unprotected noncombustible; 5 Protected ordinary; 6 Unprotected ordinary; 7 Protected wood frame; 8 Unprotected wood frame; 9 Not classified above; 0 Undetermined or not reported

(N) EXTENT OF DAMAGE: 1 Confined to the object of origin; 2 Confined to part of room or area of origin; 3 Confined to room of origin; 4 Confined to the fire-rated comp. of origin; 5 Confined to floor of origin; 6 Confined to structure of origin; 7 Extended beyond structure of origin; 9 No damage of this type (N A) — Flame: | Smoke:

(O) (P) DETECTOR PERFORMANCE: 1 Det. in room or space of fire origin — oper; 2 Det. not in rm. or space of fire origin — oper; 3 Det. in rm. or space of origin — no oper.; 4 Det. not in rm. or space of origin — no oper; 5 Det. in rm. or space of fire origin but fire too small to oper; 9 Not classified above; 0 Undetermined or not reported; 8 No detectors present (N A)

SPRINKLER PERFORMANCE: 1 Equipment operated; 2 Equipment should have operated — did not; 3 Equipment pre. but fire too small to oper; 9 Not classified above; 0 Undetermined or not reported; 8 No equipment present (N A)

(Q) IF SMOKE SPREAD BEYOND ROOM OF ORIGIN | MATERIAL GENERATING MOST SMOKE | FORM | TYPE

(R) WEATHER CONDITIONS:

AVENUE OF SMOKE TRAVEL: 1 Air handling duct; 2 Corridor; 3 Elevator shaft; 4 Stairwell; 5 Opening in construction; 6 Utility opening in wall; 7 Utility opening in floor; 9 Not classified above; 0 Undetermined or not reported; 8 No avenue of smoke travel (N A)

MEMBER MAKING REPORT: Lt. Kenneth Baker | DATE: 4/12/95

Entries contained in this report are intended for the sole use of the State Fire Marshal. Estimations and evaluations made herein represent "most likely" and "most probable" cause and effect. Any representation as to the validity or accuracy of reported conditions outside the State Fire Marshal's office is neither intended nor implied.

FIRE MARSHAL
FM ____ 1 Yes 2 No

Appendix E

Teleconference Notes with USFA

Teleconference Notes

Date
- January 30, 2002

Location
- WPI Center for Firesafety

Attendance
- Matthew Long (student)
- Paul Elliott (student)
- Brad Paybody (USFA)
- Bob McCarthy (USFA)
- Alex Furr (USFA)

Notes

On January 30, 2002 Paul and I met with Ms. Furr, Mr. Paybody, and Mr. McCarthy. The following is a brief synopsis of the meeting.

- How NFIRS works
  - Fire department responds to a call
  - Complete NFIRS form
  - Sent to state fire marshal
  - QC/QA
  - Validated
  - Sent to USFA
- Every state participates to a degree except for Arizona
  - Due to lack of resources
- Reasons for departments not participating
  - Do not use data
  - Like more simple system
  - Resources
- USFA puts out annual reports with the data
- Who uses the data
  - NFPA
    - Generally scales up NFIRS data
  - CPSC
  - National Highway and Traffic Administration

Appendix F

Dr. John Interview/Email

Meeting Notes

Date
- October 4, 2001

Location
- National Fire Protection Association Headquarters, Quincy, Massachusetts

Attendance
- Matthew Long (student)
- Paul Elliott (student)
- Kimberly D. Rohr (Fire Data Specialist, Fire Analysis & Research)
- Nancy L. Schwartz (Fire Analysis & Research)
- Marty Ahrens (Fire Analysis Specialist, Fire Analysis & Research Division)
- John R. Hall, Jr., Ph.D. (Assistant Vice President, Fire Analysis & Research)

Notes

On October 4, 2001, Paul and I met with Ms. Rohr, Ms. Schwartz, Ms. Ahrens, and Dr. Hall. The following is a brief synopsis of the meeting.

- Fire data is limited internationally
- Only about 2-3 dozen countries have available data
- Much of this data is not compatible
- First Chapter of NFPA handbook has pertinent information
- US Safety Council has fire death breakdown state by state
- Many studies done comparing causes of fires and suppression systems
- When a fire occurs it does not have to be reported
- NFIRS is voluntary and there are many different cutoffs
- Example: fire occurs, no dollar loss,
  - Reported in some states as a fire
  - Others it goes unreported
  - Other reasons fires go unreported
    - Firefighters don't like paperwork
    - No laws stating they must
- gray area on what a fire death is
  - motor vehicle accident and car catches fire
    - NFPA fire death
    - State vehicular homicide
- political reasons why a study like this hasn't been done
  - make cities look bad for honesty
  - some cities have special considerations
  - no data
    - different thresholds of reporting fires for each state
  - last attempted in 1970
- possible places for information
  - FEMA

- National Safety Council
- NFIRS
- NFPA library
- Municipal Fire Departments
- National Database
- Wisquers database
- Insurance Companies
-

.att long

From: Hall, John [jhall@NFPA.org]
Sent: Friday, April 12, 2002 8:11 AM
To: 'matt long'; Hall, John
Cc: pelliott@WPI.EDU
Subject: RE: couple more questions.....

.tt -- As far as I know, no one was publishing single-year fire death rates for individual cities, then or at any other time. The numbers were and are so volatile from year to year. Also, back in 1969, NFPA's statistics were ot prepared in statistically sound ways; I would try to avoid using them if you can. -- John Hall

-----Original Message-----
rom: matt long [mailto:mlong_11@WPI.EDU]
ent: Thursday, April 11, 2002 10:03 PM
o: jhall@nfpa.org
c: pelliott@WPI.EDU
ubject: couple more questions.....

r. Hall,
We have found the 1969 Fire Record of cities, it gives total alarms, total
ires, building fires, and false alarms, but not fire death rates. Where an we find previous fire death rate. Was this published somewhere else other than the Fire Journal?
hanks,
Matt Long
aul Elliott

Appendix G

NFPA Press Release on U.S. Fire Death Rates

Appendix H

Pat Samson Interview on Media Coverage of Social Ills

Meeting Notes

Date
- December 13, 2001

Location
- Boynton Hall Worcester Polytechnic Institute, Worcester, MA

Attendance
- Matthew Long (student)
- Paul Elliott (student)
- Patricia Samson (university media relations)

Notes

On December 13, Paul and I met with Ms. Samson, The following is a brief synopsis of the meeting.

- Research on statistics is done by non-profit organizations
- Then transmitted to media
- Many forms
  - Press release
  - Press briefing
  - Business wire
  - Public Relations wire
  - Connection with bid media outlets
    - USA Today
    - New York Times
    - Boston Globe
- Once information released it takes a life of its own
- Journalists analyze
- Bring in outside people to analyze
- Different interpretations
- Why are crime rates more well known that fire statistics?
  - Data more readily available
  - Generally more public interest
  - Less people effected by crime rates
  - All depends on what is reported

Appendix I

City-by-city Fire Death Rate Press Release

Baltimore's Fire Death Rate Worst in the Country

Worcester, MA, October 6, 2002 – A recent study shows that Baltimore, Maryland has a fire death rate of 52.5 fire deaths per million population. A team of students from Worcester Polytechnic Institute conducted a study of the fire death rates for 46 of the largest United States cities. The team found that Baltimore's fire death rate was higher than any other city in the sample.

The fire death rate of each city was calculated using data from the U.S. Bureau of the Census and the National Fire Incident Reporting System (NFIRS). NFIRS is a database that was established by the United States Fire Administration (USFA). After a fire, fire departments voluntarily fill out a report and send it to the USFA. The data is stored in the NFIRS database for future studies. Also, every state, which participates in the NFIRS program, has a NFIRS official that oversees the database. Fire death figures for a few cities were gathered from their state representatives.

Table 1:

Highest Ten Rates
1990-1995
Fire Deaths per Million Population

Rank	City	Rate
1	Baltimore, MD	52.5
2	Detroit, MI	49.4
3	Cincinnati, OH	32.4
4	Nashville, TN	27.0
5	Washington DC	24.5
6	Chicago, IL	24.0
7	Portland, OR	23.5
8	Toledo, OH	22.5
9	New York, NY	21.9
10	Atlanta, GA	21.3

Table 2:

Lowest Ten Rates
1990-1995
Fire Deaths per Million Population

Rank	City	Rate
46	Indianapolis, IN	1.3
45	New Orleans, LA	2.1
44	Houston, TX	2.5
43	Oakland, CA	2.7
42	San Jose, CA	3.0
41	Seattle, WA	3.0
40	Honolulu, HI	3.4
39	Milwaukee, WI	3.4
38	Long Beach, CA	3.9
37	San Diego, CA	4.0

Table 1 and table 2 show the ten highest and ten lowest city fire death rates based on a five-year rolling average. Death rates in the 46 city sample ranged from Indianapolis' 1.3 to Baltimore's 52.5. The annual fire death rate was 13.1, Baltimore is 39.4 deaths above the average.

The study does not examine the causes for variations in fire death rates.

A copy of the team's report can be obtained by contacting the WPI Center for Firesafety Studies.