

FIRE LOSS IN THE UNITED STATES DURING 2009

Michael J. Karter, Jr.

August 2010



**National Fire Protection Association
Fire Analysis and Research Division**

FIRE LOSS IN THE UNITED STATES DURING 2009

Michael J. Karter, Jr.

August 2010



**National Fire Protection Association
Fire Analysis and Research Division**

Abstract

U.S. fire departments responded to an estimated 1,348,500 fires. These fires resulted in 3,010 civilian fire fatalities, 17,050 civilian fire injuries and an estimated \$12,531,000,000 in direct property loss. There was a civilian fire death every 175 minutes and a civilian fire injury every 31 minutes in 2009. Home fires caused 2,565, or 85%, of the civilian fire deaths. Fires accounted for five percent of the 26,534,000 total calls. Eight percent of the calls were false alarms; sixty-five percent of the calls were for aid such as EMS.

Keywords: fire fatalities, fire injuries, fire losses, fire statistics, intentional fires, region fire department calls, intentional fires.

Acknowledgements

The NFPA gratefully thanks the many fire departments that responded to the 2009 National Fire Experience Survey for their continuing efforts for providing us in a timely manner the data so necessary to make national projections.

The survey project manager and author of the report gratefully thanks the many members of NFPA staff who worked on this year's survey including Frank Deely, John Baldi, and John Conlon for editing the survey forms and their follow-up calls to fire departments; and Norma Candeloro for handling the processing of survey forms and typing this report.

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

Copies of this report are available from:

National Fire Protection Association
One-Stop Data Shop
1 Batterymarch Park
Quincy, MA 02169-7471
www.nfpa.org
e-mail: osds@nfpa.org
phone: 617-984-7443

NFPA NO. FLX09

Copyright © 2010, National Fire Protection Association, Quincy, MA

Overview of 2009 U.S. Fire Experience

Number of Fires

- 1,348,500 fires were attended by public fire departments, a decrease of 7.1% from the year before.
- 480,500 fires occurred in structures, a decrease of 6.7%.
- 377,000 fires or 78% of all structure fires occurred in residential properties.
- 219,000 fires occurred in vehicles, a decrease of 7.2% from the year before.
- 649,000 fires occurred in outside properties, a decrease of 7.4%.
- What do these fire frequencies above mean? Every 23 seconds, a fire department responds to a fire somewhere in the nation. A fire occurs in a structure at the rate of one every 66 seconds, and in particular a residential fire occurs every 84 seconds. Fires occur in vehicles at the rate of 1 every 146 seconds, and there's a fire in an outside property every 49 seconds.

Civilian Fire Deaths

- 3,010 civilian fire deaths occurred in 2009, an increase of 9.3%.
- About 85% of all fire deaths occurred in the home.
- 2,565 civilian fire deaths occurred in the home, a decrease of 6.9%.
- 260 civilians died in highway vehicle fires.
- 105 civilians died in nonresidential structure fires.
- Nationwide, there was a civilian fire death every 175 minutes.

Civilian Fire Injuries

- 17,050 civilian fire injuries occurred in 2009, a slight increase of 2.1%. This estimate for civilian injuries is on the low side, because many civilian injuries are not reported to the fire service.
- 13,050 of all civilian injuries occurred in residential properties, while 1,690 occurred in nonresidential structure fires.
- Nationwide, there was a civilian fire injury every 31 minutes.

Property Damage

- An estimated \$12,531,000,000 in property damage occurred as a result of fire in 2009, a decrease of 19.0% from last year. This decrease reflects the California Wildfire 2008 with an estimated property loss of \$1,400,000,000.
- \$10,842,000,000 of property damage occurred in structure fires.
- \$7,796,000,000 of property loss occurred in residential properties.

Intentionally Set Fires

- An estimated 26,500 intentionally set structure fires occurred in 2009, a decrease of 13.1%.
- Intentionally set fires in structures resulted in 170 civilian deaths, a decrease of 46.0%.
- Intentionally set structure fires also resulted in \$684,000,000 in property loss, a decrease of 21.2%.
- 15,000 intentionally set vehicle fires occurred, a decrease of 14.3% from a year ago, and caused \$108,000,000 in property damage, a decrease of 22.3% from a year ago.

List of Tables and Figures

	Page
Table 1. Estimates of 2009 Fires, Civilian Deaths, civilian Injuries and Property Loss in the United States	2
Table 2. Estimates of 2009 Fires and Property Loss by Property Use	3
Table 3. Estimates of 2009 Structure Fires and Property Loss by Property Use	4
Figure 1. Estimates of Fires by Type in the United States (1977-2009)	5
Figure 2. Fires per Thousand Population by Size of Community (2005-2009)	6
Figure 3. Civilian Home Fire Deaths and Rates per 1,000 Fires (1977-2009)	9
Table 4. Estimates of 2009 Civilian Fire Deaths and Injuries by Property Use	10
Figure 4. Civilian Fire Deaths per Million People in Home Fires by Community Size and Year	12
Figure 5. Average Loss per Structure Fire in the U.S. (1977-2009)	14
Table 5. Estimates of 2008 Losses in Intentionally set Structure Fires	16
Table 6. Fire Loss Rates Nationwide and by Region, 2009	18
Table 7. 2009 Fires per Thousand Population by Region and Size of Community	19
Table 8. Civilian Fire Deaths per Million Population by Region and Size of Community	20
Table 9. Civilian Fire Injuries per Million Population by Region and Size of Community	21
Table 10. 2009 Property Loss per Person by Region and Size of Community	22
Table 11. Average 2009 Fire Experience by Size of Community	24
Table 12. Average 2009 Residential Fire Experience by Size of Community	25
Table 13. Fire Department Responses by Type of Call, 2008	26
Table 14. Percent of Fires and Nonfire Incidents by Community Size	27
Table 15. Estimates of False alarms by Type, 2009	28
Table 16. Number of Fire Departments Responding by Region and Size of Community	31
Table 17. Respondents and Nonrespondents Fire Experience by Community Size	35



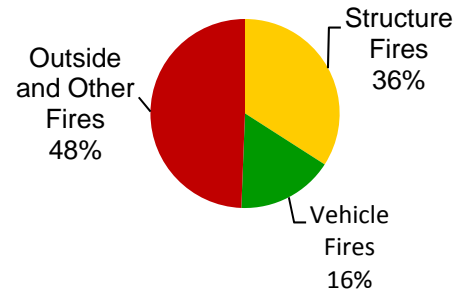
Fires in the United States During 2009



1,348,500 fires were reported in the U.S. during 2009.

- down **7%** from 2008
- **3,010** civilian fire deaths
- On civilian death occurred every two hours and 55 minutes
- **17,050** civilian fire injuries
- One civilian injury occurred every 31 minutes
- **\$12.5 billion** in property damage
- A fire department responded to a fire every 23 seconds

Fires in the United States During 2009



480,500 structure fires occurred in the U.S. during 2009.

- down **7%** from 2008
- **2,695** civilian fire deaths
- **14,740** civilian fire injuries
- **\$10.8 billion** in property damage
- One structure fire was reported every 66 seconds



219,000 vehicle fires occurred in the U.S. during 2009.

- down **7%** from 2008
- **280** civilian fire deaths
- **1,610** civilian fire injuries
- **\$1.4 billion** in property damage
- One vehicle fire was reported every 146 seconds



649,000 outside and other fires occurred in the U.S. during 2009.

- down **7%** from 2008
- **35** civilian fire deaths
- **700** civilian fire injuries
- **\$328 million** in property damage
- One outside fire was reported every 49 seconds



Number of Fires

In 2009, public fire departments responded to 1,348,500 fires in the United States, according to estimates based on data the NFPA received from fire departments responding to its 2009 National Fire Experience Survey (see Tables 1 and 2). (A fire department is a public organization that provides fire prevention, fire suppression and associated emergency and non-emergency services to a jurisdiction such as a county, municipality, or organized fire district.) This represents a significant decrease of 7.1% from last year, and is the lowest since the NFPA started using its current survey methodology in 1977-78¹.

There was an estimated 480,500 structure fires reported to fire departments in 2009, a significant decrease of 6.7%, and the lowest figure since 1977-78 when NFPA started using its current survey methodology. For the 1977-2009 period, the number of structure fires were at their peak in 1977 when 1,098,000 structure fires occurred (see Figure 1). The number of structure fires then decreased quite steadily particularly in the 1980s to 688,000 by the end of 1989 for an overall decrease of 37.3% from 1977. Since 1989, structure fires again decreased quite steadily 24.7% to 517,500 by the end of 1998. They stayed in the 505,000 to 530,500 area from 1999 to 2008, before the decrease to 480,500 in 2009.

Fire incident rates by community size were examined for the 2005-2009 period (see Figure 2). The smallest communities (populations less than 2,500) had the highest rate with 11.8 fires per thousand population.

Of the structure fires, 377,000 were residential fires, accounting for 78.5% of all structure fires, and a slight decrease of 6.5% from a year ago. Of the residential structure fires, 272,500 occurred in one- and two-family homes, accounting for 56.7% of all structure fires. Another 90,000 occurred in apartments accounting for 18.7% of all structure fires.

For nonresidential structure fire, all property types declined with some notable decreases: a decrease of 19.5% to 16,500 in stores and offices, a decrease of 15.4% to 5,500 in institutional properties, and a decrease of 10.0% to 22,500 in special structure properties.

For the 1977-2009 period, the number of outside fires were at their high in 1977 when 1,658,500 outside fires occurred. The number of outside fires decreased steadily the next six years to 1,011,000 in 1983 for a considerable decrease of 39.0% from 1977. Outside fires changed little for the rest of the 1980s except for 1988 when 1,214,000 occurred. Outside fires dropped to 910,500 in 1993, and stayed near the 1,000,000 level

Table 1
Estimates of 2009 Fires, Civilian Deaths, Civilian Injuries
and Property Loss in the United States

	Estimate	Range¹	Percent Change From 2008
Number of Fires	1,348,500	1,324,000 to 1,372,500	-7.1**
Number of Civilian Deaths	3,010	2,680 to 3,340	-9.3
Number of Civilian Injuries	17,050	16,100 to 18,000	+2.1
Property Loss ²	\$12,531,000,000	\$12,221,000,000 to 12,841,000,000	-19.0**

The estimates are based on data reported to the NFPA by fire departments that responded to the 2009 National Fire Experience Survey.

¹ These are 95 percent confidence intervals.

² This includes overall direct property loss to contents, structures, vehicles, machinery, vegetation, and anything else involved in a fire. It does not include indirect losses. No adjustment was made for inflation in the year-to-year comparison.

**Change was statistically significant at the .01 level.

**Table 2
Estimates of 2009 Fires and
Property Loss by Property Use**

Type of Fire	Number of Fires		Property Loss ¹	
	Estimate	Percent Change from 2008	Estimate	Percent Change from 2008
Fires in Structures	480,500	-6.7**	\$10,842,000,000	-12.3**
Fires in Highway Vehicles	190,500	-8.0**	1,054,000,000	-9.7**
Fires in Other Vehicles ²	28,500	-1.7	307,000,000	-6.1
Fires Outside of structures with value involved but no vehicle (outside storage, crops, timber, etc.)	69,000	-2.8	254,000,000	+96.9**
Fires in Brush, Grass Wildland (excluding crops and timber) with no value or loss involved	306,000	-8.7**	—	—
Fires in Rubbish including dumpsters (outside of structures), with no value or loss involved	171,000	-9.0	—	—
All Other Fires	103,000	-3.3	74,000,000	-21.3*
Total	1,348,500	-7.1**	\$12,531,000,000	-19.0**

The estimates are based on data reported to the NFPA by fire departments that responded to the 2009 National Fire Experience Survey.

¹ This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation or anything else involved in a fire. It does not include indirect losses, e.g., business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison.

² This includes trains, boats, and ships. aircraft, farm vehicles and construction vehicles.

*Change was statistically significant at the .05 level.

**Change was statistically significant at the .01 level.

Table 3
Estimates of 2009 Structure Fires and
Property Loss by Property Use

Property Use	Structure Fires		Property Loss ¹	
	Estimate	Percent Change from 2008	Estimate	Percent Change from 2008
Public Assembly	14,500	+3.6	\$757,000,000	+46.1*
Educational	5,500	-8.3	83,000,000	+25.8*
Institutional	5,500	-15.4	32,000,000	+45.5
Residential (Total)	377,000	-6.5**	7,796,000,000	-8.8**
One- and Two-Family Homes ²	272,500	-6.4**	6,391,000,000	-7.3**
Apartments	90,000	-5.8**	1,225,000,000	-9.3
Other Residential ³	14,500	-12.1**	180,000,000	-41.4**
Stores and Offices	16,500	-19.5	713,000,000	+4.2
Industry, Utility, Defense ⁴	9,500	-5.0	572,000,000	-59.2** ⁵
Storage in Structures	29,500	-1.7	791,000,000	+19.7*
Special Structures	22,500	-10.0	98,000,000	-78.9**
Total	480,500	-6.7**	\$10,842,000,000	-12.3**

The estimates are based on data reported to the NFPA by fire departments that responded to the 2009 National Fire Experience Survey.

¹ This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation or anything else involved in a fire. It does not include indirect losses, e.g., business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison.

² This includes manufactured homes.

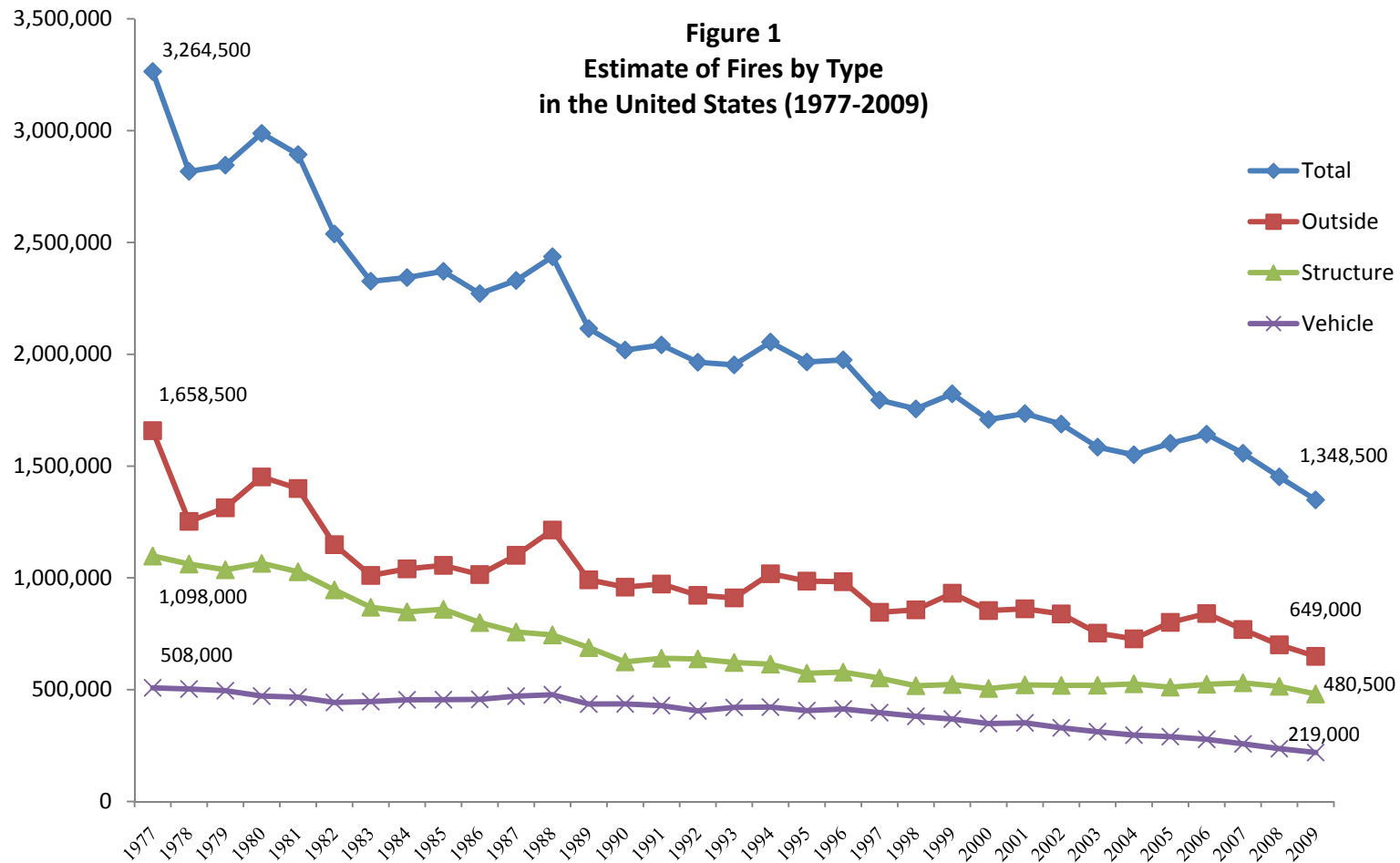
³ Includes hotels and motels, college dormitories, boarding houses, etc.

⁴ Incidents handled only by private fire brigades or fixed suppression systems are not included in the figures shown here.

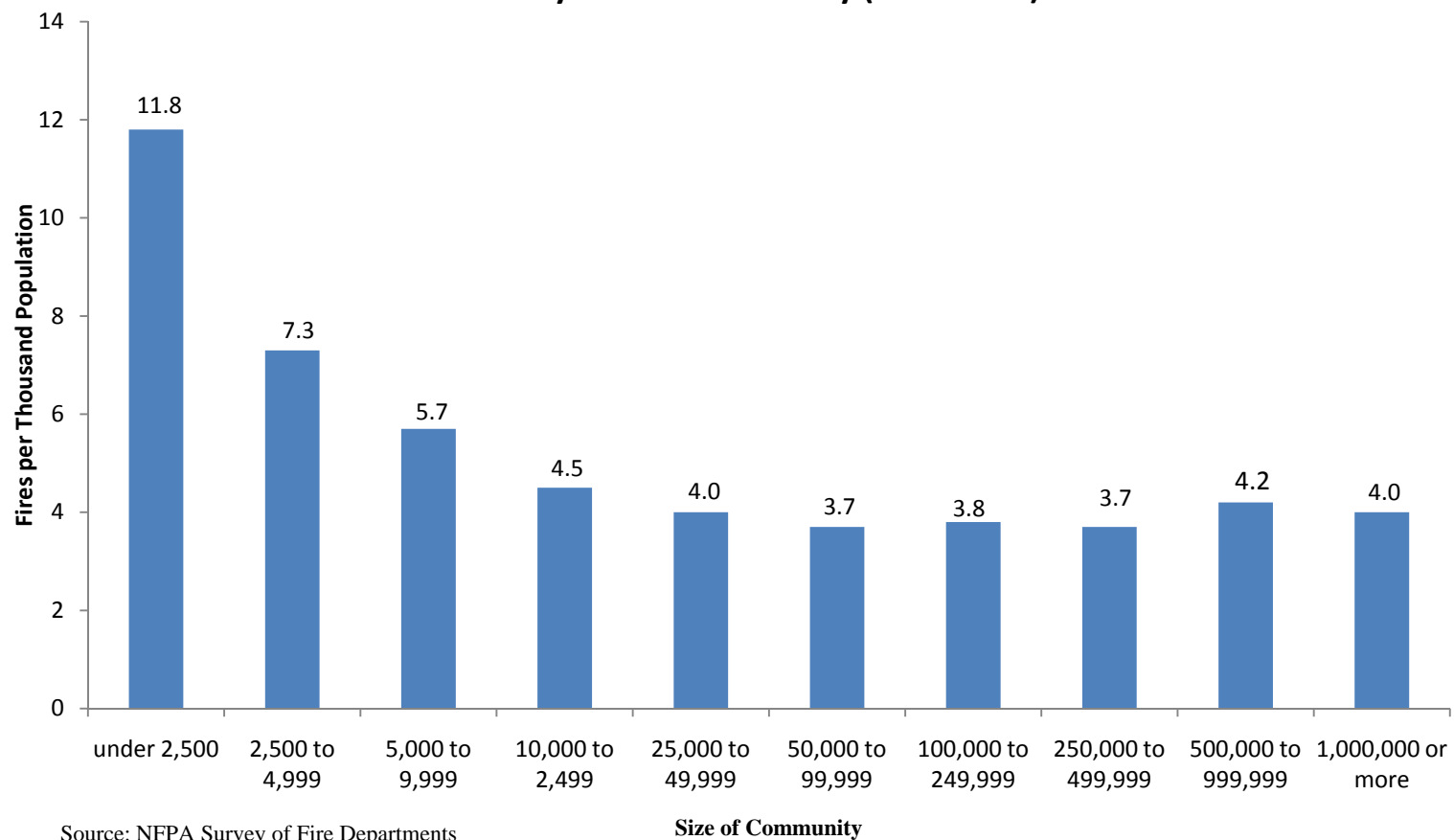
⁵ This decrease reflects three industrial property incidents that resulted in \$775 million in property damage.

*Change was statistically significant at the .05 level.

**Change was statistically significant at the .01 level.



**Figure 2. Fires per Thousand Population
by Size of Community (2005-2009)**



Source: NFPA Survey of Fire Departments
for U.S. Fire Experience; (2005-2009)

the next three years. From 1997 to 2002, the number of outside fires stayed in the 839,000 to 861,500 level except for 1999, then rose in 2005 and 2006, before declining during 2007-2009 to 649,000 at the end of 2009.

Of the outside fires, there were an estimated 306,000 brush fires in 2009, a significant decrease of 8.7%, while an estimated 171,000 rubbish fires occurred a decrease of 9.0%.

Civilian Fire Deaths

The 1,348,500 fires reported by fire departments in the U.S. in 2009, resulted in an estimated 3,010 civilian deaths based on data reported to the NFPA. This is a decrease of 9.3% from a year ago, and is the lowest since the NFPA started using its current survey methodology in 1977-78. The nature of the decrease is better understood when results are examined by property type.

An estimated 2,590 civilians died in residential fires in 2009, a decrease of 6.8%. Of these deaths, 465 occurred in apartment fires. Another 2,100 died in one- and two-family homes fires, a decrease of 11.2%. Most of this decrease is due to a 33% drop in the death rate for departments that protect communities of 25,000 to 49,999, and a 42% drop for departments that protect communities of 2,500 to 4,999. Though encouraged by this drop in 2009, we must remain cautious because death rates can vary considerably from year to year by community size, particularly for smaller communities.

In all, fires in the home (one- and two-family homes including manufactured homes and apartments) resulted in 2,755 civilian deaths, a decrease of 3.8% from a year ago, and the third lowest since 1977. Looking at trends in civilian deaths since 1977-78¹, several observations are worth noting (see Figure 3). Home fire deaths were at their peak in 1978 when 6,015 fire deaths occurred. Home fire deaths then decreased steadily during the 1979-82 period except for 1981, and decreased a substantial 20% during the period to 4,820 by the end of 1982. From 1982 to 1988, the number of home fire deaths stayed quite level in the 4,655 to 4,955 area except for 1984 when 4,075 fire deaths occurred. From 1989 to 1996 home fire deaths continued to decline and stayed in the 3,425 to 4,335 area. From 1997 onward home fire deaths have generally continued to decline with the number of deaths staying in the 2,580 to 3,190 area since 2001.

Overall for the 1977-2009 period, the number of home fire deaths decreased from 5,865 in 1977 to 2,565 in 2009 for a decrease of 56%. The number of home fire incidents also declined steadily for an overall decrease of 50% for the same period. When the death rate per 1,000 home fire incidents is looked at (Figure 3), there is no steady decline, but rather the rate fluctuates considerably up and down². In fact, the death rate per 1,000

home fires was 8.1 in 1977 and 7.1 in 2009 for a decrease of 12%. These results suggest that even though the number of home fires and home fire deaths declined similarly during the period, the death rate did not, and when there is a home fire, the fire death rate risk has not changed much for the period.

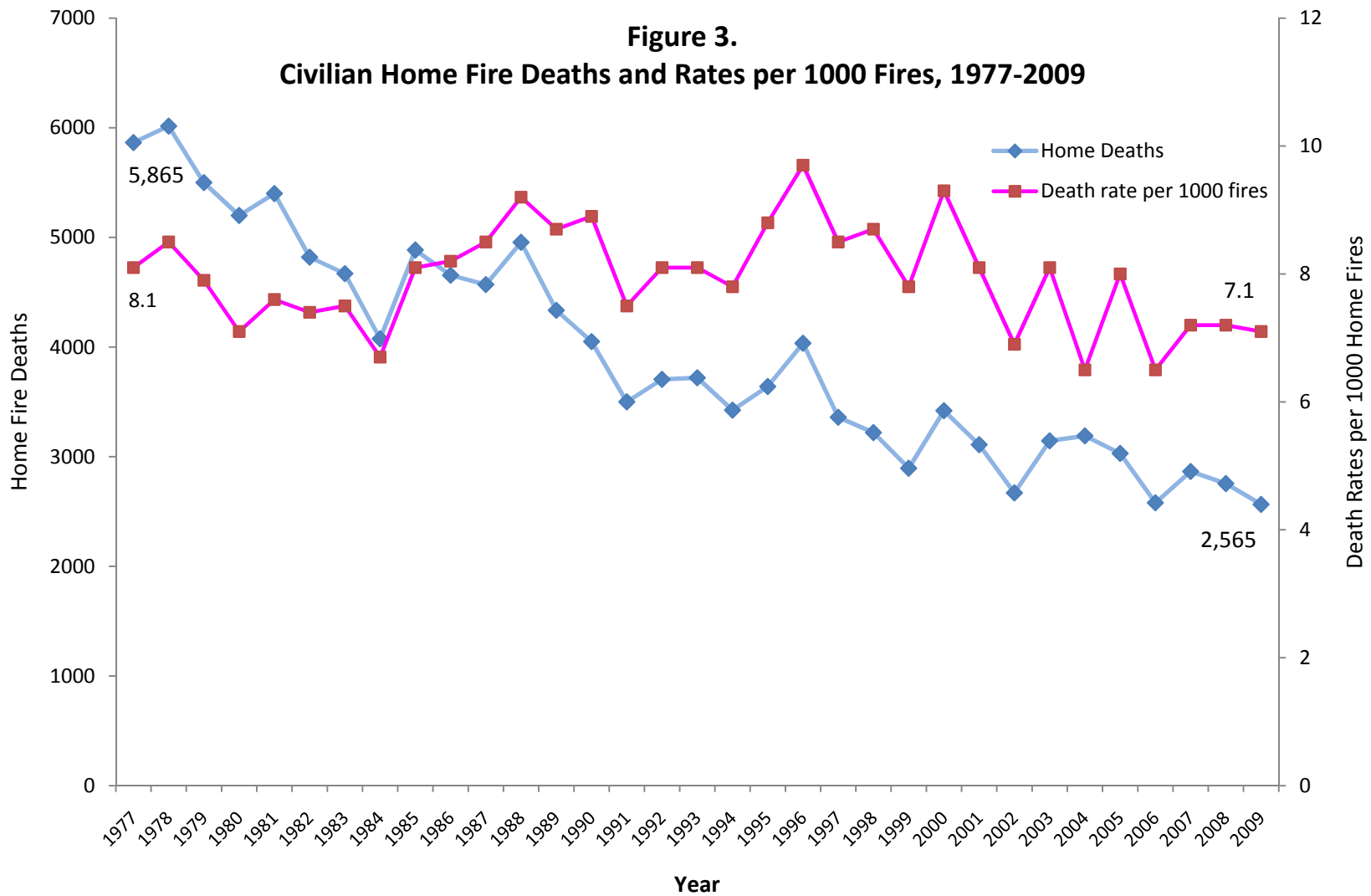
With home fire deaths still accounting for 2,565 fire deaths or 85% of all civilian deaths, fire safety initiatives targeted at the home remain the key to any reductions in the overall fire death toll. Five major strategies are: First, more widespread public fire safety education is needed on how to prevent fires and how to avoid serious injury or death if fire occurs. Information on the common causes of fatal home fires should continue to be used in the design of fire safety education messages. Second, more people must use and maintain smoke detectors and develop and practice escape plans. Third, wider use of residential sprinklers must be aggressively pursued. Fourth, additional ways must be sought to make home products more fire safe. The regulations requiring more child-resistant lighters are a good example, as are requirements for cigarettes, with reduced ignition strength (generally called “fire-safe” cigarettes). The wider use of upholstered furniture and mattresses that are more resistant to cigarette ignitions is an example of change that has already accomplished much and will continue to do more. Fifth, the special fire safety needs of high-risk groups, e.g., the young, older adults, and the poor need to be addressed.^{3,4}

Also in 2009, 105 civilians died in nonresidential structure fires, a decrease of 12.5%.

Civilian fire deaths per million people in home fires by community size and year (2000 to 2009) was examined (Figure 4). All community sizes, the smallest to the largest, experienced a decline in civilian death rates during the period. The decline for larger communities (populations of 100,000 or more) was more consistent from year to year than for smaller communities, where the rate fluctuated somewhat from year to year.

Of the 2,695 civilians that died in structure fires, 170 or 6.3% died in fires that were intentionally set.

Also in 2009, an estimated 260 civilians died in highway vehicle fires, a decrease of 25.7%, and the lowest it has been since the NFPA started using its current survey methodology in 1977-78.



Source: NFPA Survey of Fire Departments (1977-2009)

Table 4
Estimates of 2009 Civilian Fire Deaths and
Injuries by Property Use

Property Use	Civilian Deaths			Civilian Injuries		
	Estimate	Percent Change From 2008	Percent of all Civilian Deaths	Estimate	Percent Change From 2008	Percent of all Civilian Injuries
Residential (total)	2,590	-6.8	86.0	13,050	-3.8	76.6
One-and-Two-Family Homes ¹	2,100	-11.2	69.8	9,300	+1.2	54.6
Apartments	465	+19.2	15.4	3,350	-15.7	19.6
Other Residential ²	25	0	0.8	400	0	2.4
Non-residential Structures ³	105	-12.5	3.5	1,690	+20.7	9.9
Highway Vehicles	260	-25.7	8.6	1,455	+71.2*	8.5
Other Vehicles ⁴	20	+33.3	0.7	155	-27.9	0.9
All Other ⁵	35	-36.4	1.2	700	+2.9	4.1
Total	3,010	-9.3		17,050	+2.1	

Estimates are based on data reported to the NFPA by fire departments that responded to the 2009 National Fire Experience Survey. Note that most changes were not statistically significant; considerable year-to-year fluctuation is to be expected for many of these totals because of their small size.

¹This includes manufactured homes.

² Includes hotels and motels, college dormitories, boarding houses, etc.

³ This includes public assembly, educational, institutional, store and office, industry, utility, storage, and special structure properties.

⁴ This includes trains, boats, ships, farm vehicles and construction vehicles.

⁵ This includes outside properties with value, as well as brush, rubbish, and other outside locations.

*Change was statistically significant at the .05 level.

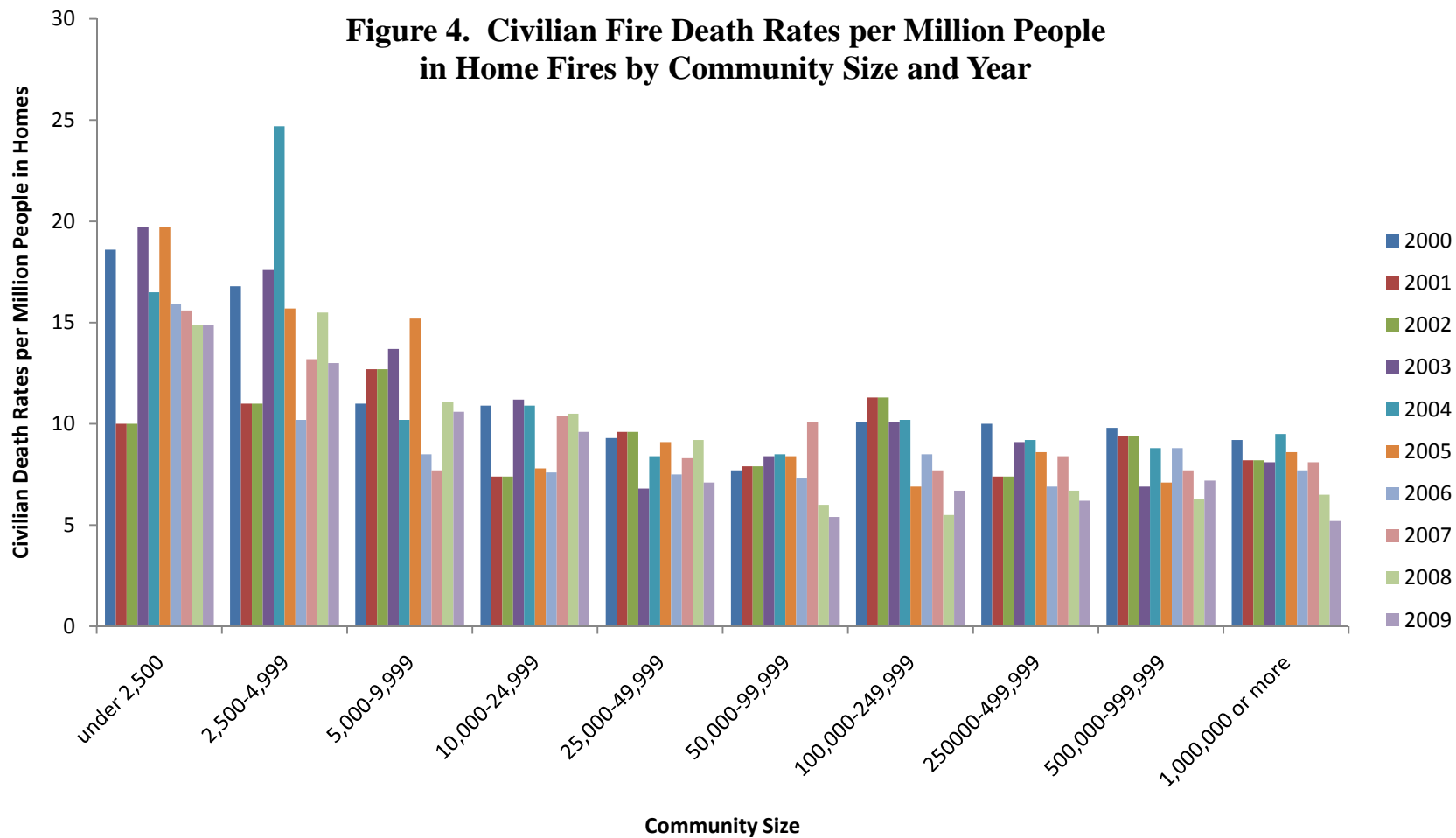
Civilian Fire Injuries

Results based on data reported to the NFPA indicate that in addition to 3,010 civilian fire deaths, there were an estimated 17,050 civilian fire injuries in 2009. This represents a slight increase of 2.1% from a year ago.

Estimates of civilian fire injuries are on the low side, because many civilian injuries are not reported to the fire service. For example, many injuries occur at small fires that fire departments do not respond to, and sometime when departments do respond they may be unaware of injured persons that they did not transport to medical facilities.

The NFPA estimates that there were 13,050 civilians injured in residential properties, a decrease of 3.8%. Of these injuries, 9,300 occurred in one- and two-family homes, and 3,350 occurred in apartments. There were also 1,690 civilians injured in nonresidential structures in 2009. For the 1977-2008 period, the number of civilian injuries has ranged from a high of 31,275 in 1983 to a low of 16,400 in 2006 for an overall decrease of 48%. There was no consistent pattern going up or down until 1995, when injuries fell roughly 5,000 in 1994-95 to 25,775. From 1996 to 2002, injuries declined 28% to 18,425 by the end of 2002. From 2002 to 2009, injuries have been in the 17,650 to 18,425 area except for 2006, 2008 and 2009.

Figure 4. Civilian Fire Death Rates per Million People in Home Fires by Community Size and Year



Property Loss

The NFPA estimates that the 1,348,500 fires responded to by the fire service caused \$12,531,000,000 in property damage in 2009. This is a highly significant decrease of 19.0% (Most of this decrease reflects the California Wildfires 2008 that occurred with an estimated property damage of \$1,400,000,000.)

Fires in structures resulted in \$10,842,000,000, in property damage, a significant decrease of 12.3%. Average loss per structure fire was \$22,564, a decrease of 6.0%.

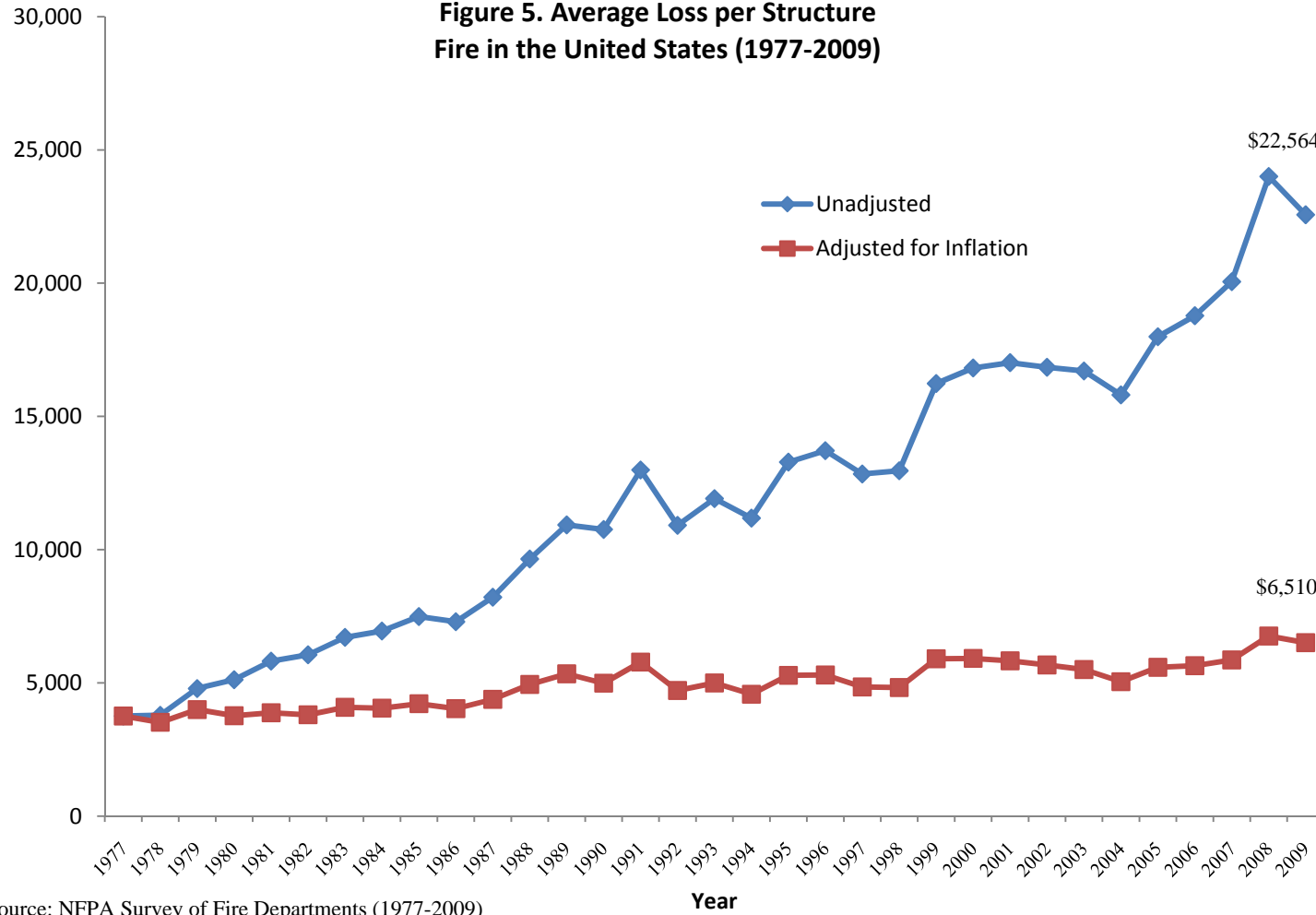
Over the 1977-2009 period, and excluding the events of 9/11/01, the average loss per structure fire was \$3,757 in 1977 and \$22,564 in 2009 for an overall increase of 500%. When property loss is adjusted for inflation, the increase in the average structure fire loss between 1977 and 2009 is 80%.

Of the property loss in structures, \$7,796,000,000 occurred in residential properties, a decrease of 8.8%. An estimated \$6,391,000,000 occurred in one- and two-family homes, a decrease of 7.3%. An estimated \$1,225,000,000 also occurred in apartments.

Other property damage figures worth noting for 2009 include: \$572,000,000 in industrial properties, a significant decrease of 59.2%, (the decrease reflects three industrial property incidents that resulted in \$775,000,000 in property damage in 2008); \$757,000,000 in public assembly properties, a significant increase of 46.1% (includes a casino fire that resulted in \$340,000,000 in property loss); \$98,000,000 in special properties, a highly significant decrease of 78.9%; \$83,000,000 in educational properties, a significant increase of 25.8%; and \$791,000,000 in storage properties, a significant increase of 19.7%.

It should be kept in mind that property loss totals can change dramatically from year to year because of the impact of occasional large loss fires. The NFPA provides an analysis of these large loss fires in the November/December issue of *NFPA Journal* every year.

**Figure 5. Average Loss per Structure
Fire in the United States (1977-2009)**



Source: NFPA Survey of Fire Departments (1977-2009)

Intentionally Set Fires

Based on data reported by fire departments in the survey, the NFPA estimates there were 26,500 intentionally set structure fires in 2009, a decrease of 13.1% from a year ago (see Table 5). (Note the NFPA survey is based on the NFIRS 5.0 system. This new system has an intentionally set category which is equivalent to the old incendiary category. There is no new equivalent to the old suspicious category, which has been eliminated.)

These intentionally set structure fires resulted in an estimated 170 civilian deaths, a significant decrease of 46.0%. Both estimates of intentionally set structure fires and the resulting civilian deaths are the lowest figures since the NFPA started using its current survey methodology in 1977-78. These set structure fires also resulted in \$684,000,000 in property loss, a decrease of 21.2%.

Also in 2009, there were an estimated 15,000 intentionally set vehicle fires, a decrease of 14.3% from a year ago. These set vehicle fires resulted in \$108,000,000 in property loss a decrease of 22.3% from a year ago.

Table 5
Estimate of 2009 Losses in
Intentionally Set Structure Fires

Intentionally² Set Structure Fires	Estimate	Percent change from 2008
Number of Structure Fires	26,500	-13.1*
Civilian Deaths	170	-46.0**
Property Loss ¹	\$684,000,000	-21.2**

The estimates are based on data reported to the NFPA by fire departments that responded to the 2009 National Fire Experience Survey.

¹ This includes overall direct property loss to contents, structure, a vehicle, machinery, vegetation, or anything else involved in a fire. It does not include indirect losses, e.g., business interruption or temporary shelter costs. No adjustment was made for inflation in the year-to-year comparison.

²The NFPA Survey is based on the NFIRS 5.0 system. This system has an intentionally set category which is equivalent to the old incendiary category. There is no new equivalent to the old suspicious category, which has been eliminated.

*Change was statistically significant at the .05 level.

**Change was statistically significant at the .01 level.

Region

Fire loss rates nationwide and by region⁵ can be seen in Table 6. The Midwest (5.2) and the South (4.7) had the highest fire incident rates per thousand people.

The Midwest with 12.1 had the highest death rate per million population followed by the Northeast and South both with 10.7.

The Midwest with 74.5 had the highest civilian injury rate per million population followed by the Northeast (56.2), and the South (51.2).

The Midwest with \$53.6 had the highest property loss rate per capita followed by the South (\$40.8), and the Northeast (\$38.2).

Fire incident rates by region and community size are shown in Table 7. The Midwest had the highest rate for communities of 250,000 to 499,999, the Northeast had the highest rate for communities of 100,000 to 249,000, and the South had the highest rates for communities of 500,000 or more, communities of 10,000 to 99,999, and smaller communities (populations of less than 10,000).

Civilian fire deaths per million population by region and community size are shown in Table 8. The Midwest had the highest rate for communities of 250,000 to 499,999, the Northeast had the highest rate for communities of 100,000 to 249,999, the West had the highest rate for communities of 2,500 to 4,999, and the South had the highest rates for communities of 500,000 or more, communities of 10,000 to 9,999, and the smallest communities (populations of less than 2,500).

Civilian fire injuries per million population by region and community size are shown in Table 9. The West had the highest rates for communities of 500,000 or more (though only the South and the West had sufficient data for this community size), and the Northeast had the highest rates communities of 50,000 to 249,999. The Midwest had the highest rates for communities of 250,000 to 499,999, communities of 25,000 to 49,999, and communities of 2,500 to 4,999 (though only the Northeast and the Midwest had sufficient data for this community size). The South had the highest rates for communities of 5,000 to 24,999, and communities less than 2,500 population.

Property loss per capita by region and community size are shown in Table 10. The Midwest had the highest rates for communities of 25,000 to 49,999, and communities of less than 2,500 population and the South had the highest rates for communities of 100,000 or more, communities of 50,000 to 99,999, and for communities of 2,500 to 24,999.

Table 6
Fire Loss Rates Nationwide and by Region, 2009

<u>Region</u>	<u>Number of Fires per Thousand Population</u>	<u>Civilian Deaths per Million Population</u>	<u>Civilian Injuries per Million Population</u>	<u>Property Loss per Capita</u>
Nationwide	4.4	9.8	55.5	\$40.8
Northeast	4.3	10.7	56.2	38.2
Midwest	5.2	12.1	74.5	53.6
South	4.7	10.7	51.2	40.8
West	3.1	5.7	44.2	30.9

Source: NFPA's; Survey of Fire Departments for 2009 U.S. Fire Experience.

Table 7
2009 Fires per Thousand Population

Population of Community	All Regions	Northeast	Midwest	South	West
500,000 or more	3.7	5.3	*	3.5	2.7
250,000 to 499,999	3.1	*	4.1	3.3	2.1
100,000 to 249,999	3.3	5.0	3.1	4.0	2.3
50,000 to 99,999	3.3	3.8	2.7	4.3	2.7
25,000 to 49,999	3.4	3.7	2.8	4.3	3.1
10,000 to 24,999	4.0	3.5	3.5	5.2	3.8
5,000 to 9,999	5.1	4.4	4.4	6.8	5.4
2,500 to 4,999	6.7	5.2	6.4	8.5	6.5
under 2,500	10.8	8.6	10.0	14.7	10.8

Source: NFPA's Survey of Fire Departments for 2009 U.S. Fire Experience.

*Insufficient data

Table 8
2009 Civilian Fire Deaths per Million Population
by Region and Size of Community

Population of Community	All Regions	Northeast	Midwest	South	West
500,000 or more	8.1	10.2	*	11.2	3.6
250,000 to 499,999	8.3	*	11.7	8.9	4.6
100,000 to 249,999	9.2	14.1	6.8	11.5	7.1
50,000 to 99,999	6.7	8.9	5.6	9.9	3.1
25,000 to 49,999	8.2	9.1	8.1	9.3	5.6
10,000 to 24,999	11.7	11.5	11.6	14.2	7.0
5,000 to 9,999	11.9	17.0	13.1	7.8	7.2
2,500 to 4,999	15.1	12.1	16.2	9.8	23.2
under 2,500	17.5	7.8	14.0	35.8	13.1

Source: NFPA's Survey of Fire Departments for 2009 U.S. Fire Experience

*Insufficient data

Table 9
2009 Civilian Fire Injuries per Million Population
by Region and Size of Community

Population of Community	All Regions	Northeast	Midwest	South	West
500,000 or more	62.1	*	*	42.0	72.3
250,000 to 499,999	49.3	*	78.7	52.8	26.1
100,000 to 249,999	57.4	115.7	78.4	60.3	36.8
50,000 to 99,999	62.4	91.4	64.5	63.6	45.5
25,000 to 49,999	61.4	56.5	68.4	67.7	34.0
10,000 to 24,999	65.4	68.4	65.4	78.4	30.9
5,000 to 9,999	51.9	47.2	49.6	65.7	40.7
2,500 to 4,999	39.4	37.2	62.6	*	*
under 2,500	47.3	31.3	53.2	59.8	*

Source: NFPA's Survey of Fire Departments for 2009 U.S. Fire Experience.

*Insufficient data

Table 10
2009 Property Loss per Person
by Region and Size of Community

Population of Community	All Regions	Northeast	Midwest	South	West
500,000 or more	\$29.3	*	*	\$32.2	\$25.4
250,000 to 499,999	29.5	*	\$26.4	35.6	25.1
100,000 to 249,999	33.6	\$35.7	30.0	35.8	32.9
50,000 to 99,999	36.4	36.7	35.0	41.4	32.2
25,000 to 49,999	39.2	25.6	41.3	39.3	41.3
10,000 to 24,999	38.7	33.7	38.8	43.3	33.0
5,000 to 9,999	57.4	38.9	56.7	81.9	43.4
2,500 to 4,999	87.6	105.4	79.8	113.7	62.5
under 2,500	107.1	96.6	112.5	100.6	111.1

Source: NFPA's Survey of Fire Departments for 2009 U.S. Fire Experience.

*Insufficient data

Average Fire Experience

Average fire experience by community size for all fires and residential properties can be seen in Tables 11 and 12.

Table 11
Average 2009 Fire Experience by Size of Community

Population of All Community	Total Fires	Structure Fires	Civilian Deaths	Civilian Injuries	Property Loss
1,000,000 or more	3,951	1,419	17.0	138.25	\$46,895,400
500,000 to 999,999	2,616	1,041	6.23	33.18	21,675,600
250,000 to 499,999	1,060	432	2.89	17.24	10,004,000
100,000 to 249,999	494	193	1.39	8.66	7,930,900
50,000 to 99,999	222	92	0.46	4.24	2,488,300
25,000 to 49,999	118	46	0.28	2.12	1,376,200
10,000 to 24,999	63	24	0.18	1.02	680,800
5,000 to 9,999	37	13	0.09	0.38	458,600
2,500 to 4,999	22	7	0.05	0.13	400,000
under 2,500	11	3	0.02	0.05	111,400

Source: NFPA's Survey of Fire Departments for 2009 U.S. Fire Experience

Table 12
Average 2009 Residential Fire Experience by Size of Community

Population of Community	Number of Fires	Civilian Deaths	Civilian Injuries	Property Loss
1,000,000 or more	1,099	13.83	58.00	\$26,209,700
500,000 to 999,999	808	5.32	26.21	14,065,100
250,000 to 499,999	346	2.32	14.54	6,325,100
100,000 to 249,999	150	1.07	7.18	3,496,700
50,000 to 99,999	75	0.38	3.49	1,532,200
25,000 to 49,999	38	0.25	1.74	888,800
10,000 to 24,999	19	0.16	0.85	365,500
5,000 to 9,999	10	0.08	0.29	245,400
2,500 to 4,999	5	0.04	0.07	198,600
under 2,500	2	0.02	0.02	62,500

Source: NFPA's Survey of Fire Departments for 2009 U.S. Fire Experience

Table 13

Fire Department Responses by Type of Call, 2009

In all, fire departments responded to the following estimated number of fires and other incidents in 2009.

	Number	Percent Change From 2008
Fire Incidents	1,348,500	-7.1
Medical Aid Responses (Ambulance, EMS, Rescue)	17,104,000	+8.5
False Alarms	2,177,000	-2.9
Mutual Aid or Assistance Calls	1,296,000	+6.7
Hazardous Material Responses (Spills, Leaks, etc.)	397,000	+0.6
Other Hazardous Responses (arcing wires, bomb removal etc.)	625,500	-10.3
All Other Responses (smoke scares, lock-outs, etc.)	3,586,500	+2.9
Total Incidents	26,534,500	+5.1

The percent of fires and nonfire incidents by community size is shown in Table 13.

A further breakdown on false responses was collected on the 2009 surveys and the results can be seen in Table 14.

Table 14
Percent of Fires and Nonfire Incidents by Community size, 2008-2009

	Community Size									
	1,000,000 or more	500,000 to 999,999	250,000 to 499,999	100,000 to 249,999	50,000 to 99,999	25,000 to 49,999	10,000 to 24,999	5,000 to 9,999	2,500 to 4,999	less than 2,500
Fire Incidents	2.8%	3.3%	3.3%	3.6%	3.5%	4.4%	5.3%	7.6%	11.2%	17.1%
Medical Aid Responses	70.1%	69.9%	70.9%	68.6%	66.9%	62.6%	60.8%	56.8%	52.2%	49.4%
False Alarms	9.5%	6.7%	6.9%	7.8%	8.8%	10.3%	9.3%	9.7%	7.5%	7.4%
Mutual Aid Responses	1.0%	2.0%	1.5%	2.8%	2.2%	4.0%	6.5%	10.8%	14.0%	14.5%
Hazardous Material Responses	0.5%	0.8%	1.0%	1.2%	1.4%	1.9%	2.0%	2.1%	1.5%	0.9%
Other Hazardous Responses	1.2%	1.6%	2.1%	1.9%	2.5%	3.0%	3.2%	3.6%	3.3%	3.0%
All Other Responses	11.0%	15.1%	16.9%	16.1%	14.1%	14.0%	13.0%	11.9%	9.2%	8.3%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: NFPA's Survey of Fire Departments for U.S. Fire Experience, 2008-2009.

Table 15
Estimates of False Alarms by Type, 2009

	Estimate	Percent Change From 2008	Percent of All False Alarms
Malicious, Mischievous False Call	183,000	-3.7	8.4
System Malfunction	698,000	-8.8	32.1
Unintentional Call	979,500	+0.3	45.0
Other False Alarms (Bomb Scares, etc.)	316,500	+4.1	14.5
Total	2,177,000	-2.9	

Source: NFPA's Survey of Fire Departments for 2009 U.S. Fire Experience

SURVEY METHODOLOGY

Each year, based on a sample survey of fire departments across the country, the NFPA estimates the national fire problem as measured by the number of fires that public fire departments attend, and the resulting deaths, injuries and property losses that occur. This report summarizes key findings based on the NFPA Survey for 2009 Fire Experience. This section explains the major steps in conducting the 2009 survey.

Sample Selection

The NFPA currently has 30,170 public fire departments listed in the US in its Fire Service Inventory (FSI) file. Based on desired levels of statistical precision for the survey results and the staff available to process, edit, and follow up on the individual questionnaires the NFPA determined that 3,000 fire departments were a reasonable number for the 2009 sample.

Because of the variation in fire loss results by community size, fire departments were placed in one of the following 10 strata by size of community protected:

- 1,000,000 and up
- 500,000 to 999,999
- 250,000 to 499,999
- 100,000 to 249,999
- 50,000 to 99,999
- 25,000 to 49,999
- 10,000 to 24,999
- 5,000 to 9,999
- 2,500 to 4,999
- Under 2,500

Sample sizes for the individual strata were chosen to ensure the best estimate of civilian deaths in one- and two-family dwellings, the statistic that most aptly reflects the overall severity of the fire problem. All departments that protect 50,000 people or more were included. These 799 departments in the five highest strata protect 146,257,500.

For the remaining five population strata, assuming response rates similar to the past two years for the five highest strata, a total sample of 2,640 was indicated. Sample sizes for individual strata were calculated using a methodology that assured optimum sample allocations⁶. Based on the average variation in civilian deaths in one- and two-family dwellings by stratum for the last two years and on the estimated number of fire departments, appropriate relative sample weights were determined. Then the corresponding sample sizes by stratum were calculated. The sample size by stratum was

then adjusted based on the response rates from the last two years' returns. A sample size of 17,900 was found to be necessary to obtain the desired total response of 3,000 fire departments. For all strata, where a sample was necessary, departments were randomly selected.

Data Collection

The fire departments selected for the survey were sent the 2009 NFPA Fire Experience Questionnaire during the 2nd week of January 2010. A second mailing was sent in mid-March to fire departments that had not responded to the first mailing. A total of 2,732 departments responded to the questionnaire 2,210 to the first mailing and 522 to the second.

Table 14 shows the number of departments that responded by region and size of community. The overall response rate was 15%, although response rates were considerably higher for departments protecting larger communities than they were for departments protecting smaller communities. The 2,732 departments that did respond protect 106,411,300 people or 35% of the total U.S. population.

After the NFPA received the surveys, technical staff members of the Fire Analysis and Research Division reviewed them for completeness and consistency. When appropriate, they followed up on questions with a telephone call.

After the edit, procedures were completed, the survey data were keyed to a computer file, where additional checks were made. The file was then ready for data analysis and estimation procedures.

Estimation Methodology

The estimation method used for the survey was ratio estimation⁷, with stratification by community size. For each fire statistic a sample loss rate was computed for each stratum. This rate consisted of the total for that particular statistic from all fire departments reporting it, divided by the total population protected by the departments reporting the statistic. Note that this means that the departments used in calculating each statistic could be different, reflecting differences in unreported statistics. The sample fire loss rates by stratum were then multiplied by population weighing factors to determine the estimates were combined to provide the overall national estimate.

If this method of estimation is to be effective, estimates of the total number of fire departments and the total population protected in each stratum must be accurate. The NFPA makes every effort to ensure that this is the case. The population weights used for

Table 16
Number of Fire Departments Responding to 2009 NFPA Survey, by
Region and Community Size

Population of Community	All Regions	Northeast	Midwest	South	West
1,000,000 or more	7	2	0	3	2
500,000 to 999,999	31	1	2	16	12
250,000 to 499,999	40	1	9	19	11
100,000 to 249,999	107	8	20	41	38
50,000 to 99,999	212	25	67	66	54
25,000 49,999	306	45	132	82	47
10,000 to 24,999	504	89	212	138	65
5,000 to 9,999	443	89	190	109	55
2,500 to 4,999	295	49	148	62	36
Under 2,500	787	118	419	143	107
TOTAL	2,732	426	1,199	679	427

the national estimates were developed using the NFPA FSI (Fire Service Inventory) File and U.S. Census population figures.

For each estimate, a corresponding standard error was also calculated⁶. The standard error is a measure of the error caused by the fact that estimates are based on a sampling of fire losses rather than on a complete census of the fire problem. Due to the fact that the survey is based on a random sample, we can be very confident that the actual value falls within the percentage noted in parentheses for the overall national fire loss statistics: number of fires (1.8%), number of civilian deaths (11.0%), number of civilian injuries (5.5%), and property loss (2.5%).

The standard error helps in determining whether year-to-year differences are statistically significant. Differences that were found to be statistically significant were so noted in tables. Property loss estimates are particularly prone to large standard errors because they are sensitive to unusually high losses, and, as a result, large percentage differences from year to year may not always be statistically significant. In 2009, for instance, property damage in institutional properties was estimated to be \$32,000,000. This represented an increase of 45.5% from the year before, but was found not to be statistically significant.

In addition to sampling errors, there are nonsampling errors. These include biases of the survey methodology, incomplete or inaccurate reporting of data to the NFPA, differences in data collection methods by the fire departments responding. As an example of a nonsampling error, most of the fires included in the survey took place in highly populated residential areas, because the fire departments selected for the surveys are primarily public fire departments that protect sizable residential populations. Fires that occur in sparsely populated areas protected primarily by State and Federal Departments of Forestry are not likely to be included in the survey results.

The NFPA Fire Incident Data Organization (FIDO) data base was also used in conjunction with the annual survey to help identify any large loss fires or deaths in nonresidential structures or large losses that the survey may have missed.

The editors of survey data attempted to verify all reported civilian deaths in vehicle fires. They contacted most of the fire departments that reported fire-related deaths in vehicles and found that many of the deaths were indeed the results of fire. In some instances, however, impact was found to have been the cause of death. This effort can have a considerable impact on the estimates.

The results presented in this report are based on fire incidents attended by public fire departments. No adjustments were made for unreported fires and losses (e.g., fires extinguished by the occupant). Also, no adjustments were made for fires attended solely by private fire brigades (e.g., industry and military installations), or for fires extinguished by fixed suppression systems with no fire department response.

Fire Experience of Nonrespondents

A telephone follow-up was made to a sample of nonrespondents to determine whether fire departments that did not respond to the survey experienced fire loss rates similar to those that did respond. This would help the NFPA determine whether we received questionnaires only from departments that had experienced unusually high or low fire losses.

The sample of nonrespondents selected was proportional by state and population of community to the original sample selected for the survey. As a result of these efforts, 157 fire departments were successfully contacted and answered some of the questions about their fire experience.

Table 16 compares fire loss rates for both respondents and nonrespondents. For communities of 100,000 to 249,999, the nonrespondent rate was 12% higher for fires, while the respondent rate was 89% higher for property loss, and the rates were similar for civilian deaths (None of these results were statistically significant).

For communities of 50,000 to 99,999, the nonrespondent rate was 48% higher for civilian deaths, while the respondent rate was 14% higher for fires and 110% higher for property loss. (Only the property loss result was statistically significant).

For communities of 25,000 to 49,999, the nonrespondent rate was 6% higher for civilian deaths, while the respondent rate was 156% for civilian deaths, and 40% higher for property loss. (Only the civilian death result was statistically significant).

For communities of 10,000 to 24,999, the nonrespondent rate was 15% higher for fires, and 44% higher for civilian deaths, while the rates were similar for property loss (None of these results were statistically significant).

For communities of 5,000 to 9,999, the nonrespondent rate was 27% higher for civilian deaths, while the respondent rate was 48% for property loss, and the rates were similar for fires. (None of these results were statistically significant).

Table 17
A Comparison of Respondents and Nonrespondents*
to the 2009 NFPA Survey by Community Size

Population of Community	Number of Fires (Per Thousand Population)				Civilian Deaths (Per Million Population)				Property Loss (Per Capita)			
	Respondents		Nonrespondents		Respondents		Nonrespondents		Respondents		Nonrespondents	
	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
100,000 to 249,999	101	3.3	22	3.7	101	9.2	22	9.2	77	52.2	17	27.6
50,000 to 99,999	196	3.3	32	2.9	207	6.7	30	9.9	153	36.4	25	17.4
25,000 to 49,999	288	3.4	46	3.6	304	8.2	44	3.2	204	39.2	32	28.1
10,000 to 24,999	483	4.0	31	4.6	501	11.7	31	16.8	294	43.2	17	42.0
5,000 to 9,999	427	5.1	26	5.0	440	11.9	26	15.1	243	63.0	17	42.5

*Some departments did not return the questionnaire. A sample of these nonrespondents was contacted by telephone and questioned about their 2009 fire experience.

Note: “n” refers to the number of departments reporting the statistic.

ns – Data not sufficient.

Definition of Terms

Civilian: The term “civilian” includes anyone other than a firefighter, and covers public service personnel such as police officers, civil defense staff, non-fire service medical personnel, and utility company employees.

Death: An injury that occurred as a direct result of a fire that is fatal or becomes fatal within one year.

Fire: Any instance of uncontrolled burning. Includes combustion explosions and fires out on arrival. Excludes controlled burning (whether authorized or not), over pressure rupture without combustion, mutual aid responses, smoke scares, and hazardous responses (e.g., oil spill without fire).

Injury: Physical damage that is suffered by a person as a direct result of fire and that requires (or should require) treatment by a practitioner of medicine (physician, nurse, paramedic, EMT) within one year of the incident (regardless of whether treatment was actually received), or results in at least one day of restricted activity immediately following the incident. Examples of injuries resulting from fire are smoke inhalation, burns, wounds and punctures, fractures, heart attacks (resulting from stress under fire condition), strains and sprains.

Property Damage: Includes all forms of direct loss to contents, structure, machinery, a vehicle, vegetation or anything else involved in the fire but not indirect losses, such as business interruption or temporary shelter provisions.

Structure: An assembly of materials forming a construction for occupancy or use in such a manner as to serve a specific purpose. A building is a form of structure. Open platforms, bridges, roof assemblies over open storage or process areas, tents, air-supported, and grandstands are other forms of structures.

Vehicles, Highway and Other: Fires in these instances may have been associated with an accident; however, reported casualties and property loss should be the direct result of the fire only. Highway vehicles include any vehicle designed to operate normally on highways, e.g., automobiles, motorcycles, buses, trucks, trailers (not mobile homes on foundations), etc. Other vehicles include trains, boats and ships, aircraft, and farm and construction vehicles.

Footnotes

1. Note that the NFPA changed its survey methodology in 1977-78, and meaningful comparisons cannot be made with fire statistics estimated before 1977.
2. The downward trend of home fire deaths for the period was examined by a Spearman's rho correlation coefficient and was found to be statistically significant at the .001 level, while for the death rate per 1,000 home fires, there was no statistically significant trend found.
3. John R. Hall, Jr., *Characteristics of Home Fire Victims Including Age and Sex*, July 2005, Quincy: National Fire Protection Association, Fire Analysis and Research Division.
4. Rita F. Fahy and Alison L. Miller, "How Being Poor Affects Fire Risk", *Fire Journal*, Vol. 83, No. 1 (January 1989), p. 28.
5. As defined by the U.S. Bureau of the Census, the four regions are: Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.
6. Steve K. Thompson, *Sampling*, John Wiley, New York, NY, 1992, pp. 107-111.
7. William G. Cochran, *Sampling Techniques*, John Wiley, New York, NY, 1977, pp. 150-161.