IMPACT OF THE FORT WORTH FIRE DEPARTMENT'S RESIDENTIAL SMOKE DETECTOR PROGRAM

LEADING COMMUNITY RISK REDUCTION

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An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

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Appendices Not Included. Please visit the Learning Resource Center on the Web at http://www.lrc.dhs.gov/ to learn how to obtain this report in its entirety through Interlibrary Loan.

Certification Statement

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

Abstract

The problem was the impact of Fort Worth's Residential Smoke Detector Program had never been determined. The purpose of this study was to determine the impact of Fort Worth's Residential Smoke Detector Program, since its inception in 1982. This descriptive research project compared Fort Worth and national residential fire death, injury, and property loss rates, to determine the program's success. The research questions were: 1) How did the residential fire death rates of Fort Worth compared to national rates since the Smoke Detector Program's inception? 2) How did the residential fire injury rates of Fort Worth compared to national rates since the Smoke Detector Program's inception? 3) How did the residential fire property loss rates of Fort Worth compared to national rates since the Smoke Detector Program's inception? 4) Is Fort Worth's Smoke Detector Program effective as is or should it be modified?

Historical Fort Worth and national data relating to fire deaths, injuries and property losses, was collected and normalized. When the same data was available from the NFPA (National Fire Protection Association) and NFIRS (National Fire Incident Reporting System), the NFIRS data was used to retain the most uniformity with Fort Worth's reporting method. In this research paper "smoke detector" and "smoke alarm" describe the same device. A search seeking similar articles, studies and papers, related to smoke alarm impact on residential fire deaths, injuries and property loss were conducted. The developer of Fort Worth's Smoke Detector Program, was interviewed, as were the program's current leaders.

All related information and data were reviewed and compared to establish any possible impact on Fort Worth's Smoke Detector Program. This information was considered, a conclusion was drawn and recommendations delineated.

Current information was limited, while plentiful in the early 1980's; it had dwindled nearly to just statistical data, in no standard format, and a small amount of Executive Fire Officer Applied Research Projects. *America Burning*, 1973 and the 1987 *America Burning Workshop*, seem to echo many of the issues that still ring true today... Smoke alarms save lives and money, discharged (or disconnected) batteries are the primary reason smoke alarms fail (Ahrens, 2001), the vast majority of fire deaths occur in residences without an operational detector (USFA, 2001), and statistical data is not being completely recorded or exploited. Fort Worth had better trends than the nation in the percentage of all fires that were residential, residential fire injuries per/million residents, and total residential fire property losses; similar trends in residential fire rates per/million citizens; poorer trends in residential fire deaths per/million residents, and in per/residential fire property losses. Smoke alarm performance was not determined in 38% of all Fort Worth residential fires, however smoke alarms that operated during a fire, and the number of residences with alarms had positive trends. The rate of fires where an alarm was present, but did not operate has not changed in 15 years.

Fort Worth's Residential Smoke Detector Program had a positive impact, however it is recommended that staffing and funding for the program is increased. Also they must ensure all NFIRS report fields are accurately completed. A more effective smoke alarm battery replacement plan must be implemented. Lastly they must include replacing smoke alarms every 10 years in public education endeavors.

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Introduction

The problem is that the impact of Fort Worth's Residential Smoke Detector Program has never been determined.

The purpose of this study is to determine the impact of Fort Worth's Residential Smoke Detector Program, since its inception in 1982.

This is a descriptive research project that compares Fort Worth and national residential fire death, injury, and property loss rates, since the inception of their Residential Smoke Detector Program, to determine the program's success.

The research questions are:

1. How have the residential fire death rates of Fort Worth compared to national rates since the Smoke Detector Program's inception?
2. How have the residential fire injury rates of Fort Worth compared to national rates since the Smoke Detector Program's inception?
3. How have the residential fire property loss rates of Fort Worth compared to national rates since the Smoke Detector Program's inception?
4. Is Fort Worth's Smoke Detector Program effective as is or should it be modified?

Background and Significance

America Burning formalized what most fire organizations already knew, Americans were needlessly dying, being injured, and millions of dollars were being lost as the result of residential structure fires (United States Fire Administration [USFA], 1973). Like other cities, Fort Worth was frustrated by its own residential fire losses. As a result the Fort Worth Fire Department began its first organized smoke detector initiative in the late 1970's by installing smoke detectors in neighborhoods that had recently experienced a fire death. Firefighters would canvas the area,

on foot, making contact with as many residents as possible and distribute detectors until they ran out. These detectors were donated by a local company, and cost the citizens nothing. The idea behind this was that the fire death would draw interest, especially if it was shown that a detector could have prevented it, making residents more likely to allow a firefighter into their home. Captain Roy Knight, leading the department's Fire Safety Education Section, recognized that year after year most of the city's fire deaths were still occurring on the city's southeast side. Even though the area had been covered with this haphazard pattern of detectors distribution deaths were still occurring. These deaths were occurring in residences without detectors or with inoperable detectors. Knight's mission became "get as many smoke detectors in homes as possible", a personal goal he and the Fire Chief shared (R. Knight, personal communication April 4, 2004).

America Burning became the catalyst of Fort Worth's first organized attack on residential fire losses. Stressing "Americans need to be encouraged to install early-warning fire detectors in their homes where most fire deaths occur", and "Of basic importance is finding the best harbinger of fire" also rang true in Fort Worth's values (USFA, 1973, p. XI).

"Project 'Smoke Alarms Save Lives' began after a fire department survey, covering a four year period by Captain Knight, indicated that neighborhoods recording the highest fire death rates coincided with Community Development Block Grant (CDBG) areas" (Knight, 1985, p. 6).

A block grant was sought, in cooperation with Fort Worth Housing and Human Services Department, and obtained allowing for the purchase of 7,000 detectors. Three of the eleven CDBG were in the southeast side of the city and were targeted for total saturation; a working detector in every occupied structure. However, because of the terms of the grant, the recipient had to be the homeowner, meet income guidelines, and is within the CDBG area (Knight, 1985).

As many residents were renters, Captain Knight “scrounged” enough detectors so that everyone contacted who wanted a detector would receive one, regardless if they met the other criteria. Off duty firefighters and civilian volunteers installed and tested these detectors, as the grant did not fund labor (R. Knight, personal communications April 4, 2004). He believed “This door to door method proved to be highly effective for smoke alarm installation as well as for fire safety education” (Knight, 1985, p. 6). The Fort Worth Fire Department has had some form of a free smoke detector program ever since.

Today Battalion Chief Roger Woodard oversees the Fire Safety Education Section of the Educational Services Division. He has developed a partnership with several local corporations, and at least twice a year, firefighters, employees of the partnership corporations, and volunteers canvas a previously uncovered section of the city distributing and installing detectors (R. Woodard, personal communications April 7, 2004). In addition, the department has a smoke detector policy that requires detectors to be checked each time a department member is inside a dwelling. If a detector is missing, improperly located, or has a dead battery, they will correct the problem many times installing multiple detectors for proper coverage (McMillen, 1995). Each department vehicle, and the members of the Citizens Fire Academy (McMillen, 1996), carries a “Smoke Detector Kit” which contains detectors, batteries and the tools for installation (McMillen, 1995). The only requirement to receive a detector or battery is the occupant must sign a release of liability, offered in English (see Appendix A) and Spanish (see Appendix B). Additionally the department’s web site and multi-lingual radio and television “Public Safety Announcements” inform citizens of smoke alarm availability (Fort Worth Fire Department [FWFD], n.d.).

I believe the impact of this program, when determined, will be significant in terms of deaths, injuries, and property losses and Fort Worth's Smoke Detector Program will continue. They have shown past creativity in acquiring detectors and installation volunteers, and I see no reason why this will not continue. However, to data no attempt has been made to qualify the effectiveness of this endeavor, specifically if this program has impacted Fort Worth's residential fire death, injury and property losses.

This Applied Research Project is relevant to the Executive Fire Officer Program and the *Leading Community Risk Reduction* course in that "The local fire department gains influence in the community by demonstrating its proactive commitment to the safety and wellbeing of the citizens" (National Fire Academy [NFA], 2003, pp. 0-18). This influence can be translated as credibility. A community that believes their fire department is truly looking out for their welfare is far more likely to trust it on issues, such as smoke alarm save lives.

This research project relates to the United States Fire Administration operational objective "to promote within communities a comprehensive, multi-hazard risk-reduction plan led by the fire service organization" (NFA, 2002, p. II-2), by efficiently managing costs while assuring the welfare of the citizens, and those within the fire service organization.

Literature Review

The first comprehensive national analysis of fire deaths was reported in *America Burning,* which reported that in 1971 56% of fire deaths occurred in residential structures (United States Fire Administration [USFA], 1973). Also according to the USFA from 1970, when battery-powered smoke alarms were introduced, to the year 2000 nearly 94% of U. S. households had installed a smoke detector (2001).

The National Fire Protection Association (NFPA) stated that residential fire death rates, using data from 1980 – 1997, are 40% - 50% less with operational smoke alarms than those without operational smoke alarms (NFPA, 2001).

About 73% of residential fire deaths occurred between 8 pm and 8 am (USFA, 1993).

The USFA reported that nationally between 1982 and 1998 fires in dwellings decreased from 25.3%, of all reported fires, to 22.9% (2001).

Multiple deaths fires, where 3 or more deaths occurred as a result of the same incident, occurred in residential occupancies 91.5% of the time in 1983 (USFA, 1994).

A 1988 study in Montgomery County Maryland concluded that since the adoption of a residential smoke detector law, in 1978, their residential fire deaths have been reduced by 62%. In addition the study found “no one died in a house fire where detectors [were] properly located, maintained and where occupants have evacuated when the detector warning sounded” (Fire Chief, 1988, p. 8).

The national ten-year trend, from 1989 - 1998, was that residential fires account for 21.9% of all fires, and 20.5% of the fire deaths of which 32.6% had no detector present and 11.8% had a detector, did not operate (USFA, 2001).

Battalion Chief Roger Woodard, the manager of the current Smoke Detector Program in Fort Worth, reported that of the residencies the department enters “about 25% have no alarm, 25% have alarms with dead batteries, 25% have no battery, and 25% are operational” (personal communication, April 21, 2004).

A USFA study stated, “…no smoke alarms were present or they did not operate in 75% of all residences where a fire fatality occurred”, and during the same period 27.8% of residential fires had no detector and 16% had a detector that did not work (2001).

The Altamonte Springs Florida Fire Department, after 3 fire deaths, found in multi-family dwellings that requested fire department services, and their adjoining units, that all had detectors, but 60% were inoperable because of missing or dead batteries. (G. S. Gaston, 1990, p. 8)

After their introduction the use of smoke detectors, especially from 1975 to 1984, "skyrocketed" however, "In homes with smoke alarms, 20% had none that worked" (Ahrens, 2001). Another NFPA study reported that in 3 of every 10 fires in smoke alarm equipped homes, the alarm didn't work (NFPA, 2001, p. 19).

"Smoke Alarm failures usually result from dead, missing or disconnected batteries" (Ahrens, 2001, p. i). The National Fire Alarm Code, 2002 edition, requires "Power for household alarm systems shall comply with the following requirements": two power sources, one of which must be a rechargeable battery, placed outside each sleeping area, and on each level of the dwelling (p. 72-107 – 108).

The USFA reported in 1998 that 63.8% of fire related injuries occurred as the result of residential fires (USFA, 1993).

America Burning reported that in 1971 residential property losses exceeded $874,000, or 31.9% of total fire losses (USFA, 1973).

The USFA also reports "38% of residences had an operable alarm during a fire, but these fires accounted for only 8% of total property loss" (2001).

In 2001, U.S. residential fires caused more than $5.6 billion in property damage (Centers for Disease Control, 2002).

Chief Larry McMillen, in March 1994, issued a department "Information Bulletin" emphasizing the importance of data collection, specifically data related to the data collected for

he Uniform Fire Incident Reporting System (UFIRS) related to the presence, location, and performance, of smoke detectors (McMillen, 1994).

J. T. McGrath in his research pointed out, "…that the distribution of smoke detectors initially reduced fire deaths, though long term effects were negligible." He concluded with the recommendation "that providing detection equipment is not enough to reduce fire deaths, but requires the commitment, vigilance and care of the individual to a comprehensive fire prevention program to prevent disaster" (1991, p. 3).

G. W. Maughan concluded in his paper "A small investment of a few dollars will save a person's life, and yet many residential occupancies… … do not have a working smoke detector" (1992, p. 3).

Fort Worth adopted a fire code that requires and makes the property owner responsible for a fully functioning detector, at all times, in all occupancies that are rented with sleeping accommodation. This ordnance covers all types of residences defined by NFIRS, it provides for daily fines, and for regular inspections by building and fire inspectors (Fort Worth Fire Code, 2002).

Captain Knight stated in a 1987 article, "Project ' Smoke Alarms Save Lives' has been the Fort Worth Fire Departments most effective fire prevention program" (1987, p. 20).

Nationally residential fires, from 1987 – 1998, that had no detector present decreased from 35% to 27%, and deaths with no detector present decreased from 42.7% to 32.0%. However, deaths during the same period increased in residences with inoperable detectors from 13.3% to 16% (USFA, 2001).

"Only 6% of U.S. homes are not equipped with smoke alarms, yet 40% of residences with a fire had no installed alarm". Alarms also operated with more frequency in apartments

than in one- and two-family homes, because property management and maintenance personnel are generally responsible for alarm maintenance, not dwellers (USFA, 2001).

Deputy Chief Peacock identified funding, for alarms and staff, as the primary roadblock to expanding the smoke alarm program. However, he felt that because of the department has done so much over the years with their smoke alarm initiatives, that it had a positive impact on residential fire deaths, injuries, and losses. He also felt consistent data collection and maintenance is the key to accurately evaluating smoke alarm impacts in Fort Worth, adding, "we now use the Firehouse data system and because of that our successors will have an easier time conducting studies like this" (personnel communication April 5, 2004).

Chief Roger Woodard felt similarly, offering, "it's not just installing alarms or batteries… the citizen must be educated that they are responsible for insuring their smoke alarms is always operational" (personal communication, April 5, 2004).

Procedures

Data used in this paper was imperfect; national and local data have not been maintained, or not maintained in the same format for the study period. Additionally Fort Worth is a large, rapidly growing city with constantly changing demographics; their death, injury and property loss data have not been maintained in a format that allows for specific regions of the city to be studied. Any data that was unavailable and replaced with interpolated values was noted as such.

Dollars were adjusted into 2002 dollars using a Consumer Price Index (CPI) Inflation Calculator (National Aeronautics and Space Administration, 2004). When the same data was available from the NFPA (National Fire Protection Association) and NFIRS (National Fire Incident Reporting System), the NFIRS data was used to maintain compatibility with Fort Worth's reporting method.

> The term residential as used by NFIRS (National Fire Incident Reporting System) includes what is commonly referred to as homes, whether they are one- or two-family dwellings or multi-family apartment buildings. It also includes manufactured housing, hotels and motels, dormitories, and much of what might be considered "halfway houses" for the care of people with problems but who are able to operate in the community. (USFA, 2001, p. 57)

"Prior to 1996 smoke alarms in U. S. were generally referred to as smoke detectors." In 1996 manufacture officially began using the term "smoke alarm" to more accurately describe their function (USFA, 2001). In this research paper "smoke detector" and "smoke alarm" describe the same device; the original authors' vocabularies were maintained.

An extensive search seeking similar articles, studies and papers, related to smoke alarm impact on residential fire deaths, injuries and property loss was conducted at the Learning Resource Center of the National Fire Academy, in Emmitsburg, Maryland. National residential fire death, injury and property historical loss data was also collected from materials at this Learning Resource Center.

The original article was reviewed with Captain Knight, now retired, by telephone; he related his experience with the smoke detector program, and his source of data for his original, and subsequent, 1987, article.

The personnel currently responsible for Fort Worth's "Smoke Alarm Program," Deputy Chief Jay Peacock and Battalion Chief Roger Woodard, were interviewed concerning past and present methods, and their vision of the program's future.

Historical data related to Fort Worth's fire incidents, property loss and smoke alarm performance was obtained from Fort Worth's Information Technology Department in table form; see Appendix C (Steinharter, 2004). Historical data related to Fort Worth's fire deaths was obtained from Fort Worth's Fire Investigation Section in table form; see Appendix D, (Milton, 2004).

National data was compared to Fort Worth's, and Fort Worth's data was compared to itself.

All information and data were reviewed, and compared to reveal trends and any impact on Fort Worth's Smoke Detector Program on residential fire deaths, injuries and property losses. This information was considered, a conclusion was drawn and recommendations delineated.

Results

Captain Knight reiterated his original 1985, and subsequent 1987, article, "Project smoke alarms save lives". He added that is was always difficult to actually acquire detectors, or funding for detectors, and to get them installed, regardless of the targeted neighborhood. Public fire safety education was the responsibility of the "Fire Safety Education Section and was staffed with 3 personnel in 1980… just as it still is" (personal communications, April 4, 2004).

Research seeking similar articles, studies and papers, related to smoke alarm impact on residential fire deaths, injuries and property loss was conducted at the Learning Resource Center of the National Fire Academy, in Emmitsburg, Maryland yielded early research regarding smoke alarms and their impact. After the mid 1980's information dwindled to primarily statistical information found in the publication series Fire in the United States, but even this data has not been consistent (USFA, 2001).

Deputy Chief Jay Peacock and Battalion Chief Roger Woodard, both currently responsible for Fort Worth's "Smoke Alarm Program", felt that the program would always continue in some form, but acknowledged funding for public education has not appreciably increased even though the population of the city has nearly doubled since 1980 (J. Peacock, personal communication, April 26, 2004).

Historical data related to Fort Worth's residential fires, injuries, incidents, property loss and smoke alarm performance obtained from Fort Worth's Information Technology Department (see Appendix C), (Steinharter, 2004); and data related to Fort Worth's residential fire deaths was obtained from Fort Worth's Fire Investigation Section (see Appendix D), (Milton, 2004). A reliable source for missing data in these tables was not located. These data was compared to national data and against itself in Tables 1 through 7, and plotted in Figures 1 through 8 to expose trends.

Table 1 shows the actual percentages of reported residential fires, of all reported fires within the United States and Fort Worth.

Table 1

Percentages of reported fires within the U.S. and Fort Worth, that were residential.

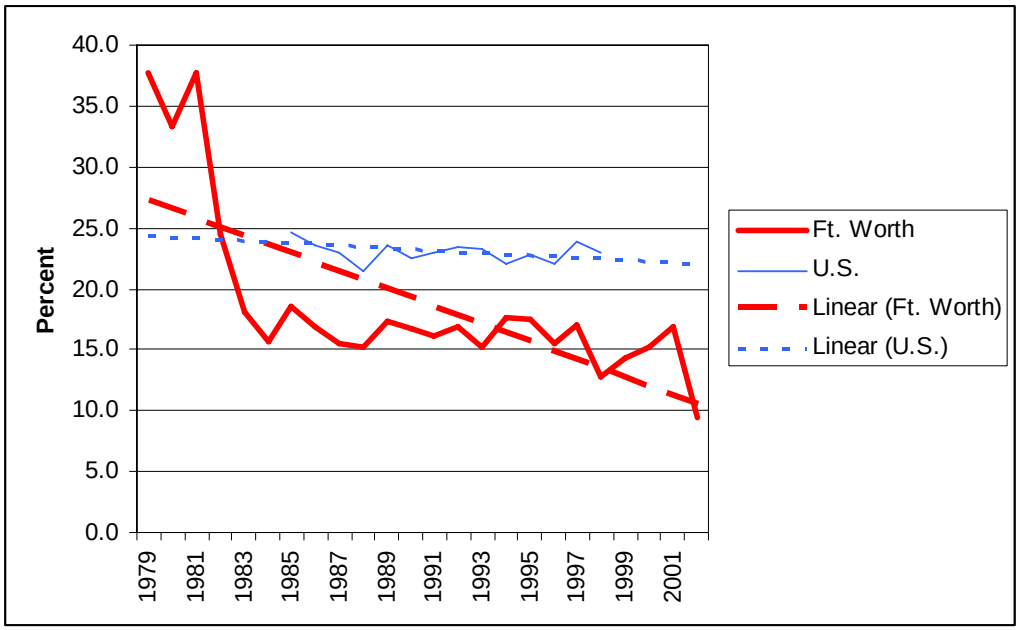
Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth
1979		37.8	1987	23.0	15.6	1995	22.8	17.4
1980		33.3	1988	21.5	15.2	1996	22.1	15.6
1981		37.7	1989	23.6	17.4	1997	23.9	17.0
1982	25.3	24.4	1990	22.5	16.7	1998	22.9	12.8
1983		18.1	1991	22.9	16.2	1999		14.3
1984		15.7	1992	23.4	16.9	2000		15.3
1985	24.7	18.6	1993	23.2	15.2	2001		16.9
1986	23.5	16.9	1994	22.1	17.7	2002		9.5

Figure 1 shows the relationship of reported residential fires, as seen in Table 1, within the United States and Fort Worth. The linear trend of each is also depicted. This figure shows the

national trend of residential fires is moving slightly downward; Fort Worth's trend shows a sharp downward trend. This indicates Fort Worth is significantly outpacing the national trend with fewer residential fires.

Figure 1

Trends in residential fires, as a percentage of all reported fires, in the U.S. and Fort Worth.



Another method of evaluating residential fires is presented in Table 2, which shows reported residential fires, per/million residents.

Table 2

Reported residential fires, per/million residents, within the United States and Fort Worth.

Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth
1979		2,754.4	1987	2,276.2	2,271.3	1995	1,598.0	1,613.2
1980		2,565.1	1988	2,255.2	2,345.7	1996	1,588.7	1,523.5
1981		2,461.3	1989	2,080.5	2,157.3	1997	1,490.9	2,647.7
1982	2,925.1	2,382.3	1990	1,877.7	1,896.7	1998	1,383.0	1,555.6
1983		2,565.0	1991	1,889.5	1,638.3	1999	1,372.6	1,249.9
1984		2,704.6	1992	1,840.1	1,365.9	2000	1,348.5	1,399.0
1985	2,614.3	2,762.5	1993	1,808.3	1,478.0	2001	1,389.7	1,168.3
1986	2,421.6	2,332.9	1994	1,714.0	1,490.0	2002	1,390.6	805.0

Figure 2 shows the relationship of residential fires, per/million residents, within the United States and Fort Worth, as seen in Table2. The linear trend of each is depicted. The Nation and Fort Worth have nearly identical trends. This information suggests that Fort Worth is typical in their residential fires history.

Figure 2

Trends in residential fires, per/million residents, within the United States and Fort Worth.

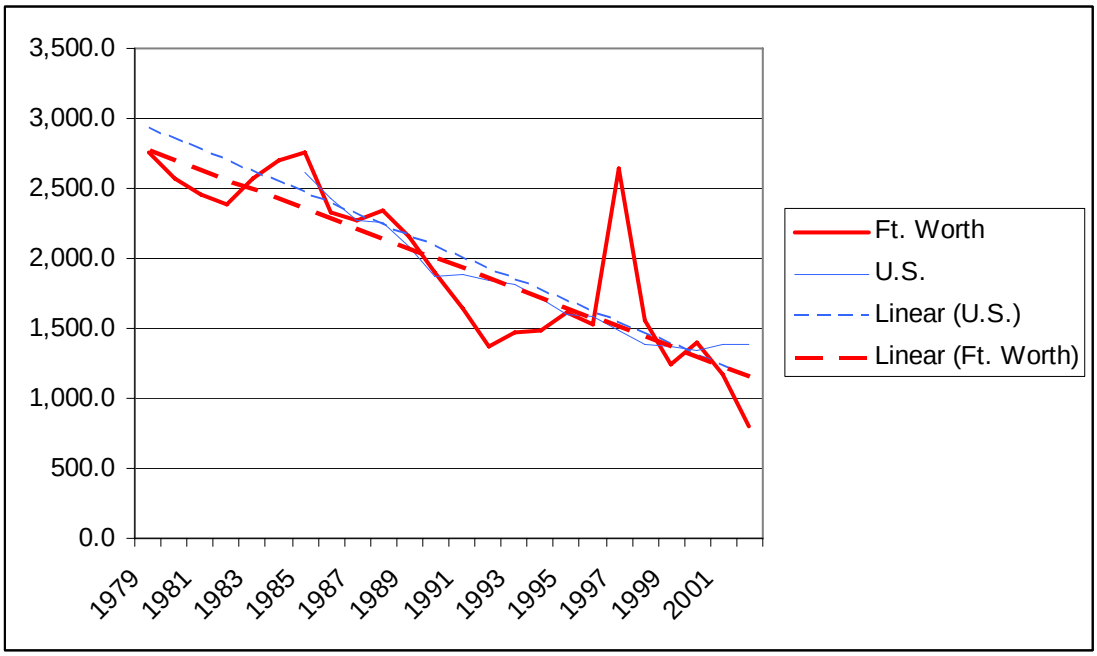


Table 3 shows the number of residential fire deaths, per/million residents, within the U.S. and Fort Worth. The Fort Worth data in this table is suspect, as no one source maintained this information, and each source maintained it in a different format, no better source is available.

Table 3

Number of residential fire deaths, per/million residents, within the U.S. and Fort Worth.

Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth
1979	25.7	10.6	1987	19.2	34.6	1995	13.9	23.2
1980	24.0	33.8	1988	20.7	22.6	1996	15.1	18.8
1981	24.1	40.9	1989	18.0	6.7	1997	12.4	24.8
1982	21.3	15.2	1990	16.5	38.0	1998	11.8	20.4
1983		15.1	1991	14.1	46.8	1999	10.5	21.8
1984		22.2	1992	14.7	15.5	2000	12.2	11.1
1985	21.1	14.4	1993	14.7	21.6	2001	11.0	16.6
1986	19.9	30.6	1994	13.2	21.4	2002	9.3	5.4

Figure 3 shows the relationship of residential fire deaths, per/million residents, within the United States and Fort Worth, as seen in Table 3. Figure 2 shows the linear trend of both the United States and Fort Worth is downward, however Fort Worth's residential fire death trend is not keeping pace with the nation.

Figure 3

Trends in residential fire deaths, per/million residents, within the U.S. and Fort Worth.

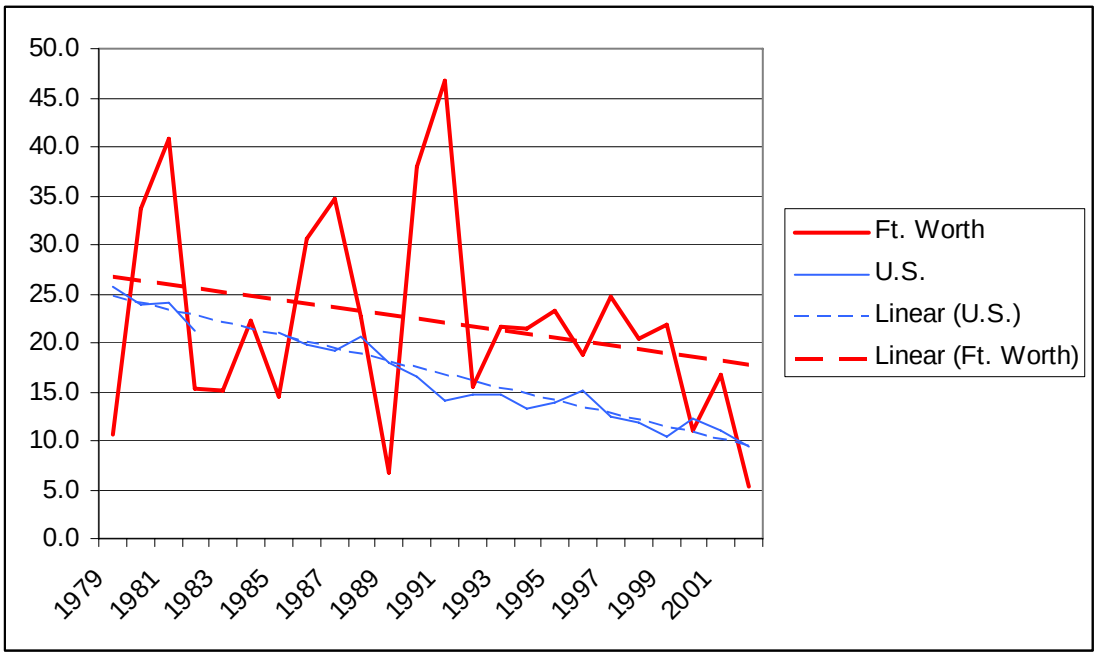


Table 4 shows the number of residential fire injuries, per/million residents, within the U.S. and Fort Worth. Fort Worth data in this table is suspect as it also was not maintained in any standardized format.

Table 4

Number of residential fire injuries, per/million residents, within the U.S. and Fort Worth.

Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth
1979		84.5	1987	84.4	94.6	1995	71.8	25.3
1980		85.7	1988	92.2	77.0	1996	71.6	29.3
1981		97.0	1989	84.1	71.1	1997	65.2	28.9
1982	91.1	40.6	1990	83.0	82.7	1998	62.3	
1983		40.2	1991	86.4	31.2	1999		
1984		61.6	1992	84.2	37.8	2000		
1985	83.3	48.1	1993	87.0	4.3	2001		
1986	79.2	63.6	1994	76.1	21.4	2002		

Figure 4 shows the relationship of residential fire injuries, per/million residents, within the United States and Fort Worth, as seen in Table 4. The linear trend of each is depicted. This data indicated a downward trend for both the United States and Fort Worth. Fort Worth is outpacing the nation in reported residential fire injuries.

Figure 4

Trends in residential fire injuries, per/million residents, within the U.S. and Fort Worth.

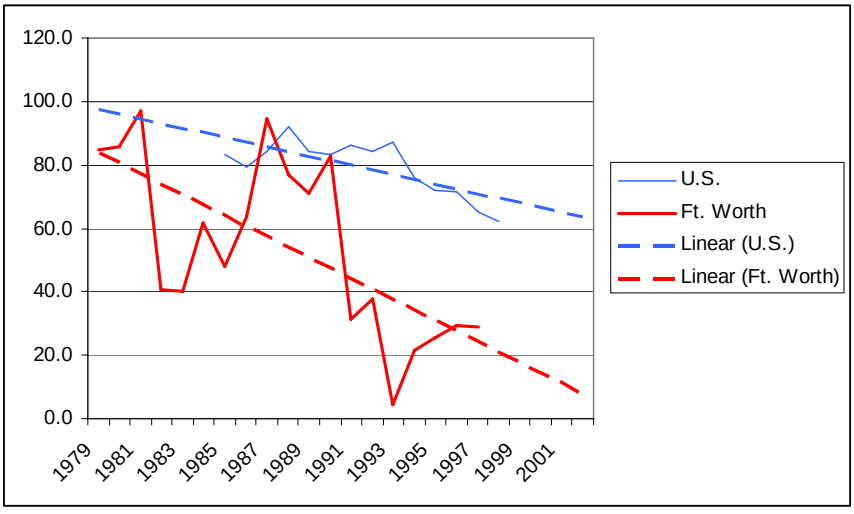


Table 5 shows the residential fire property losses, adjusted into 2002 dollars, within the U.S. and Fort Worth.

Table 5

Residential fire property losses, adjusted into 2002 dollars (in thousands), within the U.S. and Fort Worth.

Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth
1979		$17,562	1987	$5,831,654	$19,250	1995	$4,762,480	$12,456
1980		$16,007	1988	$6,068,790	$15,521	1996	$5,480,366	$12,201
1981		$12,491	1989	$5,557,330	$13,053	1997	$5,062,436	$19,042
1982		$13,494	1990	$5,824,608	$11,673	1998	$4,847,664	$9,544
1983		$16,860	1991	$7,283,994	$8,851	1999	$5,499,360	$11,898
1984		$18,087	1992	$4,976,724	$5,860	2000	$5,929,330	$13,452
1985	$6,312,134	$18,803	1993	$6,069,375	$10,221	2001	$5,733,288	$12,435
1986	$5,828,832	$18,056	1994	$5,220,200	$9,138	2002	$6,055,000	$9,176

Figures 5 and 6 shows the relationship of residential fire property losses, adjusted into 2002 dollars, within the United States and Fort Worth, as seen in Table 5. The linear trend of each is depicted. Fort Worth's trend is slightly more downward than the national trend which is also downward.

Figure 5

Trend in residential fire property losses within the U.S. in 2002 dollars.

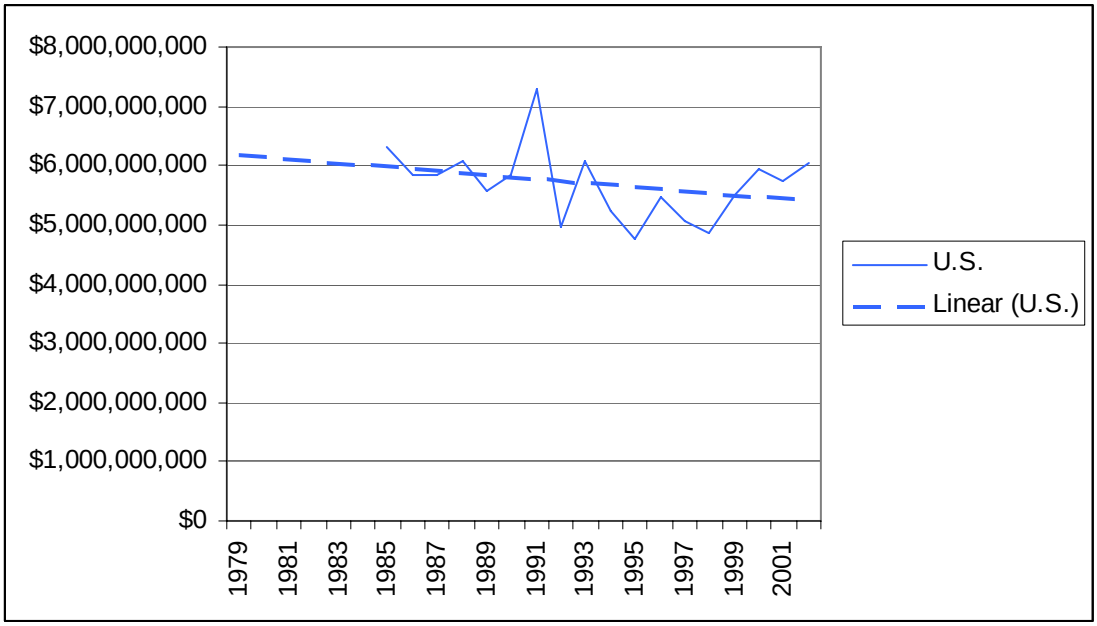


Figure 6

Trend in residential fire property losses within Fort Worth in 2002 dollars.

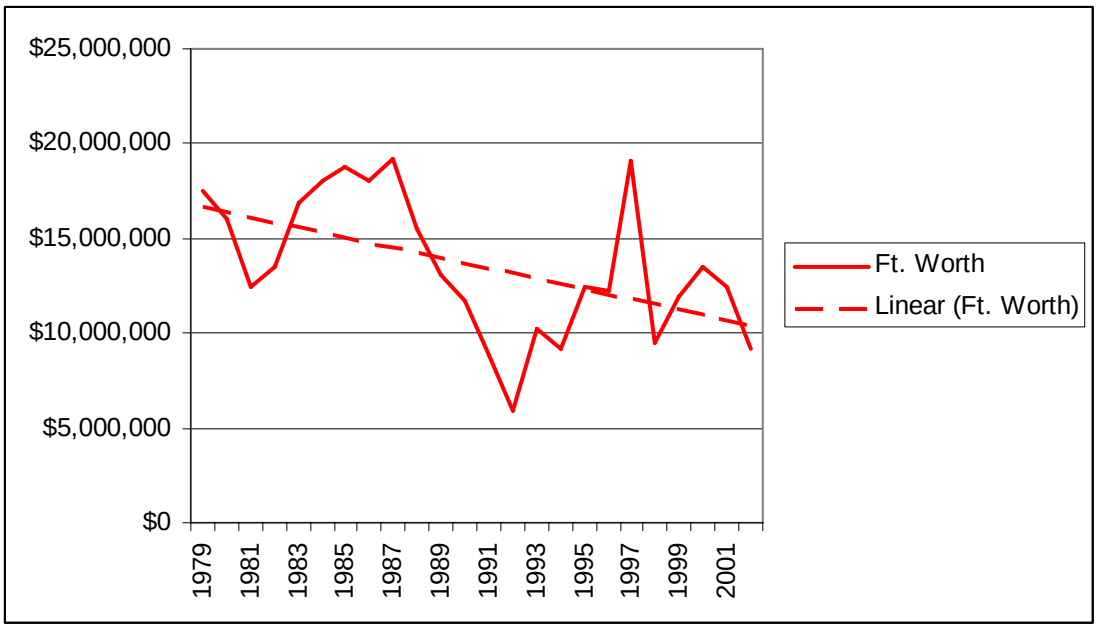


Table 6 shows residential fire property losses per fire, adjusted into 2002 dollars, within the U.S. and Fort Worth.

Table 6

Residential fire property losses per fire, adjusted into 2002 dollars, within the U.S. and Fort Worth.

Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth	Year	U.S.	Ft. Worth
1979		$16,839	1987	$10,574	$19,563	1995	$11,193	$16,304
1980		$16,202	1988	$10,984	$14,982	1996	$12,805	$16,760
1981		$12,958	1989	$10,822	$13,444	1997	$12,454	$14,854
1982		$14,371	1990	$12,472	$13,750	1998	$12,707	$12,509
1983		$16,530	1991	$15,238	$12,042	1999	$14,359	$18,857
1984		$16,473	1992	$10,544	$9,529	2000	$15,624	$17,794
1985	$10,148	$16,379	1993	$12,914	$14,944	2001	$14,460	$19,676
1986	$10,024	$18,221	1994	$11,575	$13,130	2002	$15,100	$20,437

Figure 7 show that even though losses per residential fire were adjusted into 2002 dollars, the loss per residential fire trend in both the United States and Fort Worth is increasing. Fort Worth's trend is increasing at a slower rate.

Figure 7

Trends in residential fire property losses, per residential fire, within the U.S. and Fort Worth.

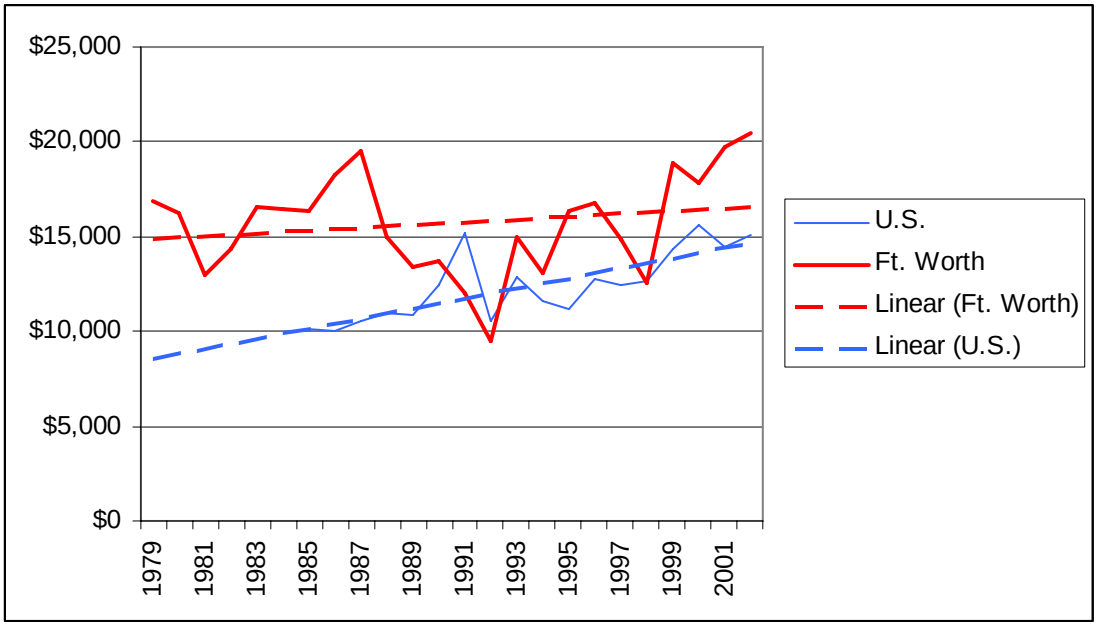


Table 7 shows the reported residential fire smoke alarm performance per residential fire, within Fort Worth

Table 7

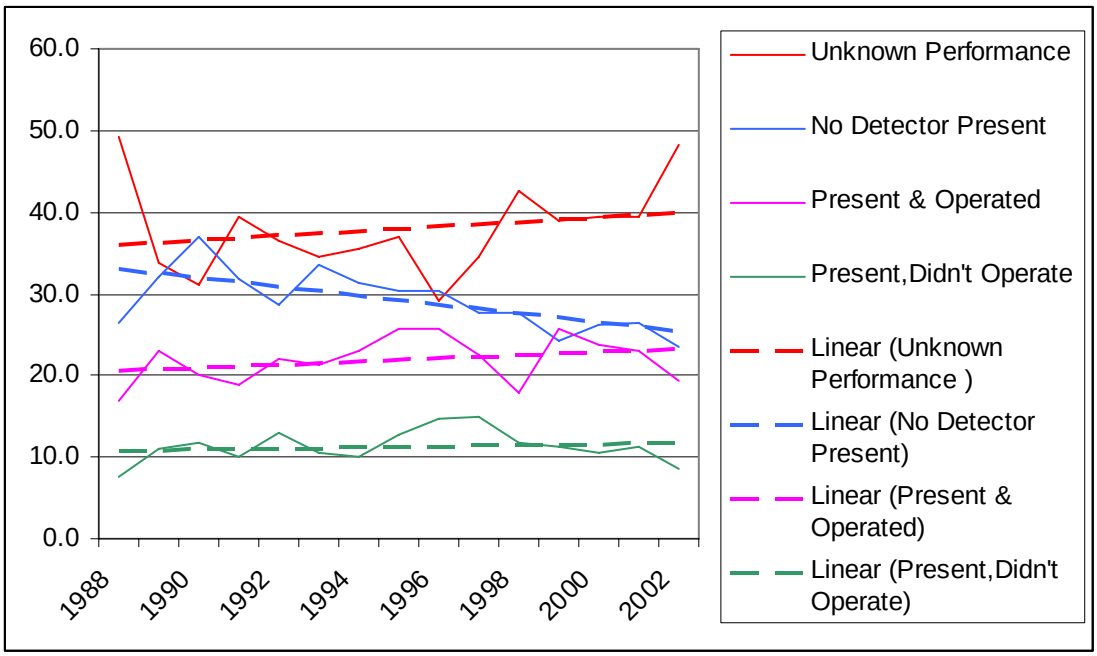
Residential fire smoke alarm performance during reported residential fires within Fort Worth. (Key: Unk = unknown or unreported detector presence; N = no detector present; PO = detector present and operated; PDNO = detector was present, but did not operate)

Year	Unk	N	PO	PDNO	Year	Unk	N	PO	PDNO	Year	Unk	N	PO	PDNO
1979	100.0				1987	100.0				1995	37.0	25.7	12.8	30.4
1980	100.0				1988	49.2	16.8	7.5	26.4	1996	29.1	25.8	14.7	30.4
1981	100.0				1989	33.9	23.0	11.0	32.1	1997	34.6	22.6	15.0	27.8
1982	100.0				1990	31.2	20.0	11.8	37.0	1998	42.7	18.0	11.7	27.7
1983	100.0				1991	39.5	18.8	9.9	31.8	1999	38.8	25.7	11.3	24.2
1984	100.0				1992	36.4	22.0	13.0	28.6	2000	39.4	23.7	10.6	26.3
1985	100.0				1993	34.6	21.2	10.5	33.6	2001	39.4	22.9	11.2	26.4
1986	100.0				1994	35.5	23.1	10.1	31.3	2002	48.3	19.4	8.7	23.6

Figure 8 shows the relationship, and trends, of reported residential fire smoke alarm performance during residential fires within Fort Worth, as seen in Table 7. The linear trend of each is depicted.

Figure 8

Trends in residential fire smoke alarm performance within Fort Worth.



America Burning reported that in 1973 that standardize data collection was a must if we were to accurately prevent resident fire deaths, injuries and losses (USFA, 1973). A national workshop, held at Tyson's Corner, Virginia from November 30 through December 2, 1987, revisited *America Burning***.** Their findings echoed *America Burning***:**

> Collection and analysis of meaningful data is critical in order to address the fire problem with respect to civilian and firefighter casualties. Analysis of data provides a basis for direction and prioritization to initiatives discussed herein. A large quantity of data exists. However, the strategic quality and significance of much of these data are not apparent or have been questioned. The Commission is

> unaware that the data collected are effective for advancing or achieving the prevention goals of the fire prevention and services community. In addition, there is no central center or focus for the analysis of data that are collected. It is not clear whether the current National Fire Incident Reporting System has cost inefficiencies with respect to data overlap or is providing corroborating data, whether there is under-utilization for data analysis (USFA, 1973).

This was true in the Fort Worth Fire Department; data that is available, prior to 2003, is not in any manageable format, in any one location and is incomplete. Fort Worth, however in 2003 implemented the *Firehouse* information management system, and even though this data was not evaluated it appears this system will improve information management.

The NFPA found that "Roughly half of the smoke alarms collected as inoperable and studied in the National Smoke Detector Project, were more than 10 years…" They recommend not only to have and maintain alarms, but to also replace them every 10 years (Ahrens, 2001, p. i).

Discussion

I was surprised by the limited amount of current information that related to smoke alarms, while plentiful in the early 1980's; it has dwindled nearly to just statistical data, in no standard format, and a few Executive Fire Officer Applied Research Projects.

In my early years as a Fort Worth Fire Fighter I felt inspecting, replacing batteries and installing smoke detectors was a necessary evil that led to what I was really hired for… fighting fire! That changed about 8:30 one morning in 1985. I had all but forgotten the tragedy that occurred that morning until I discovered an article while doing research for this paper… "Lack of smoke detectors contributes to the deaths of three children… …The community had

established an “unusual” program that gave free smoke detectors to qualifying residents, but it was not known if the family had ever applied for an alarm” (Fire Journal, 1985). It was a very small fire. I had just walked another part of the same neighborhood offering “free smoke detectors”.

Fort Worth has had a long history of dedicated firefighters who truly believed fire safety education is the departments’ primary obligation to the citizens. These visionaries, however have always competed for staffing and funding with the traditional roles of the fire service and lost (J. Peacock, personal communication, April, 26, 2004).

National trends in 1973, *America Burning*, and the 1987 *America Burning Workshop*, seem to echo many of the same issues that still ring true today... Smoke alarms save lives and money, dead (or disconnected) batteries are the primary reason smoke alarms fail (Ahrens, 2001), the vast majority of fire deaths occur in residences without an operational detector (USFA, 2001), deaths draw more attention than data, because data is still not being fully exploited.

These are not just United States issues, Australia’s Fire Engineers Journal stated that in 1999 14% of [Australia’s] fire deaths, up from 10% in 1998, occurred in dwellings with smoke detectors with battery deficiencies that prevented them from operating (Birch, 2001).

A tremendous effort was expended by the city’s Information Technology Department and Mr. Ron Steinharter to decipher many years of data from fragile media, this should have never been the case. All data related to all activities of the organization must be properly collected, maintained in a standard format, usable and used! This was evidenced by many hours of dead-end research treks and the fact that the Fort Worth Fire Department still only collects smoke detector performance data on about 68% of its residential fires. During this study every attempt

was made to avoid over interpolating data; to that end missing data, except population data was treated as missing, not zero.

Fort Worth has a residential fire rate, per/million citizens, almost identical to national trends (Figure 2), however the percent of all fires that are residential in Fort Worth show a significant downward trend (Figure 1). I believe this suggests Fort Worth has a typical urban residential fire rate, but because of the vastness of the city a disproportional number of wildland fires are occurring, slanting that data.

Fort Worth's residential fire death rate per/million citizens is trending downward, as is the national rate (Figure 3), but Fort Worth appears to be loosing ground. The significance of this is not apparent until Figure 4, residential fire injuries per/million citizens, is examined. Figure 4 shows just the opposite. Fort Worth and national trends are both moving downward, but Fort Worth is significantly out performing the nation.

All of this could be construed to mean Fort Worth has a typical residential fire rate, but more citizens are dying in residential fires and fewer are being injured, This statement should be taken with a grain of salt, because as previously mentioned Fort Worth fire death and injury data is suspect.

Fort Worth (Figure 5) and the nation's (Figure 6) total residential property losses are both trending down; Fort Worth's rate is trending downward at a greater rate. When per residential fire losses are examined (Figure 7) Fort Worth has a higher rate that the nation, but their rate is not increasing as quickly and should to be within a couple of years of having a lower per residential fire loss rate than the national rate.

Figure 8 points out that NFIRS data is not being consistently collected, in fact the "unknown or undetermined" rate is increasing! Also the rate of "detector present, but did not

operate" has remained "flat", once a detector is installed in a home it is not being maintained, even though the Fire Department will replace the battery for free with just a phone call! The good news is the number of residences with "no detector present" is deceasing, as is "detector present and operated" is increasing.

What does this mean? They are not taking the importance of documentation seriously! We are not addressing the continued maintenance of detectors after installation, batteries! They are increasing the numbers of residences with detectors, and more detectors are operating during fires!

Fort Worth Smoke Detector Program appears to be making a positive impact on fire deaths, injuries, and property losses. Captain Knight's 1987 remark; "Project 'Smoke Alarms Save Lives' has been the Fort Worth Fire Departments most effective fire prevention program" is coming to bare.

Echoing the message from every published study… "The presence of smoke alarms substantially reduces risk of death in residential fires; and property losses are significantly less" (USFA, 2001).

Recommendations

Even though the Fort Worth Fire Department has maintained a Smoke Alarm Program since the early 1980's, it has survived solely on the fortitude of dedicated firefighters who have labored in the Fire Safety Education Section. The first recommendation is to staff and fund this, our most vital obligation, like the lives of the citizens depends on it!

The second recommendation is to evaluate the types of data being collected and entered into the *Firehouse* database. This information must be readily available, in the nationally accepted Uniform Fire Incident Reporting System (UFIRS) format, and be regularly utilized to

determine program effectiveness. Accurate historical data is the major ingredient in any recipe that determines effectiveness of any Smoke Alarm Program. Until a reliable volume of data can be collected in the *Firehouse* system all existing data must be collected, placed in one location, and made available for research.

The third recommendation is to enforce the mandate that all fire officers complete all NFIRS fields accurately and completely as 38% of residential fire reports, don't contain detector performance information!

A dependable smoke alarm battery replacement campaign must be created and implemented, as data shows that Fort Worth's "detector present, but did not operate" rate has remained unchanged for 15 years!

And lastly include replacing smoke alarms every 10 years in our public education endeavors.

This study indicates Fort Worth's smoke detector program has had a positive impact on fire deaths, injuries, and property losses; however a second study should be undertaken in five years. That study will have the benefit of 7 or more years of *Firehouse* data, and all previous data will have been collected and made accessible for study to verify the results of this study.

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