



2003 Fireworks Annual Report

Fireworks-Related Deaths, Emergency Department-Treated Injuries, and Enforcement Activities During 2003

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These comments are those of the CPSC staff, have not been reviewed or approved by, and may not necessarily reflect the views of the Commission.

Executive Summary

This report provides the results of the U. S. Consumer Product Safety Commission (CPSC) staff analysis of data on fireworks-related deaths and injuries during 2003. The report also includes a summary of CPSC enforcement activities during that year.

We obtained information on fireworks-related deaths primarily from news clippings and other sources in CPSC's Injury/Potential Injury Incident (IPII) database. We estimated fireworks-related injuries from CPSC's National Electronic Injury Surveillance System (NEISS). More detailed analyses of injuries including the type of injury and the firework involved, and the characteristics of the victim were based on a special study conducted between June 20 and July 20, 2003. About two-thirds of the annual fireworks-related injuries occurred during that period.

Highlights of the report are as follows:

- CPSC has reports of 6 deaths associated with fireworks during 2003. Four deaths were associated with aerial fireworks. The other deaths occurred in fires that were started by fireworks.
- Fireworks devices were involved in an estimated 9,300 injuries treated in U. S. hospital emergency departments during calendar year 2003. CPSC staff estimated that there were 8,800 injuries during 2002.
- One hundred people were killed and almost 200 were injured in a fire in a nightclub in West Warwick, Rhode Island. The fire was started with fireworks, not classified as consumer fireworks. These victims were not included in the number of deaths and injuries above because the incident was not typical of fireworks-related deaths or injuries.
- An estimated 6,800 fireworks-related injuries were treated in U. S. hospital emergency departments during the one month special study period surrounding the Fourth of July, 2003 (June 20, 2003 – July 20, 2003). CPSC staff estimated that there were 5,700 injuries during 2002.

Results from the special study include the following:

- About three times as many males were injured as females.
- Injuries to children were a major component of total fireworks-related injuries with children under 15 accounting for almost half the estimated injuries.

- Among different types of fireworks, firecrackers were associated with the greatest number of estimated injuries at 1,600, followed by bottle rockets at 1,000 and sparklers at 700. Sparklers accounted for more than half the injuries for children under 5.
- We estimated that there were a small number of injuries (100) at public fireworks displays.
- Firecrackers and bottle rockets were the largest single fireworks types associated with injuries to 5 to 14 year olds. About half the victims of bottle rocket-related injuries were to 15-24 year olds.
- The parts of the body most often injured were hands (estimated 1,800 emergency department visits), eyes (1,400 visits) and the head, face and ear (1,200 visits).
- About two-thirds of the injuries involved burns. Burns were the most common injury to all parts of the body except the eyes, where contusions, lacerations, foreign bodies and burns occurred with about equal frequencies.

CPSC staff conducted telephone follow-up investigations of some fireworks-related injuries reported at NEISS hospital emergency departments during the special study period. About half the cases were selected for follow-up because they involved potentially serious injuries. Such injuries included eye injuries and head injuries, finger and hand amputations. The other cases were selected from the Fire Injury Project, a separate CPSC staff study involving follow-up of emergency department-treated cases for fire-related injuries that were likely to have been attended by fire departments.

Findings from the completed telephone investigations include the following:

- Some of the hazard patterns included errant flight paths of aerial fireworks, fireworks exploding earlier or later than expected, and debris or hot material from the fireworks device.
- While most victims recovered or expected full recovery from their injuries, a few injuries had permanent consequences. These included several eye injuries that could result in permanent vision impairment.
- When they knew where the fireworks were obtained, most respondents reported that the source was a stand that sold only fireworks.

During 2003, CPSC's Office of Compliance continued to work closely with other agencies to conduct surveillance on imported fireworks and to enforce the provisions of the Federal Hazardous Substances Act. Examples of these activities are as follows:

- CPSC and Customs staffs selectively sampled and tested 286 shipments of fireworks. Approximately 27 percent of the shipments were found to contain violative fireworks. These shipments accounted for more than one million units with violations serious enough to warrant seizure or other actions by Customs.
- CPSC staff also initiated and participated in several multi-state criminal investigations with the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), the Department of Transportation (DOT) and the Department of Justice.
- Three criminal cases of note were closed during 2003. A Washington state man was sentenced to 48 months for manufacturing and distributing illegal fireworks. An Indiana man was sentenced to 80 months for dealing in display fireworks without a license and for related ATF and DOT charges. An Illinois man was sentenced to 30 months in jail for dealing in illegal fireworks. Additional indictments and prosecutions are expected in 2004.

Introduction

This report describes injuries and deaths associated with fireworks during 2003. The report also describes CPSC staff enforcement activities for 2003. The report is part of an annual series. Reports for earlier years can be found on the internet at www.cpsc.gov/library/data.html.

The report is organized into 8 sections. Following the discussion of data and methods in this section, the next section describes fireworks-related deaths. Section 3 describes an incident in West Warwick, Rhode Island that resulted in 100 deaths and almost 200 injuries. Section 4 provides a national annual estimate of fireworks-related emergency department-treated injuries for 2003 and compares that estimate with estimates for previous years. Section 5 is based on a special study of emergency department-treated injuries during the month around July 4. That section presents tables of the number of injuries broken down by different categories. Section 6 summarizes the in-depth telephone investigations of fireworks injuries. Section 7 describes enforcement activities by CPSC's Office of Compliance. The main body of the report then concludes with a summary of the findings. An appendix contains more detail on the telephone investigations that were summarized in Section 6.

Sources of Information

Information on non-work-related fireworks deaths occurring during 2003 was obtained from the CPSC Injury/Potential Injury Incident file (IPII) and CPSC's Death Certificate File. Entries in IPII come from sources such as newspaper articles, consumer complaints, referrals by lawyers, medical examiners and other government agencies. There may be multiple reports on a single death. We screened reports to eliminate duplicates. Then the CPSC field staff conducted in-depth investigations on these fireworks-related deaths. The purpose of that investigation is to determine the type of fireworks involved and the circumstances that led to the fatal injury.

Because IPII is based on voluntary reports and because it takes up to two years to receive all death certificates from the various states to complete the Death Certificate File, neither data source can be considered complete at this time for 2003 fireworks-related deaths. As a result, the number of deaths might have been greater than the number reported here.

The source of information on fireworks-related injuries was the National Electronic Injury Surveillance System (NEISS). NEISS is a probability sample of U. S. hospitals with emergency departments.¹ Injury information is taken from the emergency department record. Information includes the victim's age and sex, where the injury

¹ For a description of NEISS, including the revised sampling frame, see Kessler and Schroeder (1998). Procedures used for variance and confidence interval calculations, and adjustments for the sampling frame change in 1997 are found in Marker, Lo, Brick, and Davis (1999). SAS statistical software for trend and confidence intervals is documented in Schroeder (2000).

occurred, the emergency department diagnosis, body part injured and the consumer product associated with the injury. The information is supplemented by a 160 character narrative that often contains a brief description of how the injury occurred.

For emergency-department treated-fireworks-related injuries reported in NEISS, there are three different levels of information that were collected during the year, as follows:

- NEISS records collected during the July 4th special study period. During this period, which for 2003 was June 20 to July 20, we requested that hospital emergency department staff show pictures of different types of fireworks to patients and ask them to identify the type of firework device associated with the injury. For this period, the narrative usually contained a description of how the incident happened and the type of firework involved.
- In-depth investigations during the July 4th special study period. On the basis of information in the NEISS coded fields and the narrative, some cases were assigned for telephone investigations. The victim was telephoned and asked to describe in detail the type of fireworks involved, how the injury occurred, the medical treatment and the prognosis. The victim was also asked about the source of the fireworks.
- Incidents occurring during the remainder of the year. No special information was collected for the remaining 11 months. In particular, this meant that the narrative usually did not include the fireworks type or information on how the injury occurred.

While the numbers vary slightly from year to year, about two-thirds of the annual fireworks-related injuries usually occur during the July 4th special study period. During 2003, approximately one-third of these special study period cases were selected for telephone investigations. There were two criteria for selecting cases. About half the cases were selected because they involved the most serious injuries and/or hospital admissions. Serious injuries included eye injuries, finger and hand amputations, and head injuries. The other cases were selected from the Fire Injury Project, a separate CPSC staff study involving follow-up of emergency department-treated cases with fire-related injuries that were likely to have been attended by fire departments.² As a result of these criteria, most cases selected for the telephone surveys tended to have more serious injuries than typical NEISS hospital cases.

² The information collected by the Fire Injury Project included almost all the information required for the fireworks special study. The Fire Injury questionnaire was used first during the telephone interview, followed by an abbreviated form of the fireworks questionnaire. This allowed collection of data on many additional fireworks-related injuries at a relatively low cost.

About half the telephone investigations were completed. The most frequent reasons why investigations were not completed were difficulty contacting the victim or refusal to participate.

These different levels of information about injuries correspond to different analyses in the report as follows:

- Estimated national annual fireworks-related injuries. This estimate is made using all NEISS reported fireworks-related injuries for the calendar year. No cases are removed. That is because the information in the comment field is not usually complete enough for the approximately one-third of fireworks-related injuries that occur outside the special study period. As a result, the annual injury estimate includes a small number of cases where (1) the firework has not been lit or attempted to be lit or the victim was not attempting to light it or (2) some other product was more substantially involved in the injury than the firework.³ Calculating the annual estimates without removing these cases makes the estimates comparable to previous years.
- Detailed analyses of injury patterns. Tables in the report describe body part injured, diagnosis, fireworks types, age and sex of injured people and other information. These tables are based only on the special study period. Fireworks types are taken from the telephone investigation or the NEISS comment field, when there was no telephone investigation. When computing national estimates for the special study period, we remove cases where the fireworks device was not lit or the victim was not attempting to light the device or some other product was more substantially involved. Like the annual estimates for all injuries, estimates in these tables also use sampling weights.
- Information from the telephone investigations. Individual case injury descriptions and medical prognosis information from the telephone investigations are listed in the appendix to this report. These listings also exclude cases where the fireworks device was not lit or the victim was not attempting to light the device. Weighted national estimates are not made for medical prognoses or injury descriptions, because the cases do not represent a probability sample.

³We identified three cases in the 2003 data. In one case, a 53 year-old male was treated for a lumbar sprain from lifting fireworks. In a second, a 24 year-old woman was treated after a box of fireworks fell on her ankle. In the third case a person stepped on a nail while stomping out fireworks. Using the sampling weights, these three cases account for an estimated 100 injuries.

Statistical Methods

Injuries reported by NEISS sample hospitals were multiplied by the associated sampling weights to develop an estimate of total fireworks-related injuries for the year and for the special study month around July 4th. Confidence intervals were estimated and hypothesis tests were performed using computer programs that were written to take into account the sampling design. Results are rounded to the nearest 100 injuries.

The report also contains a number of detailed tables about fireworks-related injuries during the special study period. Estimates are also made using the sampling weights. To avoid cluttering the tables, we do not include confidence intervals and hypotheses tests with these tables. Because the estimates are based on subsets of the data, they have large relative sampling errors (i.e. larger coefficients of variation than the annual injury estimate or the special study month injury estimate.). As a result, interpretation and comparison of these estimates should be made with caution. For example, when comparing subsets of the data, say between injuries associated with two different types of fireworks, or between two different age groups, it is difficult to determine how much of the difference between estimates is associated with sampling variability and how much comes from real differences in national injury totals.

Estimates in the tables are also rounded to the nearest 100 injuries. Estimates of less than 50 injuries are shown with an asterisk (*). Totals may not add due to rounding.

Fireworks-related Deaths for 2003

CPSC has reports of 6 non-work fireworks-related deaths that occurred in 2003. We reported on 4 fireworks deaths for 2002 and 4 for 2001.⁴ Brief descriptions of the 2003 incidents are found below. In addition, in February 2003, 100 people were killed in West Warwick, Rhode Island in a nightclub fire that was started with non-consumer fireworks. This incident is not typical of fireworks-related fatal injuries and is described later in the text.

Descriptions of 2003 fireworks-related deaths are as follows:

- A 2-year-old Florida male died of smoke inhalation in a mobile home fire. The fire was started in the laundry room by another child (3 years old) who brought a lit sparkler into contact with combustibles. The 2-year-old child was overcome by smoke.
- An 18-year-old Michigan male was fatally injured when lighting a mortar type firework. The victim and his friend were huddled around a launching tube to block the wind. The victim peeled back part of the paper surrounding the wick of a mortar shell that was in the launching tube. A witness told officials that the

⁴ See Greene MA and Joholske J (2003), and Greene MA and Race PM (2002).

firework did not fly out of the tube as expected but it flew into the air and ignited with a large flash close to the victim. The victim died seven days after the incident from traumatic brain injuries. Three other people were injured in the incident.

- A 24-year-old Pennsylvania man was setting off fireworks in a field. The victim had an aerial display canister in a tube that was six inches in diameter and three feet high. The firework did not go off after being lit. When the victim went over to the tube to examine the firework, it detonated. He died instantly from massive head injuries.
- A 38-year-old Connecticut man was struck in the chest by a commercial-type firework projectile that he launched from a pipe he had placed in the ground. The police reported that the victim was leaning over the tube lighting the fuse when it went off.
- A 38-year-old Iowa man was setting off fireworks for his friends. He placed a tan baseball shaped device into a plastic launch tube. After lighting the fuse there was an immediate explosion that caused the victim to fall onto the ground. Then there was a second much louder explosion. The victim sustained fatal head injuries and was pronounced dead at the scene.
- During the early morning hours of December 2003 in Massachusetts, a 57-year-old man lit several fireworks devices. These were 2 inch long cylinders that spin on the ground and emit multicolored sparks and small flames. One of these devices ignited a dry Christmas tree after bouncing underneath. The resulting fire caused the death of a 45-year-old woman and injured three other adults.

According to the Centers for Disease Control and Prevention, there were 84 fireworks-related deaths (an average of 6 deaths annually) between 1988 and 2001.⁵

Nightclub Fire at The Station, West Warwick, Rhode Island

One hundred people died and almost 200 hundred people were injured in a nightclub fire in West Warwick, Rhode Island on February 20, 2003. The fire was caused by a pyrotechnic display that was lit during the concert. Because this incident was so different from every other fireworks incident, it is being reported separately from other fireworks-related deaths and injuries in this document.

This is what was reported about the incident.

⁵ Data from CDC for ICD 9 code 923.0 (1988-1998) and ICD 10 code W39 for 1999-2001. See <http://wonder.cdc.gov/mortsql.html>. These totals are different from our estimates because they include include work-related deaths.

At about 11 pm during the band's opening number someone working at the club ignited a pyrotechnic canister that releases a fountain of sparks. The ceiling and walls above the stage caught fire immediately. Unsure if the fire was part of the act, many patrons did not immediately head for the exits. Soon the entire club was engulfed in flames. Thick black smoke soon filled the club, making it more difficult for patrons to leave the club. When firefighters arrived, the size of the conflagration made rescue efforts difficult. Then firefighters were ordered to evacuate the building. Shortly after that, the roof caved in.⁶

A task force convened by the Commonwealth of Massachusetts Department of Public Safety summarized the situation. They said,

Each of these elements contributed to the tragedy: the proximity of pyrotechnics and foam insulation in a wood-frame building, the crowd's initial lack of awareness of an emergency situation, untrained staff, too many people with insufficient exits and most important, the lack of a potentially life-saving sprinkler system. Individually, they presented a danger. Together, they formed a 'perfect storm' of events that precipitated the catastrophe.⁷

The firework devices involved in the incident, "gerbs", emit a shower of sparks about 15 feet high for about ten to fifteen seconds. These are not classified as consumer fireworks. The devices are classified as 1.4G/Articles Pyrotechnic and have a UN number of UN0431 or UN0432 which is different from typical consumer fireworks that are designated as 1.4G/UN0336. While 1.4G/Articles Pyrotechnic do not require a Bureau of Alcohol, Tobacco, Firearms and Explosives (ATFE) license or permit for use, and while they are constructed similarly to consumer fireworks, they are not intended for consumer use according to the ATFE.

National Injury Estimates for 2003

Table 1 and Figure 1 present the estimated number of fireworks-related injuries for 1991 – 2003 that were treated in U. S. hospital emergency departments.

⁶ Shelly Reese (2004), "If Onlys Become Never Again," *NFPA Journal*. Available from www.nfpa.org/NFPAJournal/Covers/onlysjf04/onlysjf04.asp.

⁷ Secretary's Task Force on Fire & Building Safety (2003), "Safeguarding the Public from Fire: A Strategy for the Commonwealth." Executive Office of Public Safety, Boston, MA.

Table 1
Estimated Fireworks-Related Injuries 1991-2003

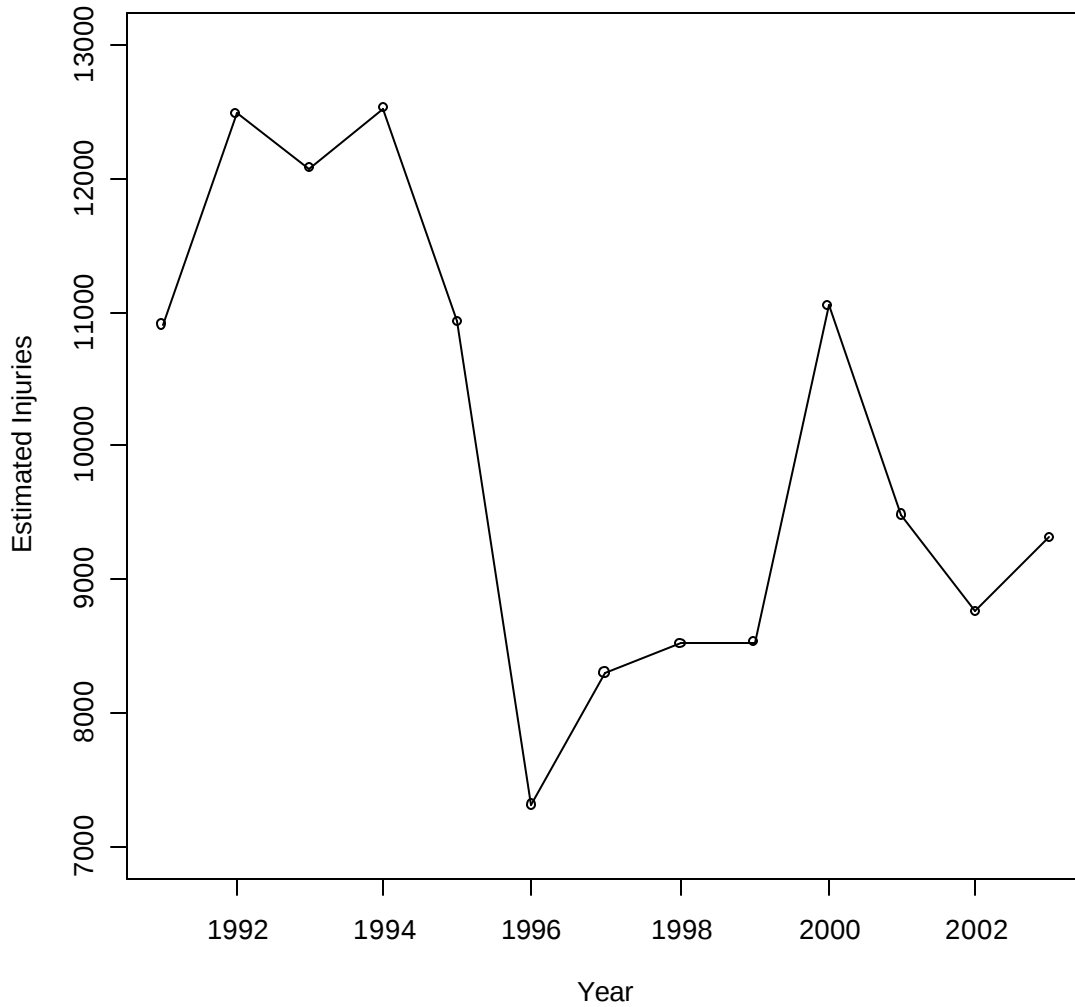
Year	Estimated Injuries	Injuries per 100,000 people
2003	9,300	3.2
2002	8,800	3.0
2001	9,500	3.3
2000	11,000	3.9
1999	8,500	3.1
1998	8,500	3.1
1997	8,300	3.0
1996	7,300	2.7
1995	10,900	4.1
1994	12,500	4.8
1993	12,100	4.6
1992	12,500	4.9
1991	10,900	4.3

Source: NEISS, U. S. Consumer Product Safety Commission/EPHA. Based on 291 fireworks-related injuries recorded in NEISS hospital emergency departments during 2003. This estimate does not include an estimated 150 injuries associated with the incident in West Warwick, RI, based on cases treated in participating emergency departments. Estimates for 1991-1996 were revised to adjust for the new sampling frame and do not match values published in reports for 1997 or earlier. 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>.

In calendar year 2003, there were an estimated 9,300 fireworks-related injuries (95% confidence interval 6,800 – 11,800). Total emergency department-treated injuries and per capita injuries were larger than 2002, but the difference is not statistically significant.

Figure 1 below shows that the highest numbers of estimated injuries were between the years 1991 and 1995, followed by a decline in 1996, and then a relatively stable pattern between 1998 and 2003 that varied between 8,500 injuries (1998) and 9,500 injuries (2001). This pattern was interrupted in 2000, where there were increased numbers of injuries associated with fireworks activities for the millennium celebration that January.

Figure 1
Fireworks Injuries 1991-2003



Injury Estimates for the 2003 Special Study

The injury analysis in this section presents the results of the 2003 special study of fireworks-related injuries that were treated between June 20 and July 20, 2003. During this period, there were an estimated 6,800 fireworks-related injuries (95% confidence interval 4,800 – 8,900), accounting for about 70 percent of the total injuries for the year. The remainder of this section presents estimates for fireworks-related injuries broken down by different categories.

Fireworks Device Types and Injury Dispositions

Table 2 shows the number and percent of emergency department-treated injuries by fireworks device type.

Table 2
Estimated Fireworks-Related Injuries
By Type of Fireworks Device
June 20-July 20, 2003

Fireworks Device Type	Estimated Injuries	Percent
Total	6,800	100
All Firecrackers	1,600	24
Small	300	5
Illegal	200	2
Unspecified	1,200	17
All Rockets	1,200	18
Bottle Rockets	1,000	15
Other Rockets	200	3
All Other Devices	2,000	30
Sparklers	700	11
Fountains	100	1
Novelties	400	5
Multiple Tube	100	2
Reloadables	300	5
Roman Candles	400	6
Public Display	100	2
Unspecified	1,800	27

Source: NEISS, U. S. Consumer Product Safety Commission/EPHA. Based on 204 reported emergency department visits between June 20, 2003 and July 20, 2003. Subtotals include categories listed directly below. Estimates rounded to nearest 100 injuries. Estimates of less than 50 injuries shown with an asterisk (*). Totals may not add due to rounding.

As shown in Table 2, firecrackers accounted for an estimated 1,600 injuries, which was about one-fourth of the total fireworks-related injuries. After firecrackers, rockets accounted for about 1,200 injuries, 18 percent of the total. Most of the rocket

injuries involved bottle rockets. Sparklers accounted for about 700 injuries or a little more than 10 percent.

Table 2 shows that the firecracker size could not be identified for about 1,200 injuries (17 percent) and the fireworks device could not be identified for 1,800 injuries (27 percent). Sometimes the victim does not know the type of device because the victim didn't purchase or light the firework. Estimates from previous years have shown a substantial number of injuries where fireworks types were unknown.

There were a small number of injuries associated with public displays. This is also in keeping with previous years.

Age and Sex of Injured Persons

Children under 5 experienced slightly more than 10 percent (700 injuries) of all fireworks-related injuries as shown in Table 3. The injury rate was 3.7 injuries per 100,000 for these children. Children in the 5 to 14 age group accounted for 35 percent (estimated 2,400) of the fireworks-related injuries. Their rate was 5.9 injuries per 100,000. This was composed of 6.5 injuries per 100,000 for children 5 to 9 and 5.3 injuries per 100,000 for children 10-14. Together, children under 15 accounted for about 45 percent of the fireworks injuries.

The age group 15 to 24 had about 25 percent of the injuries (1,800) as did the 25 to 44 age group (1,700 injuries). Young adults 15 to 24 years old experienced 4.4 injuries per 100,000 people for the special study month. The injury rate declined for older people; for example people between 25 and 44 had 2.1 injuries per 100,000 and those 45 to 64 had 0.5 injuries per 100,000.

Males had 4,900 injuries, representing about 72 percent of the total. This pattern and the concentration of injuries among people 25 and younger has been typical of fireworks injuries for previous years.

Table 3
Estimated Fireworks-Related Injuries
By Age and Sex
June 20-July 20, 2003

Age Group			Total	Male	Female	Per 100,000 People
Total			6,800	4,900	1,900	2.4
0	To	4	700	400	300	3.7
5	To	14	2,400	1,900	400	5.9
5	To	9	1,300	1,000	300	6.5
10	To	14	1,100	1,000	100	5.3
15	To	24	1,800	1,300	500	4.4
15	To	19	1,000	700	300	5.1
20	To	24	700	500	200	3.6
25	To	44	1,700	1,200	500	2.1
45	To	64	300	100	200	0.5
65+			*	*	*	*

Sources NEISS, U. S. Consumer Product Safety Commission/EPHA , U. S. population from <http://www.census.gov/population/projections/nation/summary/np-t3-b.txt> See notes for Table 2.

Age and Sex of the Injured Person by Type of Fireworks Device

Table 4 shows the ages of those injured by the type of fireworks device associated with the injury. About half the estimated 700 injuries to children under 5 were from sparklers. Firecrackers and bottle rockets were the largest single fireworks type associated with injuries for people between 5 and 14 and between 15 and 24 years of age.

Table 4
Estimated Fireworks-Related Injuries
By Device Type and Age Group
June 20-July 20, 2003

Fireworks Type	Total	Age Group				
		0-4	5-14	15-24	25-44	45+
Total	6,800	700	2,400	1,800	1,700	300
Firecrackers	1,600	100	500	300	600	100
Small	300	*	100	100	100	*
Illegal	200	*	*	100	100	*
Size Unknown	1,200	100	400	200	300	100
Rockets	1,200	*	400	500	200	*
Bottle Rockets	1,000	*	300	500	200	*
Other Rockets	200	*	100	*	100	*
						*
All Other Devices	2,000	400	600	500	400	200
Sparklers	700	400	100	*	100	100
Fountains	100	*	*	*	100	*
Novelties	400	100	100	100	100	*
Multiple Tube	100	*	*	100	*	*
Reloadables	300	*	*	200	*	100
Roman Candles	400	*	200	100	100	*
		*				
Public Display	100	100	*	*	*	*
Unspecified	1,800	100	800	400	500	*

Source: NEISS, U. S. Consumer Product Safety Commission/EPHA. See notes for Table 2.

Injury Diagnosis and Body Part Injured

Table 5 presents the types of injuries sustained to specific parts of the body. Hands and fingers with an estimated 1,800 injuries, accounted for 26 percent of the total injuries. There were almost as many eye injuries (1,400) and leg injuries (1,200) as head, face and ear injuries (1,200).

Burns with 4,300 estimated injuries and 63 percent of the total, were the most frequent diagnosis. Contusions and lacerations, at 1,200 injuries and 18 percent of the total were the second most frequent. Head and facial injuries were evenly distributed among burns, contusions and lacerations, and other diagnoses. Eye injuries were equally divided among burns, contusions and lacerations, and other diagnoses including foreign bodies in the eye.

Table 5
Estimated Fireworks-Related Injuries
By Body Part and Diagnosis
June 20-July 20, 2003

Body Part	Total	Injury Diagnosis			
		Burns	Contusions Lacerations	Fractures Sprains	Other Diagnoses
Total	6,800	4,300	1,200	100	1,200
	*	*	*	*	*
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

Source: NEISS, U. S. Consumer Product Safety Commission/EPHA. See notes for Table 2.

Fractures and sprains also include dislocations. Other diagnoses included all other injury categories. Arm and shoulder includes NEISS codes for upper arm, elbow, lower arm, shoulder and wrist. Head/ Face/Ear includes eyelid, eye area, nose, neck, and mouth. Leg includes upper leg, knee, lower leg, ankle, foot and toe. Trunk includes lower trunk, upper trunk, pubic region, all parts of body, internal and 25-50% of body.

Type of Fireworks Device and Body Part Injured

Table 6 below presents estimated injuries by the type of fireworks device and body part involved.

Table 6
Estimated Fireworks-Related Injuries
By Type of Fireworks Device and Body Part Injured
June 20-July 20, 2003

Fireworks Type	Total	Arm	Eye	Body Part			
				Hands Fingers	Head Face/Ear	Leg	Trunk
Total	6,800	500	1,400	1,800	1,200	1,200	800
Firecrackers	1,600	100	300	700	300	200	*
Small	300	100	100	100	*	*	*
Illegal	200	*	*	100	*	100	*
Size Unknown	1,200	*	200	500	300	100	*
Rockets	1,200	100	200	100	400	200	200
Bottle Rockets	1,000	100	200	100	300	200	100
Other Rockets	200	*	*	*	100	100	100
Other Devices	2,000	100	300	600	200	500	300
Sparklers	700	*	*	300	*	500	*
Fountains	100	*	*	*	*	*	*
Novelties	400	*	100	100	*	*	100
Multiple Tubes	*	*	*	*	100	*	100
Reloadables	300	100	100	*	*	*	100
Roman Candles	400	*	100	100	100	*	100
Public Display	100	*	100	*	*	*	*
Unspecified	1,800	200	500	400	300	300	200

Source: NEISS, U. S. Consumer Product Safety Commission/EPHA. See notes for Table 2 and notes for Table 5 for definition of body parts.

About half the firecracker injuries occurred primarily to the hands, usually when the victim was lighting the device. Bottle rockets were associated with injuries to various parts of the body. Most of these injuries occurred when the rocket hit a victim. Sparkler injuries occurred mostly to hands, fingers and legs. Almost all of these injuries were

burns. The other fireworks devices had injury patterns that were almost equally divided among the different parts of the body.

Hospital Disposition

Although most of these fireworks-related injuries were characterized as “treat and release,” an estimated 5 percent required hospital admission or transfer to another hospital for treatment.

Telephone Investigations of Fireworks Injuries

CPSC staff assigned telephone investigations of some fireworks injuries that occurred during the month surrounding the July 4 holiday. About half the cases were selected on the basis of injury severity such as serious eye injuries, concussions, limb amputations or because the person was admitted to the hospital. Also, cases were included that were selected for CPSC’s Fire Injury Project. The criteria for those cases specified fire-related injuries with fire department attendance likely. Because these cases were selected on the basis of severity, they are only representative of scenarios associated with the most serious injuries.

In the questionnaire, respondents were asked about the hazard patterns associated with the injury, their medical care following the emergency department treatment, and about long term effects, if any, of the injury. Respondents were also asked about the source of the fireworks that caused the injury.

Summaries of the 40 completed investigations are found in the Appendix to this report. The investigations are organized in order of emergency department disposition: “Admit to Hospital” followed by “Treat and Release.” Within disposition, cases are sorted by the age of the victim.

Hazard Patterns

In ten investigated cases injuries were associated with firework debris and other hot material from the fireworks. Debris in victims’ eyes was involved in case 8, 11, 15, 24, 25, 32 and 37. Ashes from a sparkler fell on a victim’s leg in case 9 and pieces of a sparkler broke off and burned a victim in case 22. In case 26, embers from fireworks were involved in starting a fire that was extinguished by the victim. The victim stepped on glass that had been broken in that fire.

In nine investigated cases, victims were struck by aerial fireworks. Cases 1, 4, 5, 27, 29 and 31 involved bottle rockets. Several victims were struck in the eye resulting in admission to the hospital for three cases. In case 16, a free standing rocket was accidentally misaimed while being lit. In case 23, an 11-year-old female was watching a

fireworks display from her uncle's house when a stray firework hit her in the chest catching her sleeve on fire. The victim in case 28 was struck in the back by a flying Roman Candle.

In nine other cases, victims were injured when fireworks exploded earlier or later than expected. In cases 6, 21 and 35, the fireworks device exploded earlier than the victim expected. Cases 14, 20, and 30 resulted in injuries because the firework had not exploded and the victim may have believed that it would not explode. In case 14, the victim picked up a Roman Candle, which then emitted flames; in case 20, a buried firework exploded when the victim approached; while in case 30 a firework stuck in a tube exploded when the victim approached. Case 13 involved an explosion of a ground popper when the victim was leaning over the device. Case 33 involved a firework that blew up while it was in the launching tube. Case 38 resulted in an injury when the victim righted one launching tube and another tube fired.

Five cases involved fireworks thrown or aimed at the victim. A smoke bomb was thrown into a car in case 3. A victim's shirt caught on fire as a result of a thrown firework in case 7 and a novelty device thrown at another victim resulted in burns inside the victim's shirt in case 18. Case 17 involved a young child aiming a Roman Candle at the victim, and Case 10 involved a 4-year-old male struck by a ground popper novelty device.

In two cases, injuries occurred while the victim was lighting the fireworks. These include case 2 involving a smoke bomb and case 36, where the lit fuse from a bottle rocket dropped into powder which then exploded.

Finally there were five cases, each with unique patterns. Case 12 involved a butterfly novelty firework that landed on a victim's shirt causing second degree burns to his lower arm. Case 19 involved a sparkler that exploded in a victim's hand. Another sparkler injury occurred in case 34, where a victim lit a number of sparklers to give out to some people. He could not give them out fast enough resulting in burns to his hand. In case 39, a ground spinner blew up, burning the victim's knee and hand. Case 40 involved a woman at a dance on the side of a lake. Firecrackers were being lit and thrown over the lake by a sling. The sling malfunctioned and threw a firecracker into the crowd injuring this victim in the lower leg.

Long Term Consequences of Fireworks-related Injuries

Victims were asked if there were any long term consequences of their injuries. Most expected a complete recovery. Some of the exceptions were the victims with eye injuries. Five victims struck in the eye by bottle rockets (cases 1, 4, 5, 29 and 31) experienced loss of vision that may become permanent. Also, two victims with eye injuries from other aerial fireworks in cases 21 and 38 may have some long term vision impairment.

The only other incident that mentioned long term effects was case 39, where a ground spinner blew up burning the victim's knee and hand. The victim had physical therapy and expected to have partial to full recovery within the year.

Where Fireworks Were Obtained

In the telephone interview, victims were asked where the fireworks that caused the injuries were obtained. Of the 40 respondents with completed telephone interviews, 16 did not know where the fireworks were acquired or did not answer the interviewer's question. In some cases, this was because the victim was not the person who acquired the fireworks.

For the 24 respondents aware of the source of the fireworks, most (18) reported that the fireworks came from a stand that sells only fireworks. Two respondents said that fireworks were obtained from a store. Three obtained the fireworks from a friend and one purchased them from a van.

Enforcement Activities

CPSC's Office of Compliance enforces regulations for fireworks devices that are sold to consumers under provisions of the Federal Hazardous Substances Act. CPSC's enforcement activities are focused on reducing the number of fireworks-related deaths and injuries. A variety of enforcement techniques and initiatives were utilized in 2003 to keep unsafe fireworks from consumers.

CPSC staff continues to work closely with the Bureau of Customs and Border Protection to conduct surveillance on imported shipments of fireworks. Fireworks were selected based on their past violation history, the type of device, and whether the item had been sampled previously. In fiscal year 2003, CPSC and Customs staffs selectively sampled and tested 286 shipments of fireworks to determine if they were in compliance with CPSC regulations. Of those, approximately 27% were found to contain violative fireworks. These shipments accounted for more than one million units with violations serious enough to warrant seizure or other actions by Customs.

Another enforcement activity that continues to remain a priority for CPSC staff is the investigation into firms and individuals that offer kits and components to make illegal and dangerous firecracker type explosives, such as M-80s, Cherry Bombs and Quartersticks.

CPSC staff also initiated and participated in several multi-state criminal investigations. Staff worked with other Federal agencies, including the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), the Department of Transportation (DOT), and the Department of Justice's Office of Consumer Litigation, as well as state and local law enforcement agencies. Staff provided legal, field, and technical support in

several cases involving the distribution of illegal explosive devices and the illegal diversion of professional fireworks to consumers.

Three cases of note, in which CPSC staff participated in the investigation and/or prosecution, came to a conclusion in 2003. In January, a Washington state man was sentenced to 48 months in prison for manufacturing and distributing illegal fireworks, among other charges. In November, an Indiana man was sentenced to 80 months for dealing in display fireworks without a license, and related ATF and DOT charges. Also in November, an Illinois man was sentenced to 30 months in prison and two years of supervised release for dealing in illegal fireworks, including illegal flash powder devices. Additional indictments and prosecutions are expected in 2004.

Summary

In 2003, both reported deaths and estimated injuries were at about the same level as in 2002 and 2001. There were 6 fireworks deaths reported in 2003 as compared with 4 in 2002 and 4 in 2001. Annual injury estimates were 9,300 in 2003 as compared with 8,800 for 2002 and 9,500 for 2001. These injury estimates, developed from a sample, have some amount of sampling error. The difference in the estimates among these three years was not statistically significant.

The fire at The Station in West Warwick, Rhode Island, was the first fireworks-related incident in recent years to result in a large number of deaths and injuries. One hundred people died and about 200 were injured. We have excluded the deaths and injuries in our annual totals because that incident was so different from typical incidents.

During the one-month special study period of June 20 to July 20, 2003, there were an estimated 6,800 injuries, somewhat more than the estimate of 5,700 in 2002. Children under 15 years old accounted for about half the number of injuries. Among all five year age groups, children aged 5-9 experienced the greatest number of injuries at 1,300 during the special study period. Males were three times more likely to be injured than females.

Almost two-thirds of the injuries were burns. The most frequent part of the body injured was the hand with about 25 percent of injuries followed by eye injuries at about 20 percent. Although most of these fireworks-related injuries were characterized as "treat and release," an estimated 5 percent required hospital admission or transfer to another hospital for treatment.

Firecrackers were associated with the largest number of injuries. Bottle rockets were second and sparklers were third. Most of the sparkler injuries were among children under 5 years of age. Almost all the sparkler injuries were burns and most were to the hands and legs. More than half of the victims of sparkler injuries were between 5 and 14. Firecrackers resulted in injuries primarily to the hands.

A review of data from the telephone follow up survey of people injured by fireworks showed that typical causes of injuries included (1) fireworks exploding earlier or later than expected by the user, (2) badly aimed rockets or rockets with errant flight paths, (3) fireworks debris, and (4) fireworks thrown or aimed at victims. According to the telephone survey, most victims already had recovered or will recover from their fireworks injuries. But several victims experienced serious eye injuries, putting them at greater risk for future eye problems.

CPSC's enforcement activities remained at a high level. CPSC's Office of Compliance worked with U.S. Customs to sample imported fireworks and to seize illegal shipments. Also during 2003, CPSC staff provided legal, field and technical support in cases involving large-scale distribution of illegal explosive devices and illegal diversion of professional display fireworks to consumers. These investigations have led to seizures of fireworks and to criminal convictions. Additional indictments and prosecutions are expected in 2004.

References

Greene MA and Race P (2002), "2001 Fireworks Annual Report: Fireworks-Related Deaths, Emergency Department Treated Injuries, and Enforcement Activities During 2001," U. S. Consumer Product Safety Commission, Washington DC.

Greene MA and Joholske J (2003), "2002 Fireworks Annual Report: Fireworks-Related Deaths, Emergency Department Treated Injuries, and Enforcement Activities During 2002," U. S. Consumer Product Safety Commission, Washington DC.

Kessler E and Schroeder T (1998), "The NEISS Sample (Design and Implementation)," U. S. Consumer Product Safety Commission, Washington, DC.

Marker D, Lo A, Brick M and Davis W (1999), "Comparison of National Estimates from Different Samples and Different Sampling Frames of the National Electronic Injury Surveillance System (NEISS)," Final Report prepared for the U. S. Consumer Product Safety Commission, Westat. Rockville, MD.

Schroeder T (2000), "Trend Analysis of NEISS Data." U. S. Consumer Product Safety Commission, Washington, D. C.

Appendix

Summaries of Completed Telephone Investigations

Case	Age	Sex	Diagnosis	Disposition	Body Part Injured	Fireworks Type	Incident Synopsis	Medical Treatment and Prognosis
1	8	Male	Other	Admitted	Eye	Bottle Rocket	Victim struck in the eye.	Cornea damaged. Has had surgery and may require more. Some loss of vision may be permanent.
2	9	Male	Thermal Burns	Admitted	Lower Leg	Novelty (Smoke Bomb)	Jeans caught on fire while victim was setting off smoke bombs.	Victim was hospitalized, no information on prognosis
3	12	Female	Thermal Burns	Admitted	Lower Trunk	Novelty (Smoke Bomb)	Firework thrown into car, exploded and the victim's shirt caught on fire resulting in burns to back and arms.	Scarring expected. Length of time to full recovery not known.
4	14	Male	Other	Admitted	Eye	Bottle Rocket	Bottle rocket lit, thrown in the air, came down and struck victim in eye as it exploded.	May require additional eye surgery. Future prognosis may involve loss of sight in one eye.
5	14	Male	Other	Admitted	Eye	Bottle Rocket	Victim lit firework and threw it in the air. When it came down, it struck the victim in the eye.	Victim had eye surgery. Full recovery of sight is uncertain.
6	19	Male	Thermal Burns	Admitted	25-50% of Body	Multiple Tube Device	Firework went off immediately after being lit, resulting in 1st and 2nd degree burns to victim's chin, neck, arms and stomach.	Fully recovered.
7	33	Male	Thermal Burns	Admitted	Lower Arm	Unknown Fireworks Type	Fireworks thrown at victim burning arm and hands. Shirt caught on fire.	Hospitalized for 4 weeks. No information provided on recovery.
8	5	Male	Thermal Burns	Refused Medical Treatment	Eye	Unknown Fireworks Type	Fireworks debris or a bug in victim's eye.	Seen by MD next day and was OK.

9	2	Female	Thermal Burns	Treat and Release	Upper Leg	Sparkler	Ashes fell on her leg.	Fully recovered.
10	4	Male	Dermatitis, Conjunctivitis	Treat and Release	Eye	Novelty Device (Ground Poppers)	Thrown at victim and struck him in the eye.	Fully recovered.
11	5	Female	Thermal Burns	Treat and Release	Eye	Unknown Fireworks Type	Debris in victim's eyes from aerial fireworks causing burns.	Fully recovered.
12	6	Male	Thermal Burns	Treat and Release	Lower Arm	Butterfly firework	After being lit, firework landed on victim's shirt causing second degree burns.	Fully recovered in 3 weeks.
13	7	Male	Other	Treat and Release	Eye	Novelty Device (Ground Poppers)	One device exploded when victim was leaning over it.	Fully recovered.
14	8	Male	Contusions, Abrasions	Treat and Release	Eye	Roman Candle	Victim lit firework then dropped it when it didn't go off. When he picked it up, flames shot out from the back striking the victim in the left eye.	Fully recovered.
15	8	Female	Thermal Burns	Treat and Release	Eye	Unknown Fireworks Type	Victim diagnosed with corneal burn after attending a fireworks display where spectators were also lighting fireworks.	Fully recovered.
16	9	Male	Laceration	Treat and Release	Lower Trunk	Free standing rocket	Misaimed rocket hit victim in the stomach and then exploded.	Victim received stitches. Full recovery likely.
17	9	Male	Thermal Burns	Treat and Release	Ear	Roman Candle	6 year old brother lit a Roman Candle and pointed it at victim. Second degree burn to right ear.	Fully recovered.
18	9	Male	Thermal Burns	Treat and Release	Lower Trunk	Novelty Device	Firework thrown at victim burning his forearms and left side inside shirt.	No information available.
19	9	Female	Thermal Burns	Treat and Release	Hand	Sparkler	Exploded in victim's hand.	Full recovery expected.

20	9	Male	Contusions, Abrasions	Treat and Release	Eye	Unknown Fireworks Type	Victim buried firework, then lit it. When it didn't explode immediately, he approached the device which then exploded sending powder into the victim's eye.	Fully recovered.
21	11	Male	Burns, Not Specified	Treat and Release	Eye	Multiple Tube Device (Artillery Shell)	Shell exploded immediately when lit, injuring victim's eye.	Victim treated by ophthalmologist after hospital visit. Slight vision impairment. No information on future prognosis.
22	11	Female	Thermal Burns	Treat and Release	Upper Trunk	Sparkler	Piece of lit sparkler broke off and fell down her shirt resulting in 3rd degree burns to her chest.	Full recovery expected.
23	11	Female	Thermal Burns	Treat and Release	Lower Arm	Unknown Fireworks Type	Victim hit in chest by firework at neighborhood show. Burns to arm when sleeve caught on fire.	Despite some scarring, victim has recovered.
24	12	Female	Thermal Burns	Treat and Release	Eye	Novelty (Smoke Bomb)	Fragment flew into victim's eye.	Fully recovered.
25	13	Male	Contusions, Abrasions	Treat and Release	Eye	Roman Candle	Spark from firework hit victim's eye	Fully recovered in several days.
26	13	Male	Foreign Body	Treat and Release	Foot	Unknown Fireworks Type	Victim was extinguishing a garage fire that started from embers from fireworks. He stepped on glass from windows that had been broken in the fire.	Victim experienced smoke inhalation and a foot injury from the glass. Recovered.
27	14	Female	Other	Treat and Release	Eye	Bottle Rocket	Bottle rocket struck victim in the eye causing internal bleeding.	Full recovery expected.
28	16	Male	Thermal Burns	Treat and Release	Upper Trunk	Roman Candle	Victim hit in the back by a Roman Candle.	Fully recovered.
29	17	Male	Hemorrhage	Treat and Release	Eye	Bottle Rocket	Victim walked in the path of a bottle rocket. Struck in the eye.	Lost vision in the eye for three days. May have permanent damage to eye.
30	17	Male	Radiation Burns	Treat and Release	Eye	Multiple Tube Device (Artillery Shell)	Firework became stuck in tube, then exploded when the victim approached. Burns to victim's eyes.	No information available.

31	18	Female	Other	Treat and Release	Eye	Bottle Rocket	Struck in eye by bottle rocket.	After eye surgery long term effects unknown.
32	19	Female	Other	Treat and Release	Eye	Public Display	A firework exploded near the crowd causing sparks and debris to fly everywhere. Victim received corneal abrasion.	Full recovery expected.
33	21	Male	Thermal Burns	Treat and Release	Face	Multiple Tube Device (Artillery Shell)	Device blew up in the tube. 2nd and 3rd degree burns.	Fully recovered.
34	21	Male	Thermal Burns	Treat and Release	Hand	Sparkler	Victim lit a number of sparklers and could not give them out quickly enough. Burns to victim's hand.	Except for scarring, full recovery expected.
35	23	Male	Thermal Burns	Treat and Release	Eye	Bottle Rocket	Burned in left eye by bottle rocket that went off earlier than expected.	Fully recovered.
36	28	Male	Thermal Burns	Treat and Release	Face	Bottle Rocket	Part of the lit fuse from a bottle rocket ignited black powder, which flashed causing burns to face.	No information available.
37	34	Female	Contusions, Abrasions	Treat and Release	Eye	Public Display	Large embers from the display were falling. Victim experienced corneal abrasion.	Fully recovered.
38	41	Male	Laceration	Treat and Release	Face	Multiple Tube (Grenade Launcher)	Victim righted one launching tube when another tube launched and the device hit him in the eye.	Stitches at hospital for lacerated eyelid. Advised to see retinal specialist for trauma to the eye. Complete recovery of vision uncertain.
39	41	Male	Thermal Burns	Treat and Release	Hand	Ground Spinner	Device blew up burning victim's knee and hand.	Will have physical therapy, expect partial to full recovery within a year.
40	41	Female	Foreign Body	Treat and Release	Lower Leg	M-80 Firecracker	Misaimed firecracker hit victim in the leg.	Fully recovered.