



RESEARCH

Fireworks

June 2016

Marty Ahrens

Abstract

According to the Consumer Product Safety Commission (CPSC), 10,500 fireworks-related injuries were seen in U.S. hospital emergency rooms. Despite an 8% drop from 11,400 injuries in 2013 to the 2014 estimate, the number of fireworks injuries seen in hospital emergency rooms was higher in 2013 and 2014 than it had been since 2006. In 2013, an estimated 15,600 reported fires were started by fireworks. These fires resulted in an estimated 30 civilian injuries and \$21 million in direct property damage, with no reported fire deaths. While two-thirds of the fireworks fires in 2009-2013 were brush, grass or forest fires, most of the losses resulted from structure fires.

Keywords: Fireworks, sparkler, fire statistics, NFIRS, NEISS

Acknowledgements

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the National Fire Incident Reporting System (NFIRS) and the annual NFPA fire experience survey. These firefighters are the original sources of the detailed data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

We are also grateful to the U.S. Fire Administration for its work in developing, coordinating, and maintaining NFIRS. And we appreciate the important work done by the U.S. Consumer Product Safety Commission to develop, maintain, and support analysis of the National Electronic Injury Surveillance System (NEISS) and the National Center for Health Statistics and the National Safety Council for maintenance and analysis of the U.S. death certificate data base.

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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

email: osds@nfpa.org

phone: 617-984-7451

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Executive Summary

Each year, fireworks injure thousands and cause thousands of fires.

FIREWORKS INJURIES SEEN AT EMERGENCY ROOMS

In 2014, 10,500 fireworks-related injuries were seen in U.S. hospital emergency rooms. The Consumer Product Safety Commission (CPSC) reports that the number of people seen in hospital emergency rooms for fireworks-related injuries was higher in 2013 and 2014 than it had been since 2006. In their [2014 Fireworks Annual Report](#), CPSC also noted that they had received reports of 11 fireworks-related deaths in 2014. Death totals for 2014 are considered preliminary. As in previous years, CPSC sought additional information on fireworks injuries seen in the month around July 4. *The specific information that follows is based on the two-thirds of injuries seen from June 20 through July 20, 2014.*

Children aged 5-9 had the highest rate of fireworks injury. The CPSC found that more than one-third (35%) of the victims of fireworks injuries in 2014 were under age 15. Compared to the general population, children ages 5 to 9 were 2.4 times as likely to have been seen for a fireworks injury in 2014. Youth ages 10 to 19 were almost twice (1.8 times) as likely as the overall population to have been hurt in this way. Males accounted for three-quarters (74%) of fireworks injuries.

Half of the fireworks injuries seen at emergency rooms in 2014 were to extremities. Almost two in five were to the eye or other parts of the head. Injuries to extremities were primarily to a hand or finger (36%) or leg (10%). One of every five (19%) injuries were to the eye, and another 19% were to other parts of the head or face.

Sparklers caused more injuries than any other type of fireworks. Only 6% of fireworks injuries resulted from public displays. The CPSC also found that many fireworks injuries were caused by fireworks that are legal in most states. For example, sparklers caused 28% of fireworks injuries, small firecrackers caused 13%, and novelty items caused 9%. These percentages are based on injuries in which the type of fireworks was known.

FIRES INVOLVING FIREWORKS

NFPA estimates that U.S. fire departments responded to 15,600 reported fires started by fireworks in 2013. These fires caused 30 civilian injuries and \$21 million in direct property damage. Although no deaths resulted from these fires in 2013, during the five-year period of 2009-2013, fireworks caused an average of two fire deaths per year.

Two-thirds of the fires started by fireworks were brush, grass or forest fires. In all, 91% of the fireworks fires in 2009-2013 were outdoor or unclassified fires. While only 7% of the

fireworks fires in 2009-2013 were structure fires, these incidents accounted for all of the fire deaths, two-thirds of the fire injuries (66%), and 85% of the fire property damage.

More than one-quarter (28%) of fires started by fireworks in 2009-2013 were reported on Independence Day. Almost half (47%) of the reported fires on the Fourth of July were started by fireworks.

Previously published fire incident descriptions are included at the end of the report. These descriptions show what *can* happen. They are not necessarily the most common type of fireworks incident..

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FIREWORKS FACT SHEET

EACH YEAR, FIREWORKS INJURE THOUSANDS AND CAUSE THOUSANDS OF FIRES.

FIRES INVOLVING FIREWORKS

- In 2013, fireworks caused an estimated 15,600 reported fires in the U.S., including 1,400 structure fires, 200 vehicle fires, and 14,000 outside and other fires.
- These fires resulted in an estimated 30 civilian injuries and \$21 million in direct property damage, with no reported fire deaths. Most fireworks deaths and injuries occur without fires.
- Two thirds of the fires started by fireworks in 2009-2013 were brush, grass or forest fires. However, most of the injuries and property damage resulted from structure fires.
- More than one-quarter (28%) of fires started by fireworks in 2009-2013 were reported on Independence Day. Almost half (47%) of the reported fires on the Fourth of July were started by fireworks.

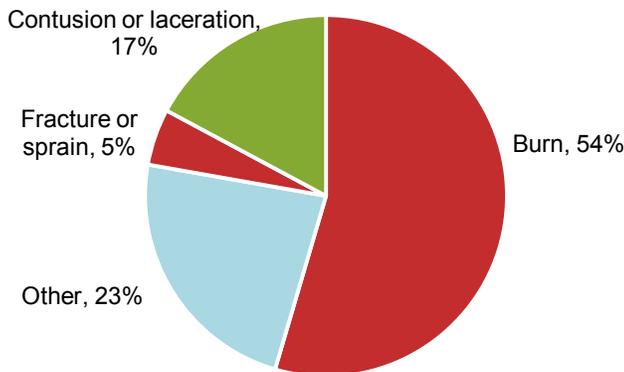
FIREWORKS INJURIES SEEN AT EMERGENCY ROOMS

In 2014, U.S. hospital emergency rooms saw an estimated 10,500 people for fireworks-related injuries. These injury estimates were obtained or derived from the [Consumer Product Safety Commission's 2014 Fireworks Annual Report by Yongling Tu and Demar Granados](#). The detailed statistics below are based only on injuries seen from June 20-July 20, 2014. Two-thirds of the fireworks injuries occurred during that period.

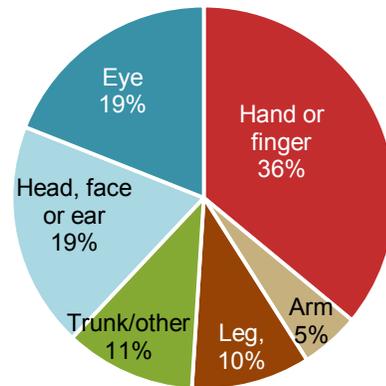
More than half (54%) of the fireworks injuries were burns, while almost 17% were contusions or lacerations.

More than one-third (36%) of the fireworks injuries in 2014 were to hands or fingers. One in five (19%) were eye injuries. An additional 19% were to other parts of the head.

**2014 Fireworks-Related Injuries*
by Type of Injury**



**2014 Fireworks-Related Injuries*
by Part of Body Injured**



Note: The reds and browns are extremities (51% of total) and the blues are parts of the head (38%).

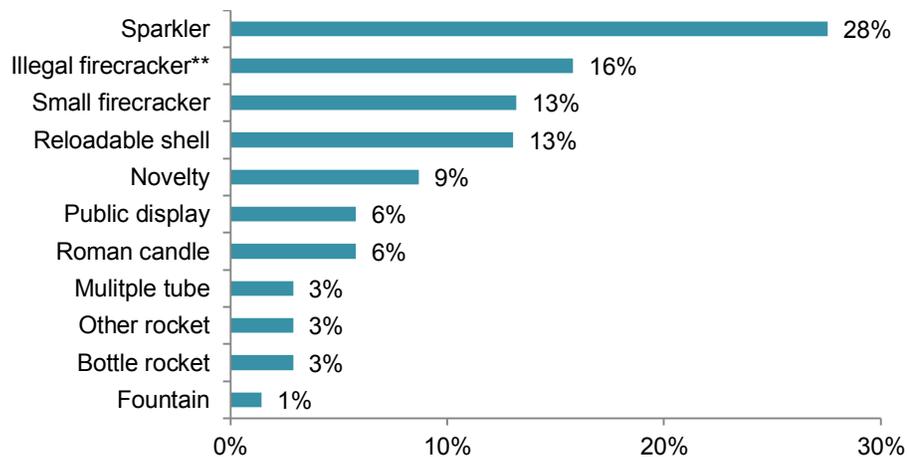
*Based on injuries during the month around July 4.

FIREWORKS INJURIES SEEN AT EMERGENCY ROOMS, FROM JUNE 20 TO JULY 20, 2014

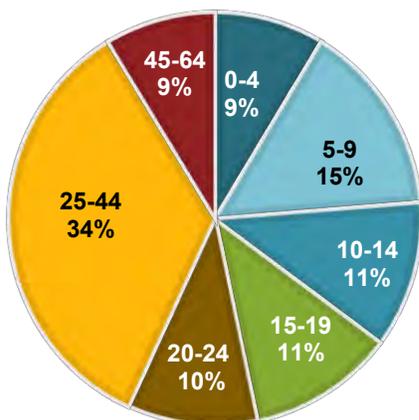
These injury estimates were obtained or derived from the [Consumer Product Safety Commission's 2014 Fireworks Annual Report by Yongling Tu and Demar Granados](#).

- Sparklers alone accounted for more than one one-quarter (28%) of the emergency room fireworks injuries¹ in 2014.
- Only 6% of fireworks injuries were caused by public displays.
- Males accounted for three-quarters (74%) of the injuries.
- More than one-third (35%) of the people hurt by fireworks were under 15; nine percent were under five.
- Children ages 5-9 were 2.4 times as likely as the general population to be injured by fireworks. Youth ages 10-19 had a risk 1.8 times the overall risk.

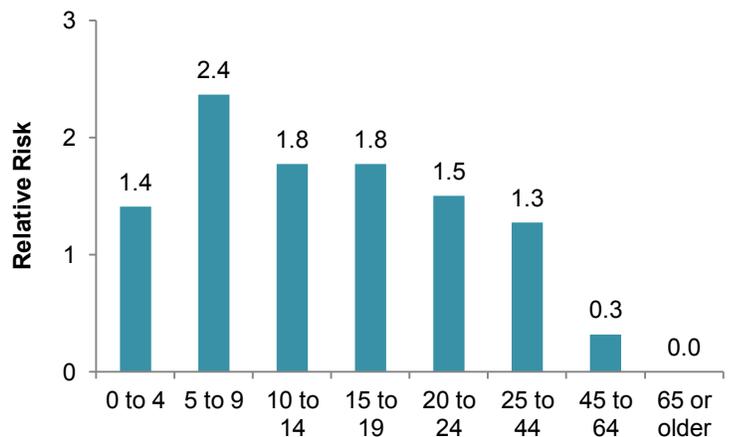
2014 Fireworks Related Injuries,* by Type of Fireworks¹



2014 Fireworks-Related Injuries* by Age of Victim



Relative Risk of 2014 Fireworks-Related Injury* by Age of Victim



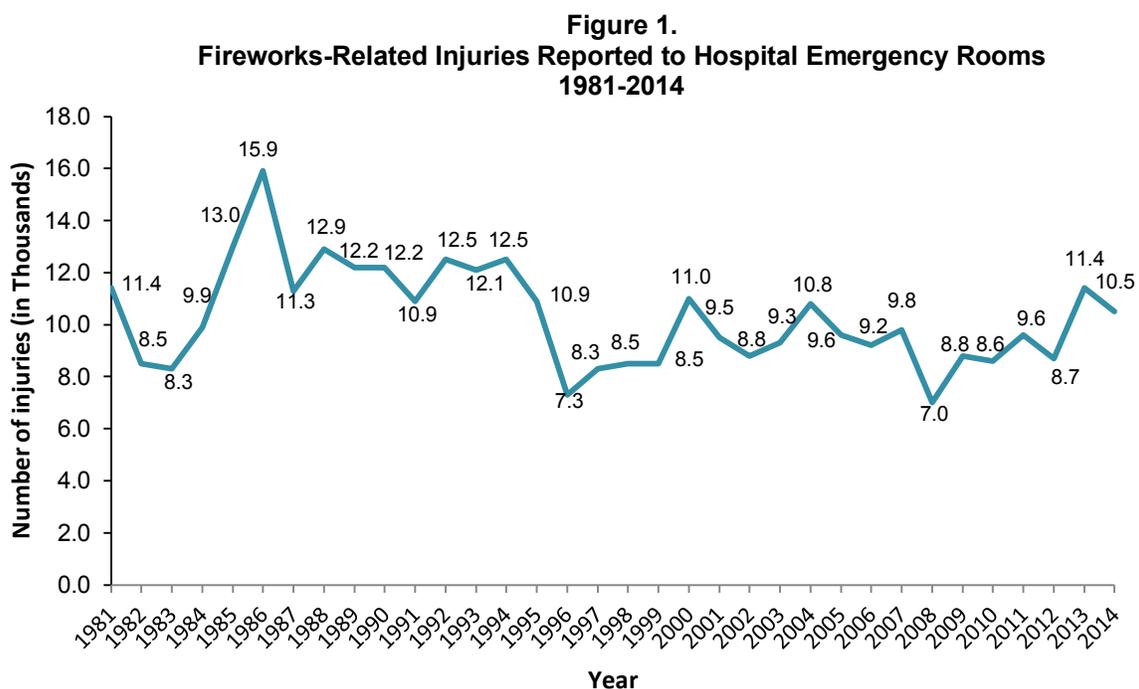
*Based on injuries during the month around July 4.

**Illegal under Federal law.

¹ Based on known types of fireworks.

Size of the Fireworks Problem

In 2014, 10,500 fireworks-related injuries were seen in U.S. hospital emergency rooms. The Consumer Product Safety Commission (CPSC) reports that the number of people seen in hospital emergency rooms was higher in 2013 and 2014 than it had been since 2006.² Injuries were generally higher in 1985-1995 than in 1997 and later years. (See Figure 1.) These statistics are estimates based on the U.S. Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS) sample of hospital emergency rooms. In its [2014 Fireworks Annual Report](#), CPSC also noted that they had received reports of 11 fireworks-related deaths in 2014. The circumstances of these deaths are described in the CPSC report. Death totals for 2014 are considered preliminary.



Note: The NEISS sample has been revised twice. The graph shows recalculation of earlier estimates using the revised samples. Source: CPSC's National Electronic Injury Surveillance System (NEISS) as reported in CPSC's *Fireworks Annual Report* series

NFPA estimates that U.S. fire departments responded to 15,600 reported fires started by fireworks in 2013. These fires caused 30 civilian injuries and \$21 million in direct property damage. No deaths were reported from these fires. [Table 1](#) shows fires and fire losses by year since 1980.

² Youngling Tu and Demar V. Granados. [2014 Fireworks Annual Report](#). Consumer Product Safety Commission, 2015.

These estimates do not include any proportional allocation of fires involving explosives of unknown type. They also do not include estimates of loss from fireworks explosions with no after-fire.

Two-thirds of the fires started by fireworks were brush, grass or forest fires. In all, 91% of the fireworks fires in 2009-2013 were outdoor or unclassified fires. Dumpster fires and other rubbish or trash fires accounted for 18% of all fireworks-related outside or unclassified fires. See Table A.

**Table A. Estimated Fires Started by Fireworks, by Incident Type
Annual Average of 2009-2013 Fires Reported to U.S. Fire Departments**

Incident Type	Fires	
Outside or Unclassified Fire	16,900	(91%)
VEGETATION FIRE	12,600	(68%)
Brush, grass or forest fire	12,300	(67%)
Grass fire	6,800	(37%)
Brush or brush and grass mixture fire	3,900	(21%)
Forest, woods or wildland fire	600	(3%)
Unclassified natural vegetation fire	1,100	(6%)
<i>Cultivated vegetation or crop fire</i>	200	(1%)
OUTSIDE RUBBISH FIRE	3,400	(18%)
Dumpster or other outside trash receptacle fire	1,700	(9%)
Outside rubbish, trash or waste fire	1,200	(6%)
Other or unclassified outside rubbish fire	600	(3%)
OUTSIDE FIRE INVOLVING PROPERTY OF VALUE	500	(3%)
Outside mailbox	100	(1%)
Other or unclassified outside fire involving property of value	400	(2%)
UNCLASSIFIED FIRE	400	(2%)
Structure Fire	1,300	(7%)
Home fire	700	(4%)
Non-home residential fire	0	(0%)
Non-residential fire	500	(3%)
Vehicle Fire	300	(2%)
Total	18,500	(100%)

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Fires are rounded to the nearest hundred. Figures reflect a proportional share of fires with heat source unknown. Totals may not equal sums because of rounding error. Source: NFIRS and NFPA survey.

While only 7% of the fireworks fires in 2009-2013 were structure fires, these incidents accounted for all of the fire deaths, two-thirds of the fire injuries (66%), and 85% of the fire property damage. Structure fires can start with outside use of fireworks, as when a bottle rocket, launched outside, lands on a roof, or when an outdoor grass or trash fire started by fireworks spreads to a structure.

More than one-quarter of fireworks fires occurred on July 4th in 2009-2013. During this period, an average of 5,100 reported Independence Day fires were started by fireworks per year. These fires accounted for almost half (47%) of the fires reported on July 4th.

In 2009-2013, an estimated average of two people per year were killed in reported fires started by fireworks, while data from death certificates show that five people per year were killed directly by fireworks. Deaths involving fireworks are identified from two data sources – the national database of death certificates and the National Fire Incident Reporting System (NFIRS), which is used to estimate fires reported to U.S. fire departments. These databases may partially or largely overlap, because fireworks can directly kill someone while also starting a fatal fire. (See [Table 2](#).) In both data bases, the death toll varies substantially from year to year.

In the past decade, the number of fireworks-related injuries reported to hospital emergency rooms has been at least ten times the estimated number of civilian injuries in fires due to fireworks reported to fire departments. Most incidents where fireworks injure people do not involve a fire that needs a fire department response. For both fatal and non-fatal injuries, it is clear that fireworks can injure directly via a traumatic injury or indirectly via a fire injury from a fire initiated by the fireworks. As for non-fatal injuries, the available statistics also omit injuries that are treated in doctor's offices or are left untreated.

Indoor use of fireworks in nightclubs and bars has accounted for several of the deadliest world fires in recent years. In 2003, 100 people were killed in a Rhode Island nightclub fire ignited by the indoor use of pyrotechnics in a crowded room with interior finish that promoted rapid flame spread. The facility had no sprinkler protection. These deaths were not reported to the National Fire Incident Reporting System (NFIRS) and are not reflected in the national estimates.

In just 2008 and 2009, three other nightclub or bar fires started by indoor use of fireworks (in Russia, Thailand, and China) killed a combined 263 people. These incidents all underscore the need for wider use of and compliance with [NFPA 1126](#), *Standard for the Use of Pyrotechnics Before a Proximate Audience*.

Also in 2009, an illegal fireworks display at a television complex building in China led to a fire that gutted a neighboring 520 foot (159 meter) tall hotel weeks before its scheduled opening. Direct property damage was estimated at 5 billion yuan or \$730 million. One firefighter was killed.

In April 2016, more than 100 people died after fireworks were used in a temple in India. According to news accounts, the temple had been denied a permit for a fireworks show.

Previously published fire incident descriptions are included in Appendix B. These descriptions show what can happen, not what is typical.

Table 1. Fires and Losses Associated With Fireworks, 1980-2013
Fires Reported to U.S. Fire Departments

A. Fires

Year	Home Structures	Other Residential Structures	Nonresidential Structures	Total Structures	Vehicles	Outdoor and Other	Total
1980	2,900	100	1,100	4,000	500	21,800	26,400
1981	2,800	100	1,300	4,200	500	27,100	31,800
1982	1,700	100	1,000	2,700	500	24,600	27,800
1983	1,400	100	800	2,300	500	25,300	28,000
1984	2,400	100	1,200	3,700	1,000	34,700	39,400
1985	2,600	100	1,500	4,100	900	46,600	51,600
1986	2,300	100	1,200	3,600	1,000	30,500	35,100
1987	1,900	100	1,100	3,100	800	33,200	37,100
1988	2,300	100	1,400	3,700	900	47,400	52,100
1989	1,700	100	900	2,700	800	29,900	33,400
1990	1,600	100	800	2,500	800	30,000	33,300
1991	1,600	100	900	2,600	900	24,900	28,400
1992	1,400	0	900	2,300	700	22,500	25,500
1993	1,300	0	800	2,100	800	27,300	30,200
1994	1,300	0	900	2,200	700	35,100	38,000
1995	1,100	0	700	1,900	700	24,900	27,500
1996	1,100	0	600	1,700	600	22,500	24,800
1997	1,000	0	700	1,700	500	17,900	20,100
1998	800	0	500	1,400	500	19,800	21,700
1999	1,700 (1,600)	0 (0)	1,200 (600)	2,800 (2,200)	900	29,000	32,700
2000	1,500 (1,400)	100 (100)	1,200 (700)	2,800 (2,200)	900	35,000	38,700
2001	1,200 (1,100)	100 (100)	1,000 (700)	2,200 (1,900)	900	32,600	35,600

**Table 1. Fires and Losses Associated With Fireworks, 1980-2013
Fires Reported to U.S. Fire Departments (Continued)**

A. Fires (Continued)

Year	Home Structures		Other Residential Structures		Nonresidential Structures		Total Structures		Vehicles	Outdoor and Other	Total
2002	1,100	(1,000)	100	(100)	700	(600)	1,900	(1,600)	900	29,900	32,700
2003	1,000	(900)	100	(100)	700	(600)	1,800	(1,600)	800	31,300	33,900
2004	900	(800)	100	(100)	600	(400)	1,500	(1,300)	600	25,800	27,900
2005	1,000	(900)	100	(0)	700	(500)	1,800	(1,400)	700	31,000	33,500
2006	900	(800)	100	(0)	700	(500)	1,700	(1,300)	600	30,300	32,600
2007	1,000	(800)	100	(100)	700	(400)	1,700	(1,300)	600	22,700	25,100
2008	900	(700)	0	(0)	500	(400)	1,400	(1,100)	500	20,600	22,500
2009	700	(600)	0	(0)	600	(300)	1,300	(900)	400	16,300	18,000
2010	600	(600)	0	(0)	400	(300)	1,100	(900)	300	14,100	15,500
2011	700	(600)	0	(0)	400	(200)	1,200	(900)	400	16,300	17,800
2012	800	(700)	100	(0)	600	(400)	1,400	(1,100)	300	23,300	25,000
2013	700	(600)	0	(0)	600	(300)	1,400	(900)	200	14,000	15,600

Note: Numbers in parentheses exclude fires reported as confined to cooking vessel, chimney or flue, fuel burner or boiler, compactor, incinerator or trash. Detailed reporting is not required and is much less often provided for fires coded as confined fires. These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred. Figures reflect a proportional share of fires with heat source unknown. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2013) and NFPA survey.

**Table 1. Fires and Losses Associated With Fireworks, 1980-2013
Fires Reported to U.S. Fire Departments (Continued)**

B. Civilian Deaths

Year	Home Structures		Other Residential Structures		Nonresidential Structures		Total Structures		Vehicles	Outdoor and Other	Total
1980	0		0		0		0		0	0	0
1981	0		0		0		0		0	0	0
1982	0		0		0		0		0	0	0
1983	0		0		0		0		0	0	0
1984	3		0		0		3		0	0	3
1985	8		0		0		8	3	4		15
1986	4		0		0		4	0	0		4
1987	4		0		3		7	0	0		7
1988	20		0		0		20	0	0		20
1989	4		0		0		4	0	0		4
1990	3		0		0		3	0	0		3
1991	0		0		0		0	2	0		2
1992	0		0		0		0	0	1		1
1993	0		0		0		0	0	3		3
1994	12		0		0		12	0	0		12
1995	0		0		0		0	0	2		2
1996	9		0		18*		27	0	0		27
1997	0		0		0		0	0	3		3
1998	0		0		0		0	0	0		0
1999	43	(43)	0	(0)	0	(0)	43	(43)	0	0	43
2000	29	(29)	0	(0)	0	(0)	29	(29)	0	0	29
2001	0	(0)	0	(0)	0	(0)	0	(0)	0	0	0

**Table 1. Fires and Losses Associated With Fireworks, 1980-2013
Fires Reported to U.S. Fire Departments (Continued)**

B. Civilian Deaths (Continued)

Year	Home Structures		Other Residential Structures		Nonresidential Structures		Total Structures		Vehicles	Outdoor and Other	Total
2002	0	(0)	0	(0)	0	(0)	0	(0)	0	0	0
2003	7	(7)	0	(0)	0**	(0)	7**	(7)	0	0	7
2004	0	(0)	0	(0)	0	(0)	0	(0)	0	0	0
2005	0	(0)	0	(0)	0	(0)	0	(0)	0	0	0
2006	4	(4)	0	(0)	0	(0)	4	(4)	0	2	6
2007	9	(9)	0	(0)	0	(0)	9	(9)	0	0	9
2008	0	(0)	0	(0)	0	(0)	0	(0)	0	1	1
2009	0	(0)	0	(0)	0	(0)	0	(0)	0	0	0
2010	8	(8)	0	(0)	0	(0)	8	(8)	0	0	8
2011	0	(0)	0	(0)	0	(0)	0	(0)	0	0	0
2012	0	(0)	0	(0)	0	(0)	8	(8)	0	0	8
2013	0	(0)	0	(0)	0	(0)	0	(0)	0	0	0

* 1996 total is inflated by statistical projection of one Ohio fire with nine deaths.

** Does not include 100 deaths in the Station night club fire.

Note: Numbers in parentheses exclude fires reported as confined to cooking vessel, chimney or flue, fuel burner or boiler, compactor, incinerator or trash. Detailed reporting is not required and is much less often provided for fires coded as confined fires. These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths are expressed to the nearest one. Figures reflect a proportional share of fires with heat source unknown. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2013) and NFPA survey.

**Table 1. Fires and Losses Associated With Fireworks, 1980-2013
Fires Reported to U.S. Fire Departments (Continued)**

C. Civilian Injuries

Year	Home Structures		Other Residential Structures		Nonresidential Structures		Total Structures		Vehicles	Outside and Other	Total
1980	30		10		0		30		0	20	50
1981	30		0		20		50		0	20	70
1982	10		0		20		30		0	60	100
1983	50		0		0		50		0	30	80
1984	40		0		10		50	10		30	90
1985	70		10		10		80	30		30	140
1986	50		10		50		100	0		20	130
1987	50		10		10		70	0		30	90
1988	40		0		20		50	20		30	100
1989	50		0		0		50	20		30	110
1990	30		10		10		50	0		60	110
1991	50		10		10		70	10		30	110
1992	40		0		10		50	10		40	100
1993	20		0		20		40	0		20	70
1994	90		0		10		100	10		50	150
1995	50		0		0		50	0		40	90
1996	20		0		20		40	0		20	70
1997	20		0		10		30	20		20	70
1998	10		0		0		10	10		30	40
1999	0	(0)	0	(0)	0	(0)	0	(0)	0	80	80
2000	30	(30)	0	(0)	0	(0)	30	(30)	0	40	70
2001	40	(40)	0	(0)	10	(10)	50	(50)	10	20	80

**Table 1. Fires and Losses Associated With Fireworks, 1980-2013
Fires Reported to U.S. Fire Departments (Continued)**

C. Civilian Injuries (Continued)

Year	Home Structures		Other Residential Structures		Nonresidential Structures		Total Structures		Vehicles	Outside and Other	Total
2002	20	(20)	10	(10)	0	(0)	30	(30)	20	10	60
2003	40	(40)	0	(0)	10*	(10)	50*	(50)	0	30	80
2004	10	(10)	0	(0)	0	(0)	10	(10)	0	30	50
2005	50	(50)	0	(0)	0	(0)	50	(50)	10	40	90
2006	20	(20)	10	(0)	0	(0)	30	(20)	10	30	70
2007	20	(20)	0	(0)	0	(0)	30	(30)	10	20	50
2008	10	(10)	10	(10)	10	(10)	20	(20)	10	10	40
2009	20	(20)	0	(0)	10	(10)	30	(30)	0	10	30
2010	30	(30)	0	(0)	0	(0)	30	(30)	0	20	60
2011	30	(30)	0	(0)	0	(0)	30	(30)	10	10	40
2012	20	(20)	0	(0)	10	(0)	30	(30)	0	10	50
2013	10	(10)	0	(0)	0	(0)	20	(20)	0	10	30

*Does not include injuries in the Station night club fire.

Note: Numbers in parentheses exclude fires reported as confined to cooking vessel, chimney or flue, fuel burner or boiler, compactor, incinerator or trash. Detailed reporting is not required and is much less often provided for fires coded as confined fires. These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian injuries are expressed to the nearest ten. Figures reflect a proportional share of fires with heat source unknown. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2013) and NFPA survey.

**Table 1. Fires and Losses Associated With Fireworks, 1980-2013
Fires Reported to U.S. Fire Departments (Continued)**

D. Direct Property Damage (in Millions)

Year	Home Structures		Other Residential Structures		Nonresidential Structures		Total Structures		Vehicles	Outdoor and Other	Total	Total in 2013 Dollars
1980	\$12		\$0		\$3		\$15		\$0	\$0	\$16	\$45
1981	\$12		\$0		\$6		\$18		\$0	\$1	\$19	\$49
1982	\$9		\$0		\$2		\$11		\$0	\$0	\$11	\$27
1983	\$7		\$0		\$5		\$12		\$0	\$0	\$13	\$30
1984	\$19		\$0		\$6		\$25		\$2	\$1	\$27	\$60
1985	\$22		\$1		\$7		\$30		\$1	\$5	\$36	\$78
1986	\$24		\$0		\$29		\$53		\$2	\$1	\$56	\$119
1987	\$17		\$0		\$7		\$24		\$1	\$0	\$25	\$51
1988	\$22		\$0		\$14		\$37		\$1	\$1	\$39	\$77
1989	\$56		\$0		\$3		\$59		\$1	\$2	\$62	\$117
1990	\$22		\$1		\$4		\$26		\$2	\$1	\$28	\$50
1991	\$17		\$0		\$5		\$21		\$2	\$0	\$23	\$39
1992	\$13		\$0		\$16		\$29		\$1	\$3	\$33	\$55
1993	\$12		\$0		\$6		\$19		\$1	\$1	\$21	\$34
1994	\$10		\$0		\$8		\$18		\$2	\$2	\$22	\$35
1995	\$21		\$1		\$9		\$30		\$2	\$1	\$32	\$49
1996	\$12		\$0		\$7		\$19		\$1	\$6	\$27	\$40
1997	\$13		\$0		\$8		\$21		\$1	\$0	\$23	\$33
1998	\$9		\$0		\$3		\$12		\$1	\$2	\$16	\$23
1999	\$17	(\$17)	\$0	(\$0)	\$1	(\$1)	\$19	(\$19)	\$3	\$1	\$23	\$32
2000	\$36	(\$36)	\$0	(\$0)	\$6	(\$6)	\$42	(\$42)	\$3	\$3	\$48	\$65
2001	\$32	(\$32)	\$1	(\$1)	\$17	(\$17)	\$50	(\$50)	\$5	\$4	\$59	\$78

**Table 1. Fires and Losses Associated With Fireworks, 1980-2013
Fires Reported to U.S. Fire Departments (Continued)**

D. Direct Property Damage (in Millions) (Continued)

Year	Home Structures		Other Residential Structures		Nonresidential Structures		Total Structures		Vehicles	Outdoor and Other	Total	Total in 2013 Dollars
2002	\$25	(\$25)	\$1	(\$1)	\$5	(\$5)	\$31	(\$31)	\$4	\$1	\$35	\$45
2003	\$47	(\$47)	\$1	(\$1)	\$13*	(\$13)	\$60*	(\$60)	\$4	\$1	\$65	\$82
2004	\$15	(\$15)	\$0	(\$0)	\$5	(\$5)	\$20	(\$20)	\$2	\$1	\$22	\$27
2005	\$26	(\$26)	\$0	(\$0)	\$10	(\$10)	\$37	(\$37)	\$2	\$1	\$41	\$49
2006	\$28	(\$28)	\$0	(\$0)	\$3	(\$3)	\$31	(\$31)	\$1	\$1	\$34	\$39
2007	\$39	(\$39)	\$1	(\$1)	\$4	(\$4)	\$43	(\$43)	\$76**	\$1	\$119**	\$134**
2008	\$23	(\$23)	\$1	(\$1)	\$8	(\$8)	\$32	(\$32)	\$1	\$9	\$42	\$46
2009	\$28	(\$28)	\$1	(\$1)	\$7	(\$7)	\$35	(\$35)	\$1	\$1	\$38	\$41
2010	\$19	(\$19)	\$0	(\$0)	\$13	(\$13)	\$32	(\$32)	\$1	\$3	\$36	\$39
2011	\$19	(\$19)	\$5	(\$5)	\$6	(\$6)	\$29	(\$29)	\$2	\$1	\$32	\$33
2012	\$36	(\$36)	1	(\$1)	\$24	(\$24)	\$60	(\$60)	\$1	\$16	\$78	\$79
2013	\$16	(\$16)	\$1	(\$1)	\$3	(\$3)	\$19	(\$19)	\$1	\$1	\$21	\$21

*Does not include damages in the Station night club fire.

**Vehicle estimate inflated by one apparently miscoded incident showing a \$20 million loss, which would project to a \$75 million estimate from that one incident.

Note: Numbers in parentheses exclude fires reported as confined to cooking vessel, chimney or flue, fuel burner or boiler, compactor, incinerator or trash. Detailed reporting is not required and is much less often provided for fires coded as confined fires. These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Direct property damage is rounded to the nearest million dollars. Figures reflect a proportional share of fires with heat source unknown. Inflation adjustment to 2006 dollars is done using the consumer price index. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2013) and NFPA survey.

**Table 2. Deaths Associated With Fireworks Incidents
1984-2013**

Year	Estimated Civilian Deaths in Fireworks-Related Fires Reported to U.S. Fire Departments	Recorded on U.S. Death Certificates
1984	3	7
1985	15	11
1986	4	8
1987	7	5
1988	20	4
1989	4	5
1990	3	5
1991	2	4
1992	1	2
1993	3	10
1994	12	4
1995	2	2
1996	27*	9
1997	3	8
1998	0	9
1999	43*	7
2000	29*	5
2001	0	6
2002	0	5
2003	7**	11**
2004	0	2
2005	0	4
2006	6	8
2007	9	10
2008	1	6
2009	0	4
2010	8	1
2011	0	5
2012	0	8
2013	0	6

* 1996 total is inflated by statistical projection of one Ohio fire with nine deaths. Estimates for 1999-2001 are subject to greater uncertainty because of limited participation in NFIRS Version 5.0 in those years.

** Does not include 100 deaths in the Station night club fire.

Note: In any year, the figures in these two columns may partially overlap if fireworks that directly cause a fatality also ignite a reported fire.

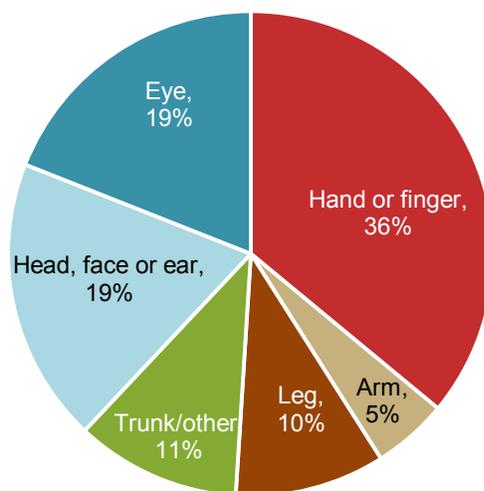
Sources: For death certificate tallies, *Accident Facts* and *Injury Facts*, Chicago (1985-1992) and Itasca, IL (1993-2016): National Safety Council, 1985-2011. For national estimates of fire deaths, data from NFIRS and NFPA survey.

Characteristics of Fireworks Injuries Reported to Emergency Rooms

As in previous years, CPSC sought additional information on fireworks injuries seen in the month around July 4. The injury estimates in this section were obtained from the [CPSCs 2014 Fireworks Annual Report by Yongling Tu and Demar Granados](#). The detailed statistics below are based only on injuries seen from June 20-July 20, 2014.

Half of the fireworks injuries seen at emergency rooms in 2014 were to extremities. Almost two in five were to the eye or other parts of the head. Injuries to extremities were primarily to hand or finger (36%) or leg (10%). (See Figure 2.) One of every five (19%) injuries were to the eye, and another 19% were to other parts of the head or face.

Figure 2.
2014 Fireworks-Related Injuries*
By Part of Body Injured



* Based on injuries during the month around July 4

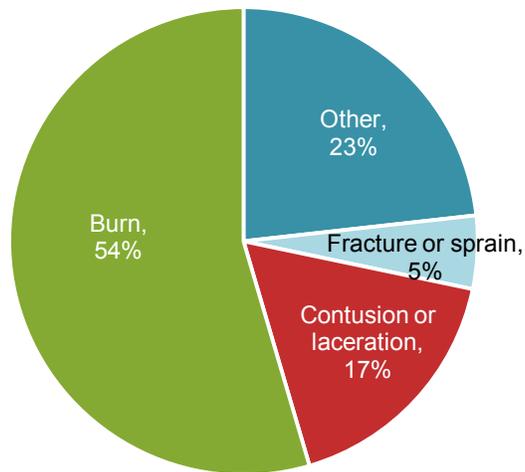
Note: The reds and browns are extremities (51% of total) (61% of total) and the blues are parts of the head (38% of total).

Source: CPSC's 2014 Fireworks Annual Report by Tu and Granados

More than half (54%) of 2014 fireworks injuries were burns.

Contusions and lacerations accounted for the next largest share among specified diagnoses (17%). (See Figure 3.) Eye injuries were more likely to have been contusions or lacerations rather than burns.

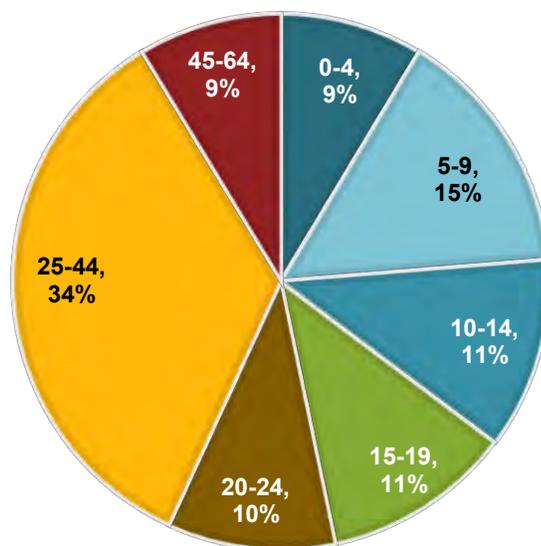
Figure 3.
2014 Fireworks-Related Injuries*
by Type of Injury



*Based on injuries during the month around July 4.
 Source: CPSC’s 2014 Fireworks Annual Report by Tu and Granados

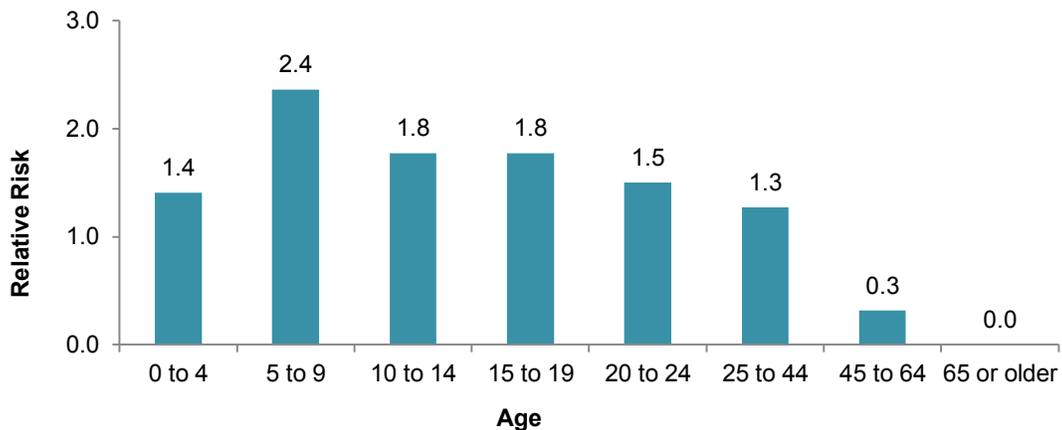
Children ages 5-9 had the highest rate of fireworks injury. More than one-third (35%) of the victims of fireworks injuries in 2014 were under age 15. (See Figure 4.) Males accounted for three-quarters (74%) of fireworks injuries.

Figure 4.
2014 Fireworks-Related Injuries*
by Age of Victim



*Based on injuries during the month around July 4.
 Source: CPSC’s 2014 Fireworks Annual Report by Tu and Granados

Figure 5.
Relative Risk of 2014 Fireworks-Related Injury* by Age of Victim



*Based on injuries during the month around July 4.

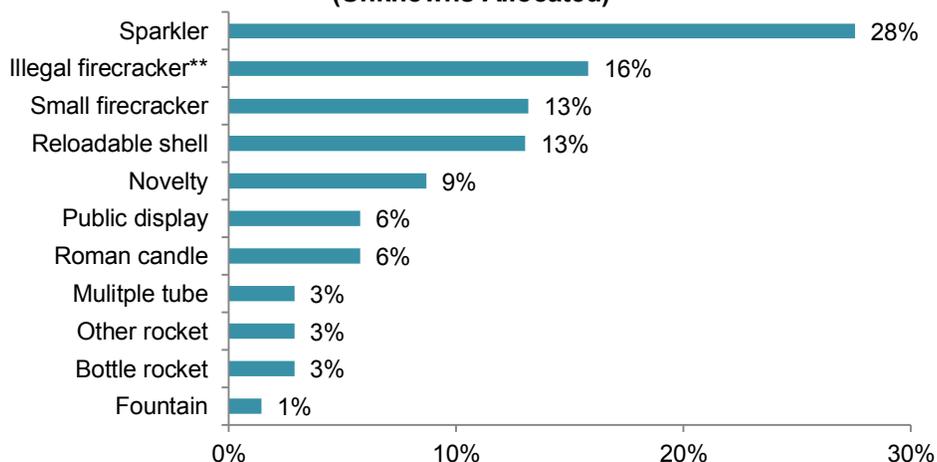
Note: Relative risk index is injuries per million population for the age group divided by injuries per million population for all ages combined. The relative risk is 1.0 for all ages combined.

Source: CPSC's 2014 Fireworks Annual Report by Tu and Granados

Figure 5 shows that compared to the general population, children ages 5 to 9 were 2.4 times as likely (had a relative risk of 2.4) to have been seen for a fireworks injury in 2014. Youth aged 10-19 were almost twice (1.8 times) as likely as the overall population to have been hurt in this way. (Relative risk of injury is defined as injuries per million population for an age range divided by injuries per million population for all ages.) After age 19, the risk decreased in each age group studied.

More than one-quarter of fireworks injuries were caused by sparklers. Figure 6 shows that many fireworks injuries were caused by fireworks that are legal in most states. For example, sparklers caused 28%, small firecrackers caused 13%, and novelty items caused 9%.

Figure 6.
2014 Fireworks-Related Injuries* by Type of Fireworks (Unknowns Allocated)



*Based on injuries during the month around July 4.

** Illegal under federal law.

Source: CPSC's 2014 Fireworks Annual Report by Tu and Granados

Data Sources

Changes in NFIRS pose opportunities and challenges in describing and tracking the problem.

The statistics in this report are national estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) in combination with NFPA's annual fire department survey. In Version 4.1, "fireworks" were usually understood to include two categories under form of heat of ignition – code 63 (fireworks) and code 64 (paper cap or party popper). In Version 5.0, these two groups of devices are combined into one – Heat Source code 54 (fireworks). Detailed information about NFIRS, including Version 4.1 and 5.0 codes and conversion tables, can be obtained from <http://www.usfa.fema.gov/>.

Data on injuries at hospital emergency rooms come from NEISS.

All fireworks-related injury statistics from hospital emergency rooms come from reports by the U.S. Consumer Product Safety Commission (CPSC) and private communications from Linda Smith and Michael Greene of the CPSC. Linda Smith also provided the rules for setting the range of fireworks injury estimates during the period from 1985 to 1989, reflecting the change in the sample, and in 1991 to 1996, reflecting the latest change in the sample. Reports referenced include Yongling Tu and Demar V. Granados, *2014, 2013, 2012, 2011 and 2010 Fireworks Annual Report*; Michael A. Greene, Yongling Tu, and Demar V. Granados, *2009 Fireworks Annual Report*; Michael A. Greene and Demar V. Granados, *2008 Fireworks Annual Report*; Michael A. Greene and James Joholske, *2007, 2006, 2005, 2004 and 2003 Fireworks Annual Report*; Michael A. Greene and Patrick M. Race, *1999 Fireworks Annual Report*; Michael A. Greene, *1998 Fireworks-Related Injuries*; Ron Monticone and Linda Smith, *1997 Fireworks-Related Injuries*; Sheila L. Kelly, *Fireworks Injuries, 1994*; Dr. Terry L. Kissinger, *Fireworks Injuries - Results of a 1992 NEISS Study*; Linda Smith and Sheila Kelly, *Fireworks Injuries, 1990*; Deborah Kale and Beatrice Harwood, *Fireworks Injuries - 1981*; and the May/June 1974 issue of *NEISS News*. All were published by CPSC.

Data on deaths directly attributable to fireworks come from NCHS.

The National Center for Health Statistics maintains the death certificate database. Since 1999, fireworks discharge has been coded as External Cause of Mortality W39. From 1980 to 1999, firework discharge was coded as E923.0. These statistics have been retrieved from the National Safety Council's *Accident Facts* (1985-1992) and *Injury Facts* (1993-2016).

Appendix A. How National Estimates Statistics Are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit <http://www.nfirs.fema.gov/>. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf.

NFIRS has a wide variety of data elements and code choices. The NFIRS database contains coded information. Many code choices describe several conditions. These cannot be broken down further. For example, area of origin code 83 captures fires starting in vehicle engine areas, running gear areas or wheel areas. It is impossible to tell the portion of each from the coded data.

Methodology may change slightly from year to year.

NFPA is continually examining its methodology to provide the best possible answers to specific questions, methodological and definitional changes can occur. *Earlier editions of the same report may have used different methodologies to produce the same analysis, meaning that the estimates are not directly comparable from year to year.*

NFPA's fire department experience survey provides estimates of the big picture.

Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are sent to all municipal departments protecting populations of 50,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city

departments are so few in number and protect such a large proportion of the total U.S. population that it makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; 3) the number and nature of non-fire incidents; and (4) information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit <http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf>.

Projecting NFIRS to National Estimates

As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second database -- the NFPA survey -- is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

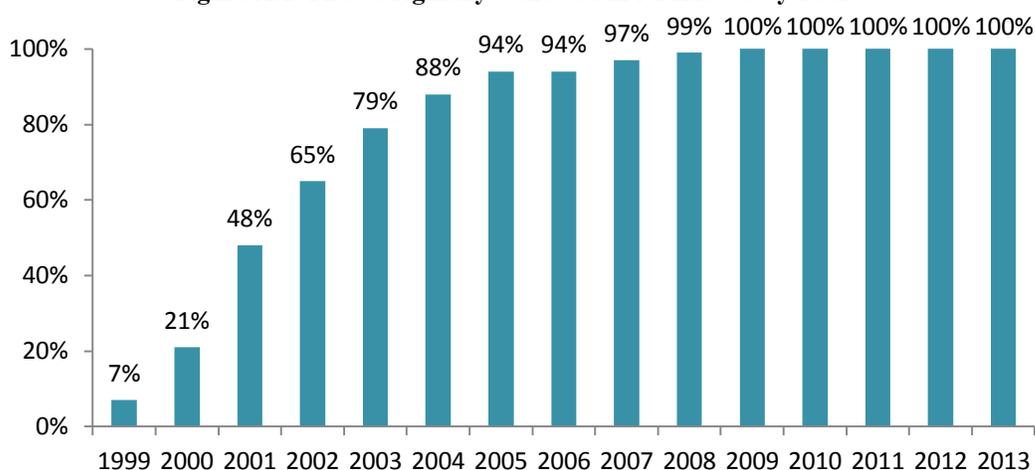
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios. Reports for incidents in which mutual aid was given are excluded from NFPA's analyses.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. ["The National Estimates Approach to U.S. Fire Statistics,"](#) by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others. The essentials of the approach described by Hall and Harwood are still used, but some modifications have been necessary to accommodate the changes in NFIRS 5.0.

Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

Figure A.1. Fires Originally Collected in NFIRS 5.0 by Year



From 1999 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

$$\frac{\text{NFPA survey projections}}{\text{NFIRS totals (Version 5.0)}}$$

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

NFIRS 5.0 introduced six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Although causal and other detailed information is typically not required for these incidents, it is provided in some cases. Some analyses, particularly those that examine cooking equipment, heating equipment, fires caused by smoking materials, and fires started by playing with fire, may examine the confined fires in greater detail. Because the confined fire incident types describe certain scenarios, the distribution of unknown data differs from that of all fires. Consequently, allocation of unknowns must be done separately.

Some analyses of structure fires show only non-confined fires. In these tables, percentages shown are of non-confined structure fires rather than all structure fires. This approach has the advantage of showing the frequency of specific factors in fire causes, but the disadvantage of possibly overstating the percentage of factors that are seldom seen in the confined fire incident types and of understating the factors specifically associated with the confined fire incident types.

Other analyses include entries for confined fire incident types in the causal tables and show percentages based on total structure fires. In these cases, the confined fire incident type is treated as a general causal factor.

For most fields other than Property Use and Incident Type, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields. *Casualty and loss projections can be heavily influenced by the inclusion or exclusion of unusually serious fire.*

In the formulas that follow, the term “all fires” refers to all fires in NFIRS on the dimension studied. The percentages of fires with known or unknown data are provided for non-confined fires and associated losses, and for confined fires only.

Cause of Ignition: This field is used chiefly to identify intentional fires. “Unintentional” in this field is a specific entry and does not include other fires that were not intentionally set: failure of equipment or heat source, act of nature, or “other” (unclassified).” The last should be used for exposures but has been used for other situations as well. Fires that were coded as under investigation and those that were coded as undetermined after investigation were treated as unknown.

Factor Contributing to Ignition: In this field, the code “none” is treated as an unknown and allocated proportionally. For Human Factor Contributing to Ignition, NFPA enters a code for “not reported” when no factors are recorded. “Not reported” is treated as an unknown, but the code “none” is treated as a known code and not allocated. Multiple entries are allowed in both of these fields. Percentages are calculated on the total number of fires, not entries, resulting in sums greater than 100%. Although Factor Contributing to Ignition is only required when the cause of ignition was coded as: 2) unintentional, 3) failure of equipment or heat source; or 4) act of nature, data is often present when not required. Consequently, any fire in which no factor contributing to ignition was entered was treated as unknown.

In some analyses, all entries in the category of mechanical failure, malfunction (factor contributing to ignition 20-29) are combined and shown as one entry, “mechanical failure or malfunction.” This category includes:

21. Automatic control failure;
22. Manual control failure;
23. Leak or break. Includes leaks or breaks from containers or pipes. Excludes operational deficiencies and spill mishaps;
25. Worn out;
26. Backfire. Excludes fires originating as a result of hot catalytic converters;
27. Improper fuel used; Includes the use of gasoline in a kerosene heater and the like; and
20. Mechanical failure or malfunction, other.

Entries in “electrical failure, malfunction” (factor contributing to ignition 30-39) may also be combined into one entry, “electrical failure or malfunction.” This category includes:

31. Water-caused short circuit arc;
32. Short-circuit arc from mechanical damage;
33. Short-circuit arc from defective or worn insulation;
34. Unspecified short circuit arc;
35. Arc from faulty contact or broken connector, including broken power lines and loose connections;
36. Arc or spark from operating equipment, switch, or electric fence;
37. Fluorescent light ballast; and
30. Electrical failure or malfunction, other.

Heat Source. In NFIRS 5.0, one grouping of codes encompasses various types of open flames and smoking materials. In the past, these had been two separate groupings. A new code was added to NFIRS 5.0, which is code 60: “Heat from open flame or smoking material, other.” NFPA treats this code as a partial unknown and allocates it proportionally across the codes in the 61-69 range, shown below.

61. Cigarette;
62. Pipe or cigar;
63. Heat from undetermined smoking material;
64. Match;
65. Lighter: cigarette lighter, cigar lighter;
66. Candle;
67. Warning or road flare, fuse;
68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11); and
69. Flame/torch used for lighting. Includes gas light and gas-/liquid-fueled lantern.

In addition to the conventional allocation of missing and undetermined fires, NFPA multiplies fires with codes in the 61-69 range by

$$\frac{\text{All fires in range 60-69}}{\text{All fires in range 61-69}}$$

The downside of this approach is that heat sources that are truly a different type of open flame or smoking material are erroneously assigned to other categories. The grouping “smoking materials” includes codes 61-63 (cigarettes, pipes or cigars, and heat from undetermined smoking material, with a proportional share of the code 60s and true unknown data.

Equipment Involved in Ignition (EII). NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source to cause ignition if the equipment malfunctioned or was used improperly. In 2006, the definition was modified to “the piece of equipment that provided the principal heat source to cause ignition.” However, much of the data predates the change. Individuals who have already been trained with the older definition may not change their practices. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

To allocate unknown data for EII, the known data is multiplied by

All fires

(All fires – blank – undetermined – [fires in which EII =NNN and heat source <>40-99])

In addition, the partially unclassified codes for broad equipment groupings (i.e., code 100 - heating, ventilation, and air conditioning, other; code 200 - electrical distribution, lighting and power transfer, other; etc.) were allocated proportionally across the individual code choices in their respective broad groupings (heating, ventilation, and air conditioning; electrical distribution, lighting and power transfer, other; etc.). Equipment that is totally unclassified is not allocated further. This approach has the same downside as the allocation of heat source 60 described above. Equipment that is truly different is erroneously assigned to other categories.

In some analyses, various types of equipment are grouped together.

Code Grouping	EII Code	NFIRS definitions
Central heat	132	Furnace or central heating unit
	133	Boiler (power, process or heating)
Fixed or portable space heater	131	Furnace, local heating unit, built-in
	123	Fireplace with insert or stove
	124	Heating stove
	141	Heater, excluding catalytic and oil-filled
	142	Catalytic heater
	143	Oil-filled heater
Fireplace or chimney	120	Fireplace or chimney
	121	Fireplace, masonry
	122	Fireplace, factory-built
	125	Chimney connector or vent connector
	126	Chimney – brick, stone or masonry
	127	Chimney-metal, including stovepipe or flue
Fixed wiring and related equipment	210	Unclassified electrical wiring
	211	Electrical power or utility line
	212	Electrical service supply wires from utility
	213	Electric meter or meter box
	214	Wiring from meter box to circuit breaker
	215	Panel board, switch board or circuit breaker board
	216	Electrical branch circuit
	217	Outlet or receptacle
	218	Wall switch
	219	Ground fault interrupter
Transformers and power supplies	221	Distribution-type transformer
	222	Overcurrent, disconnect equipment
	223	Low-voltage transformer
	224	Generator
	225	Inverter
	226	Uninterrupted power supply (UPS)
	227	Surge protector

	228	Battery charger or rectifier
	229	Battery (all types)
Lamp, bulb or lighting	230	Unclassified lamp or lighting
	231	Lamp-tabletop, floor or desk
	232	Lantern or flashlight
	233	Incandescent lighting fixture
	234	Fluorescent light fixture or ballast
	235	Halogen light fixture or lamp
	236	Sodium or mercury vapor light fixture or lamp
	237	Work or trouble light
	238	Light bulb
	241	Nightlight
	242	Decorative lights – line voltage
	243	Decorative or landscape lighting – low voltage
	244	Sign
Cord or plug	260	Unclassified cord or plug
	261	Power cord or plug, detachable from appliance
	262	Power cord or plug- permanently attached
	263	Extension cord
Torch, burner or soldering iron	331	Welding torch
	332	Cutting torch
	333	Burner, including Bunsen burners
	334	Soldering equipment
Portable cooking or warming equipment	631	Coffee maker or teapot
	632	Food warmer or hot plate
	633	Kettle
	634	Popcorn popper
	635	Pressure cooker or canner
	636	Slow cooker
	637	Toaster, toaster oven, counter-top broiler
	638	Waffle iron, griddle
	639	Wok, frying pan, skillet
	641	Breadmaking machine

Equipment was not analyzed separately for confined fires. Instead, each confined fire incident type was listed with the equipment or as other known equipment.

Item First Ignited. In most analyses, mattress and pillows (item first ignited 31) and bedding, blankets, sheets, and comforters (item first ignited 32) are combined and shown as “mattresses and bedding.” In many analyses, wearing apparel not on a person (code 34) and wearing apparel on a person (code 35) are combined and shown as “clothing.” In some analyses, flammable and combustible liquids and gases, piping and filters (item first ignited 60-69) are combined and shown together.

Area of Origin. Two areas of origin: bedroom for more than five people (code 21) and bedroom for less than five people (code 22) are combined and shown as simply “bedroom.” Chimney is no longer a valid area of origin code for non-confined fires.

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100% even if the rounded number entry is zero. The same rounded value may account for a slightly different percentage share. Because percentages are expressed in integers and not carried out to several decimal places, percentages that appear identical may be associated with slightly different values.

Appendix B. Selected Published Incidents Involving Fireworks

Included are articles from NFPA publications about fires involving fireworks. Included are short articles from the “Firewatch” or “Bi-monthly” columns in *NFPA Journal* or its predecessor *Fire Journal* and incidents from either the large-loss fires report or catastrophic fires report. If available, investigation reports or NFPA Alert Bulletins are included and provide detailed information about the fires.

It is important to remember that this is anecdotal information. Anecdotes show what can happen; they are not a source to learn about what typically occurs.

NFPA’s Fire Incident Data Organization (FIDO) identifies significant fires through a clipping service, the Internet and other sources. Additional information is obtained from the fire service and federal and state agencies. FIDO is the source for articles published in the “Firewatch” column of the *NFPA Journal* and many of the articles in this report.

Boys start house fire with fireworks, Colorado

Three boys, about 11 years of age, were playing with consumer fireworks outside a multi-family house when the dry vegetation around the home caught fire. The blaze spread to the house, which covered an area of approximately 3,600 square feet (334 square meters), and two nearby sheds.

Firefighters received a 911 call reporting the fire at 2:34 p.m. When they arrived at the scene, they noted that the blaze had spread to two sides of the house. They deployed a 1 3/4-inch hose line and extinguished the fire on the porch, allowing a ladder company to enter the house to search for anyone who might be trapped. As they did, the fire breached the windows on the first floor, and crews used hose lines to knock down fire and protect the ladder company. The incident commander ordered a second alarm.

Investigators spoke with the three boys, who reported that they were in front of the house lighting fireworks, one of which landed under a bush. Shortly afterward, they noticed white smoke coming from the bush, followed by flames. The three went into the house and told the woman inside about the fire. She called 911, and they left the house.

The home, valued at \$176,000, and its contents, valued at \$30,000, sustained a combined loss of \$135,000. Two nearby sheds also sustained losses estimated at \$3,500. There were no injuries.

Kenneth J. Tremblay, 2012, “Firewatch,” *NFPA Journal*, September/October 22-23.

Five workers killed while disposing of fireworks, Hawaii

Around 9:00 a.m. on an April morning, six employees were disposing of seized fireworks stored in an underground World War II-era munitions bunker. The bunker was 250 feet (76 meters) long, 15 feet (5 meters) wide, and 20 feet (6 meters) high. Four employees were inside the bunker and two were outside when an explosion occurred. All four workers inside the structure were killed, as was one of the two working outside. No detection or suppression equipment was

present. No information was reported on the cause of death. The cause and origin of the explosion was undetermined.

Adapted from Stephen G. Badger's report, "Catastrophic Multiple-Death Fires for 2011", Quincy, MA: NFPA, 2012.

Flames destroy consumer fireworks store, Tennessee

A store selling consumer fireworks was destroyed by fire when its contents were ignited by an unknown source.

The one-story, steel-frame building, which had metal walls and a metal roof, covered approximately 6,400 square feet (595 square meters). The building had two doors and a display window in front, a roll-up door near the warehouse section of the building, and another door located at the rear. It had no fire alarm system, and the dry-pipe sprinkler system had been shut down due to a broken air compressor.

Between 2:29 and 2:31 a.m., the fire department dispatch center received a number of phone calls reporting that the building was on fire. When arriving firefighters found flames shooting from the building's roof and windows, the incident commander ordered mutual aid from five other communities around the area.

After sifting through the debris, investigators determined that the fire started in a corner or near some wooden racks that contained fireworks, but they could not find the ignition source.

The fire destroyed the building, which was valued at \$495,000, and its contents, which were valued at \$130,000. No civilians or firefighters were reported injured.

Kenneth J. Tremblay, 2012, *NFPA Journal*, May/June, 40.

Sprinklers limit roof fire at assisted living facility, Oregon

A dry-pipe sprinkler system limited property loss and prevented injuries during a rooftop fire at an assisted-living center. The staff initially thought the alarm was false and canceled the first fire department response. However, subsequent alarms and water flowing from the sprinklers led staffers to call 911 at 10:02 p.m.

The two-story, Type-V building, which covered approximately 70,000 square feet (6,503 square meters), had a pitched wood truss roof covered with composite asphalt shingles. The facility had four individual wings, each separated by two-hour fire barrier walls with protected openings. The exit corridors, which also had protected openings, had a one-hour fire rating, and all the building's stairs were enclosed. The property was protected by a monitored dry-pipe sprinkler system, as well as a manual fire alarm and monitored smoke detection system.

The facility was holding a Fourth of July celebration outside on a patio, igniting legally bought consumer fireworks from a table that staff members had covered with aluminum foil. Fireworks were also being used elsewhere in the neighborhood.

When the smoke detection system first sounded at roughly 9:44 p.m., facility administration assumed that the haze in the building was a normal byproduct of the fireworks that had entered through open doors and windows. The monitoring service was called and the fire department response canceled.

When the detection system sounded again a short time later, however, the smoke was heavier. A broken water pipe was reported on the second floor, but the leaking water was actually coming from operating sprinklers.

The fire department response was resumed at 10:02 p.m., and first-arriving firefighters noted light smoke coming from the roof. They helped evacuate the residents and began to attack the fire in the attic.

After the fire was extinguished, investigators determined that the fireworks had ignited a large amount of lint that had been blown from the dryer exhaust and built up on the roof. The fire spread from the lint to the roof covering and underlayment before moving into the attic.

The blaze also spread into the dryer's exhaust system, which accommodated smaller exhaust ducts from four gas-fired dryers, each of which connected to the larger, single duct that rose from the lower floors of the facility to the mechanical exhaust motor and housing on the roof.

When the investigators removed and examined the ductwork, they found that nearly 50 percent of it was occluded by an accumulation of lint. They also found partially burned lint in the exhaust duct assembly and in the bell housing. Although the roof exhaust fan and the electric motor showed no signs of direct flame involvement, smoke damage was clearly visible. The investigators' report cited the management's failure to clean the lint out of the dryer's exhaust system as a contributing factor to the blaze.

The building and its contents, which together were valued at more than \$6.9 million, sustained a combined property loss of \$1.5 million. There were no injuries reported.

Kenneth J. Tremblay, 2011, "Firewatch", *NFPA Journal*, July/August, 22-23.

Explosion kills four workers getting ready for fireworks display, North Carolina

An explosion occurred around 9:00 a.m. on a July morning as workers were inside a parked large box truck preparing fireworks for a display. At the time, electric igniters were being installed into the tails of fireworks. The four victims were located inside the truck almost up to the cab as the explosion occurred. One person located near the door survived but suffered burns.

Adapted from Stephen G. Badger's report, "Catastrophic Multiple-Death Fires for 2009", Quincy, MA: NFPA, 2010.

Children playing with fireworks start fire in house, Maryland

An 11-year-old boy and his brother were playing with firecrackers in one of the boy's bedrooms when they started a fire that heavily damaged the second floor of their townhouse.

The two-story, wood-frame townhouse was a middle unit with similar units on either side. Hardwired smoke alarms were located on each level of the home and worked as designed. There were no sprinklers.

The boys ignited a firecracker with a butane lighter and put it in a dresser drawer, where it exploded and ignited the contents of the drawer. One of the boys tried to extinguish the blaze by throwing a cupful of water onto it, but he was unsuccessful. At some point, the smoke alarm operated, and their father, who was on the first floor, went to investigate. When he spotted the fire, he tried to control it using a portable fire extinguisher before calling 911 around 11:53 a.m.

Arriving firefighters, who found heavy smoke coming from the front and rear of the house, put out the blaze with interior hose lines. By the time they extinguished the fire, it had spread to the attic and roof trusses. The second floor sustained heavy smoke and fire damage, while smoke and water damaged the first floor.

Neither the boys nor their father was hurt, but the house, valued at \$130,000, and its contents, valued at \$30,000, sustained losses of \$50,000 and \$20,000, respectively.

Kenneth J. Tremblay, 2009, "Firewatch", *NFPA Journal*, September/October, 23-24.

Fireworks start fatal fire, Illinois

A 19-year-old man died and two firefighters suffered minor injuries during a fire that began when fireworks ignited at floor level in his second-story bedroom.

The two-story, wood-frame house was 52 feet (16 meters) long and 25 feet (8 meters) wide. The single-family home had smoke alarms, but there were none on the second floor.

Occupants of the home called 911 at 4:30 a.m. to report the blaze, and firefighters arriving about seven minutes later extinguished the fire. They found the victim lying on the floor of his bedroom and took him to the hospital, where he succumbed to his injuries.

The house and its contents, valued at \$125,000, sustained damage estimated at \$50,000. The fire department and the police were involved in the investigation.

Kenneth J. Tremblay, 2008, "Firewatch," *NFPA Journal*, September/October, 24.

Fireworks inside a residence ignite deadly fire, Missouri

A 6-year old boy and a 40-year old male died when fireworks ignited the interior of their home. Investigators believe hot embers from fireworks ignited an upholstered sofa and quickly spread, trapping the occupants. Firefighters fought through the fire and heavy smoke coming from the front door and quickly found one victim and later a second, but both had succumbed to smoke inhalation and burn injuries.

The single-family home was constructed of wood framing with a wooden roof and asphalt shingles. The 1,200-square-foot (111-square-meter) home lacked smoke alarms and sprinklers.

The fire department received a call from a passerby at 11:50 p.m. and arrived five minutes later to find police on scene reporting a person possibly trapped. As flames came out the front door and window, firefighters advanced a hose line into the front door knocking down the heavy fire as they went.

Within 10 feet (3 meters) of the door, the first victim was found and removed to the front lawn. Firefighters suppressed the fire and continued the primary search. A second victim was found in the kitchen and removed. The fire was contained to the first floor and the dwelling ventilated as the investigation began. Damages to the home were not reported.

Kenneth J. Tremblay, 2007, "Firewatch", *NFPA Journal*, September/October 26.

Fireworks ignite plastic bins, Washington

Two juveniles were charged with arson when fireworks they ignited spread to large plastic trash bins and then to the exterior of an elementary school. Fire spread to the wooden roof structure and to the interior of the school before being detected and extinguished.

The single-story school was constructed in phases over several years with concrete block walls, a brick veneer, and a wooden roof with a built-up roof deck. There were no detection or suppression systems installed in the school, only a burglar alarm that sounded only after the fire was well developed.

The plastic recycle bins with hinged-plastic covers were placed against the school. A lit firework was placed within a bin and it ignited the combustibles and spread to the bin itself. Flame heights reached the roofline and spread to concealed spaces involving structural wood framing.

Police investigating the burglar alarm arrived at 10:34 p.m. and alerted the fire department when smoke and fire was observed. Four minutes later, firefighters arrived and found heavy smoke and fire coming from the north section of the school. They advanced an interior hose line. Crews had some success in extinguishing fire in two of the classrooms and alcove, but fire spread in the concealed ceiling and roof spaces was too extensive. Command ordered an evacuation and began a defensive attack.

A trench cut separated the involved north section of the school from the main building, as aerial master streams were used to control the fire. Firefighters fought the fire for four hours before it was declared under control. Damage to the school was estimated at \$2.5 million for combined structural and contents losses. One firefighter suffered minor injuries during suppression activities.

Kenneth J. Tremblay, 2007, "Firewatch", *NFPA Journal*, May/June, 24.

Fireworks kill 4-year-old, Missouri

A family celebration at which people were setting off consumer fireworks ended tragically when a 4-year-old girl was killed by a projectile launched from a mortar. The girl was on a walkway near a porch 148 feet (45 meters) from the area where fireworks were being ignited when she was struck in the face.

There were no other injuries or property damage.

Kenneth J. Tremblay, 2005, "Firewatch," *NFPA Journal*, July /August, 20.

Disco fire in Buenos Aires, Argentina

[On] December 30 [2004], a fire at a rock concert in an unsprinklered disco in Buenos Aires, killed 191 people, the largest loss of life in a fire in Argentina's history. The Republica Cromagnon disco was a one-story building of approximately 1,500 square meters (16,150 square feet), with an occupancy permit for 1,037 spectators, but an estimated 3,000 people were inside on the night of the fire.

The fire started at 10:50 p.m., a few minutes after the concert had started, when fireworks thrown by a spectator set fire to the combustible acoustic lining of the ceiling, presumably made with polyurethane foam. The fire spread quickly through the ceiling. Smoke inhalation claimed the most victims. There was a lack of compliance with local codes regarding the combustible acoustic lining and the use of fireworks inside buildings.

Other factors contributing to the large loss of life included a main exit door that had been closed with a padlock, and the lack of emergency lighting and exit signs. In fact, a few minutes after the fire had started, electrical power was cut off and there was total darkness inside the overcrowded space, making a chaotic situation even worse.

Eduardo Alvarez, 2005, "Disco fire in Buenos Aires, Argentina," *NFPA Journal*, March/April, 52.

Fireworks ignited during transfer, three deaths, Kansas

At 10:00 a.m. in August, fireworks were being transferred from a storage trailer to a 29-foot goose neck trailer for transport to a fireworks show.

As a safety officer for the loading stood outside the goose neck trailer, he heard a lift charge from one of the boxed fireworks function. As the box was set down, it began to burn, and then exploded, igniting the 17 other boxes that had been transferred. As these fireworks began to ignite and explode, flaming debris and shells were propelled into the storage trailer. The storage trailer then exploded. Investigators believe the pre-wiring of the fireworks was the most plausible ignition source in the box.

Two of the victims were in the storage trailer and the third was located in the goose neck trailer.

Based on Stephen G. Badger, *Multiple-Death Fires For 2005*, September, 2006, NFPA Fire Analysis and Research, 14.

Fireworks explosion in Florida causes five deaths

Around 2:10 p.m. on a sunny and warm July day, workers unloaded fireworks from one truck to another. An explosion occurred in the cargo area of the truck. Five people were killed when the explosion prevented their escape. The cause is under investigation.

Adapted from Stephen G. Badger 2004, "Catastrophic Multi-Death Fires of 2003," *NFPA Journal*, September/October, 73.

Fireworks ignite roof, Michigan

Fireworks from a private, unpermitted Independence Day display ignited the roof of a single-family house, nearly destroying the \$3 million home. A neighbor alerted a resident, and then called 911 at 11 p.m.

The two-story, wood-framed dwelling, each floor of which covered approximately 2,400 square feet (222 square meters), had a wood-flamed roof topped with cedar-shake shingles. Smoke detectors had been installed in the unsprinklered house, but they didn't sound since the fire started on the roof.

A fireworks shell, blown onto the roof, ignited the shingles. The fire burned through the roof into the attic. From there, the blaze spread throughout the house at roof level, doing nearly \$2.5 million in damage to the home. Before the fire, the home and its contents were valued at \$3 million. No injuries were reported.

Kenneth J. Tremblay, 2004, *NFPA Journal*, July/August, 16.

Night club pyrotechnics display ignites wall covering, kills 100, Rhode Island

At 11:00 pm on a day in February, in an unsprinklered one-story nightclub of unprotected wood-frame construction, a rock band's pyrotechnics display ignited foam material used on the wall of the stage for soundproofing. The fire spread throughout the structure in a matter of minutes.

Stephen G. Badger, 2004, "Catastrophic Multiple-Death Fires 2003," *NFPA Fire Analysis and Research*, September, 14.