

U.S. Fire Administration/National Fire Data Center

# The Dangers of Fireworks

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Homeland  
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### Findings

- Injuries from fireworks—most of which occur around the 4th of July—increased from 8,800 in 2002 to 9,300 in 2003. Over the past 13 years, however, the injury rate has fallen 37%—from 4.3 to 3.2 injuries per 100,000 population.
- State laws regulating the sale of fireworks directly affect the occurrence of fireworks-related injuries.
- Children under the age of 15 suffered 45% of all injuries from fireworks. Most injuries (72%) are to males of all ages.
- Firecrackers were responsible for the greatest number of injuries (1,600) in 2003, followed by bottle rockets (1,000) and sparklers (700).
- Because most fires ignited by fireworks are to outside property, the dollar loss to these fires is substantially less than the dollar loss to structure fires.

It would be hard to imagine July 4th festivities in the United States without public displays of fireworks, and a number of other holidays, such as New Years, often call for big shows as well. But celebrations can become tragic when someone is injured by consumer fireworks. Despite federal and state regulations on the type of fireworks available for sale to the general public, even those fireworks that are sold legally carry an elevated risk of personal injury.

Fireworks are considered hazardous materials with the potential to cause serious injury. All fireworks are regulated by the Federal Hazardous Substance Act, which prohibits sale of the more dangerous types to the public to avoid injury and property damage. Among these banned products are large, reloadable mortar shells, cherry bombs, aerial bombs, M-80s, and large firecrackers with more than 2 grains of powder. Likewise, all mail order kits to construct fireworks are strictly prohibited.<sup>1</sup>

The Consumer Product Safety Commission (CPSC) regulates fireworks that can be sold legally to consumers<sup>2</sup> and is responsible for setting minimum standards, such as requiring firecrackers to have fuses that burn at least 3 seconds but not more than 9 seconds, and that all devices be sealed to prevent leakage of pyrotechnic material. Further, all legal fireworks must have labels with instructions for safe use, as well as warnings and precautions.

Although these regulations and standards have helped make consumer fireworks safer, all fireworks are potentially hazardous.<sup>3</sup> For example, sparklers, which are legal in the majority of states, burn at temperatures of approximately 2,000°F.<sup>4</sup> Their colorful sparks belie the potential dangers, and yet sparklers are predominately used by young children.

Federal, state, and local laws govern the manufacture and sale of legal fireworks (Class C). As of March 1, 2004, 37 states and the District of Columbia allowed some or all types of consumer fireworks, an increase of five states since January 2001 (Figure 1). Meanwhile six states allow only sparklers or other such novelties. Seven states ban all fireworks, including those allowed and regulated by the CPSC.

FIGURE 1. STATE REGULATIONS OF  
CONSUMER FIREWORKS

STATES THAT PERMIT CONSUMER FIREWORKS	
Alabama	Montana
Alaska	Nebraska
Arkansas	New Hampshire
California	New Mexico
Colorado	Nevada
Connecticut	North Carolina
District of Columbia	North Dakota
Florida	Oklahoma
Hawaii	Oregon
Idaho	South Carolina
Indiana	South Dakota
Kansas	Tennessee
Kentucky	Texas
Louisiana	Utah
Maryland	Virginia
Michigan	Washington
Minnesota	West Virginia
Mississippi	Wisconsin
Missouri	Wyoming
STATES THAT ALLOW ONLY SPARKLERS	
Illinois	Ohio
Iowa	Pennsylvania
Maine	Vermont
STATES THAT BAN ALL CONSUMER FIREWORKS	
Arizona	New York
Delaware	Massachusetts
Georgia	Rhode Island
New Jersey	

Source: Consumer Product Safety Commission

Previous studies have indicated that state laws regulating the sale of fireworks directly affect the occurrence of fireworks-related injuries. In one state, the number of injuries seen in emergency departments more than doubled following the legalization of fireworks.<sup>5</sup>

### INJURIES FROM FIREWORKS

In 2003, firework devices caused approximately 9,300 injuries, an increase from 8,800 injuries in 2002.<sup>6,7</sup> The vast majority of these injuries are associated with Independence Day celebrations. CPSC estimated that 6,800 people were treated in hospital emergency departments for fireworks-related injuries during the 1-month period surrounding July 4th (June 20–July 20, 2003). There were six deaths from consumer fireworks reported that year.<sup>8</sup>

According to National Electronic Injury Surveillance System (NEISS) survey data, CPSC estimated that nearly half of all fireworks-related injuries (45%) were suffered by children under age 15.<sup>9</sup> Males were disproportionately injured by fireworks (72%) with almost three times as many males as females (28%) injured. The large majority of fireworks injuries occurred with consumer products. CPSC also reported that of the estimated 9,300 fireworks injuries in 2003, only a small number of injuries—100—occurred at public fireworks events.

Burns were by far the most common form of injury. Burn injuries typically occurred to all parts of the body (Figure 2). Hands are the body parts most often injured, accounting for 1,800 of the hospital visits in the 1-month NEISS study period around July 4th, 2003. Eyes followed with 1,400 visits, and then heads/faces/ears and legs with 1,200 emergency visits each.

FIGURE 2. ESTIMATED FIREWORKS-RELATED INJURIES BY BODY PART AND DIAGNOSIS (JUNE 20–JULY 20, 2003)

Body Part	Total	Burns	Contusions, Lacerations	Fractures, Sprains	Other Diagnoses
Arm/Shoulder	500	300	100	*	*
Eye	1,400	400	500	*	500
Hand/Finger	1,800	1,600	100	*	100
Head/Face/Ear	1,200	500	400	*	300
Leg	1,200	1,000	100	100	100
Trunk	800	500	200	*	100
<b>Total</b>	<b>6,800</b>	<b>4,300</b>	<b>1,200</b>	<b>100</b>	<b>1,200</b>

Notes: Other diagnoses includes all injury categories.  
 Estimates rounded to nearest 100 injuries.  
 Estimates of less than 50 injuries shown with an asterisk (\*).  
 Totals may not add due to rounding.

Source: U.S. Consumer Product Safety Commission, "2003 Fireworks Annual Report," NEISS.

### PRODUCTS ASSOCIATED WITH INJURIES

Of all consumer fireworks, firecrackers were responsible for the greatest number of injuries. In 2003, CPSC estimated 1,600 injuries from firecrackers associated with Independence Day celebrations. Bottle rockets injured 1,000 persons, and sparklers injured another 700.

Of the estimated 700 fireworks injuries to children under 5 years of age, 400 (57%) were caused by sparklers between June 20 and July 20, 2003. Among children 5–14 years of age, firecrackers and bottle rockets resulted in 800 of the 2,400 injuries (33%). Rockets (bottle and other types) alone accounted for 500 of the 1,800 (28%) injuries to persons aged 15–24.

Fireworks sales have been increasing according to the American Pyrotechnics Association. In 2000, fireworks sales totaled \$610 million and by 2004 had increased to \$775 million.<sup>10</sup> Meanwhile, with the exception of a spike in injuries in 2000, which is likely explained by more extensive celebrations associated with the millennium, the firework injury rate has declined since 1991 (Figure 3). Overall, the injury rate has fallen 37% since 1991 and appears to have recently leveled off at about 3 per 100,000 persons each year. It is possible that this trend is due to the increasing popularity of large, public, professionally executed fireworks displays, which use thousands of pounds of fireworks and rarely cause injuries.

FIGURE 3. ESTIMATED FIREWORKS-RELATED INJURIES

Year	Estimated Fireworks-Related Injuries	Fireworks Injury Rate*
1991	10,900	4.3
1992	12,500	4.9
1993	12,100	4.6
1994	12,500	4.8
1995	10,900	4.1
1996	7,300	2.7
1997	8,300	3.0
1998	8,500	3.1
1999	8,500	3.1
2000	11,000	3.9
2001	9,500	3.3
2002	8,800	3.0
2003	9,300	3.2

\*Injuries per 100,000 people

Notes: Estimates based on 291 fireworks-related injuries recorded by NEISS in 2003.

Sources: Consumer Product Safety Commission, "2003 Fireworks Annual Report," NEISS. U.S. Consumer Product Safety Commission, U.S. population estimates from 1991-1999 from <http://eire.census.gov/popest/data/national/tables/intercensal/US-EST90INT-04.php>; population projections for 2000-2003 from <http://eire.census.gov/popest/data/states/tables/NST-EST2003-01.xls>

Even declining trends cannot mask the issue that fireworks remain dangerous. Each year, many people are injured and some are killed by fireworks. The following 2003 deaths illustrate the problems:<sup>11</sup>

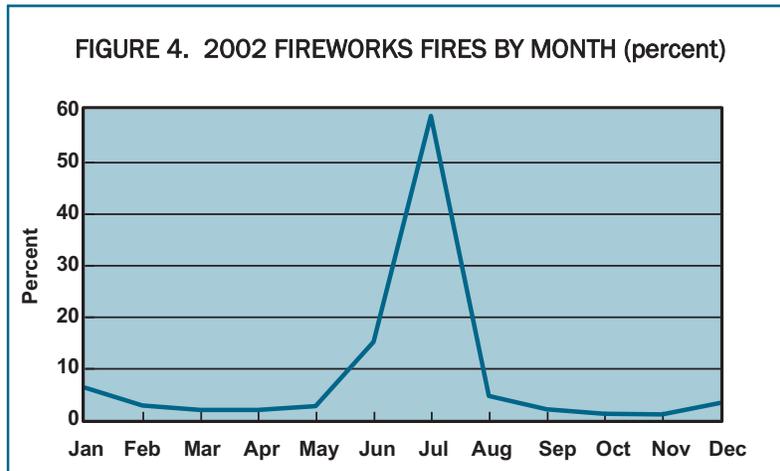
- A 2-year-old child died in Florida from smoke inhalation from a fire that was started in the laundry room of a mobile home. The fire started when a 3-year-old child lit combustibles with a sparkler.
- Leaning over a pipe where he placed a commercial-type firework projectile, a 38-year-old man in Iowa was killed when he lit the fuse.
- Attempting to block the wind around a launching tube, an 18-year-old man was fatally injured in Michigan when lighting a mortar-type firework.

### FIRES CAUSED BY FIREWORKS

The following discussion is based on 2002 National Fire Incident Reporting System (NFIRS, version 5.0) data and reflects injuries, fatalities, and fire loss associated only with the fires caused by fireworks. These losses differ from the figures presented earlier that reflect injuries, fatalities, and property loss caused directly by fireworks.

An estimated 23,200 fireworks fires in 2002 caused approximately \$35 million in property loss and injured 75 persons.<sup>12, 13</sup> No deaths were reported in the NFIRS data. Most fires are clustered around Independence Day, New Year's Eve, and other holidays or celebrations.

Fifty-nine percent of fires caused by fireworks occur around the Independence Day holiday on July 4th (Figure 4), often in open fields or vacant lots. As such, the materials most commonly ignited (68%) by fireworks are organic materials such as grass and trees. Grass alone was the first material ignited in 47% of all fireworks fires.<sup>14</sup> Because these types of fires are located outdoors, they have a relatively low property loss (Figure 5).



Source: NFIRS 5.0

**FIGURE 5. 2002 LOSS MEASURES FROM FIREWORKS**

Loss Measure	All Fires	Fireworks Fires
\$ Loss/Fire	\$7,447	\$1,841
Injuries/1,000 Fires	20.8	5.1
Fatalities/1,000 Fires	2.8	0.0

Note: Estimates based on fires with heat sources reported.

Source: NFIRS 5.0

Property loss is substantially less in fireworks fires than in other types of fires because most fireworks fires occur outside, where the fires do less damage and cause lower dollar replacement value than structure fires.

Given the high number of children injured by fireworks, it is not surprising that the most common ignition factor for fires related to fireworks is playing with the heat source (42%). Playing with the heat source is the ignition factor in one-third of the property losses due to fireworks fires and 50% of fireworks-related injuries. The larger ignition factor category of misuse of the heat of ignition includes abandoned materials, heat source too close to combustibles, as well as playing with the heat source, and accounts for the vast majority of fires (86%), injuries (90%), and property loss (89%).<sup>15</sup>

## CONCLUSION

Fireworks account for a substantial number of preventable injuries and fires. Because fireworks can be dangerous and deadly, the safest way to enjoy them is through public displays conducted by professional pyrotechnicians hired by communities over July 4th or at other times during the year. Parents need to be especially vigilant during this period in assuring that children do not possess dangerous fireworks or mishandle legal ones.

To request additional information or comment on this report, visit  
<http://www.usfa.fema.gov/applications/feedback>

## Notes:

1. Fireworks Publication #12, Consumer Product Safety Commission, March 2004, <http://www.cpsc.gov/CPSPUB/PUBS/012.pdf>.
2. U.S. Consumer Product Safety Commission, Office of Compliance, Summary of Fireworks Regulations, 16 C.F.R. Part 1500 & 1507.
3. Fireworks Publication #12, loc. cit.
4. "CPSC Holds Fireworks Safety Press Conference on Mall in Washington," Press Release, CPSC, June 28, 2000, <http://www.cpsc.gov/cpscpub/prerel/prhtm101/01179.html>.
5. Centers for Disease Control and Prevention, "Serious Eye Injuries Associated With Fireworks, United States 1990–1994," *Morbidity and Mortality Weekly Report*, 1995; 44; 449–452.
6. Michael A. Greene and James Joholske, "2003 Fireworks Annual Report, Fireworks-Related Deaths, Emergency Department-Treated Injuries, and Enforcement Activities During 2003," Consumer Product Safety Commission.
7. One hundred people died and 200 were injured in a nightclub fire in West Warwick, RI, ignited by nonconsumer fireworks. These numbers are not included in this report.
8. Michael A. Greene, loc. cit.
9. Idem.
10. Monique Stuart, "Fireworks Sales," *The Washington Times*, <http://washtimes.com/culture/20040616-094306-2607r.htm>.
11. Michael A. Greene, loc. cit.
12. Loss estimates are based on 2002 National Fire Incident Reporting System (NFIRS) data and national residential structure fire loss estimates from the National Fire Protection Association's (NFPA's) *Fire Loss in the United States During 2002*. Fireworks fire loss estimates are rounded as follows: fires to the nearest 100 fires; injuries to the nearest 25 injuries, and dollar loss to the nearest \$million.
13. Fireworks fire loss estimates are based on the total number of NFIRS fires in 2002 for which the heat source was known and on NFPA's *Fire Loss in the United States During 2002*. Approximately 42% of fires in NFIRS reported a heat source. If the fireworks estimates were based on all reported fires, including those with unknown heat sources, the estimates of firework fire losses would decrease to 9,700 fires, 50 injuries, and \$19 million in dollar loss.
14. Distribution statistics are based on data from the NFIRS 2002. At the time of this report, NFIRS continues to transition from version 4.1 to 5.0. Due to issues related to accurately converting version 4.1 data to version 5.0, this report is based on data reported only in version 5.0.
15. Statistics for ignition factors reflect those fires for which a factor was noted as contributing to the ignition of the fire. Sixty-five percent of firework-related fires have a factor contributing to ignition, 18% indicate that no factor contributed to ignition, and 17% had no factor specified.