



2005 Fireworks Annual Report

Fireworks-Related Deaths, Emergency Department-Treated Injuries, and Enforcement Activities During 2005

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This report was prepared by the CPSC staff, has 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 2005. The report also includes a summary of CPSC staff enforcement activities during that year.

We obtained information on fireworks-related deaths 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 18 and July 18, 2005. About 60 percent of the annual fireworks-related injuries for 2005 occurred during that period.

Highlights of the report are as follows:

- CPSC has reports of 4 deaths associated with fireworks during 2005. Two victims were killed in incidents involving aerial devices. In one incident an aerial shell type device exploded while the victim was holding it in a launching tube. In the second incident, a man was struck in the face by a shell which launched while he was leaning over the tube. The other two incidents involved motor vehicle fires that were started by fireworks, in both cases killing the vehicle passenger.
- Fireworks were involved in an estimated 10,800 injuries treated in U. S. hospital emergency departments during calendar year 2005 (95 percent confidence interval 8,600 – 13,100). CPSC staff estimated that there were 9,600 injuries during 2004. There has been a statistically significant upward trend in fireworks injuries since 1996.
- An estimated 6,500 fireworks-related injuries were treated in U. S. hospital emergency departments during the one month special study period between June 18, 2005 and July 18, 2005 (95 percent confidence interval 4,900 – 8,100). CPSC staff estimated that there were 6,600 injuries during the 2004 special study period.

Results from the special study include the following:

- More than twice 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 45 percent of the estimated injuries. Children and young adults under 20 had 55 percent of the estimated injuries.
- Among different types of fireworks, firecrackers were associated with the greatest number of estimated injuries at 1,700. Rockets and sparklers were

associated with 1,100 injuries each. Sparklers accounted for almost half the injuries to children less than 5 years of age.

- We estimated that there were a small number of emergency department-treated injuries (100) at public fireworks displays.
- The parts of the body most often injured were hands (estimated 2,000 injuries), eyes (1,600 injuries) and the head, face and ear (1,300 injuries).
- More than half of the injuries were burns. Burns were the most common injury to all parts of the body except the eyes, where contusions, lacerations, and foreign bodies in the eye occurred more frequently.
- Most patients were treated at the emergency department and then released. An estimated 5 percent of patients were treated and transferred to another hospital, admitted or held for observation.

CPSC staff conducted telephone follow-up investigations of some fireworks-related injuries reported at NEISS hospital emergency departments during the special study period. Most cases were selected for follow-up because they involved potentially serious injuries and/or hospital admissions. Telephone interviews were completed in 27 cases.

A review of data from telephone follow-up investigations showed that the typical causes of injuries were (1) fireworks exploding earlier or later than expected, (2) errant flight paths of aerial fireworks, and (3) debris or sparks from fireworks devices. According to the investigations, most victims already had recovered from their injuries or were expected to recover completely. Several victims had surgery or skin grafts.

During 2005, CPSC's Office of Compliance and Field Operations 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:

- With assistance from Customs, staff from CPSC selectively sampled and tested 296 shipments of fireworks in fiscal year 2005 to determine if they were in compliance with CPSC regulations. Of those, approximately 41 percent were found to contain violative fireworks. These shipments accounted for more than 1.3 million units with violations serious enough to warrant seizure or other actions by Customs.
- CPSC staff also participated in several multi-state criminal investigations with the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATFE), the Department of Justice and state and local law enforcement agencies. Staff provided legal, field, and technical support in cases involving the distribution

of illegal explosive devices and the illegal diversion of professional fireworks to consumers.

Introduction

This report describes injuries and deaths associated with fireworks during 2005. The report also describes CPSC staff enforcement activities for 2005. Reports for earlier years in this series can be found on the internet at www.cpsc.gov/library/data.html.

The report is organized into seven sections. Following the discussion of data and methods in this section, the next section describes fireworks-related deaths. Section 3 provides a national annual estimate of fireworks-related emergency department-treated injuries for 2005 and compares that estimate with estimates for previous years. Section 4 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 5 summarizes the in-depth telephone investigations of fireworks injuries. Section 6 describes enforcement activities by CPSC's Office of Compliance and Field Operations. The main body of the report then concludes with a summary of the findings. Appendix A presents a table on the relationship between fireworks-related injuries and estimated fireworks consumption between 1996 and 2005. Appendix B contains more detail on the completed telephone investigations.

Sources of Information

Information on non-work-related fireworks deaths occurring during 2005 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 these investigations was 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 for 2005 fireworks-related deaths at the time this report was prepared. 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. This includes the victim's age and sex, where the injury occurred, the

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 interval estimation is documented in Schroeder (2000). SAS is a product of the SAS Institute, Inc. Cary, NC.

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

The NEISS record specifies one or two consumer products that are associated with the injury. Products are identified without drawing conclusions as to whether the injury was caused by the products, or, at the other extreme, if the product was present but incidental to the injury. In most cases there is not sufficient information to allow these conclusions to be made. To obtain additional information, especially about the role played by the consumer product, analysts may request an in-depth investigation (IDI) where the victim is telephoned or visited. Analysts may also conduct a special study where additional product or case information is added to the NEISS record for some injuries during a fixed time period.

Every year, during the month around July 4th (in 2005, June 18 to July 18, 2005) CPSC staff conducts a special study of fireworks injuries. Staff efforts focus on fireworks during this period because historically about two-thirds of the annual injuries occur then. During this period, hospital emergency department staff show pictures of different types of fireworks to patients and ask them to identify the type of fireworks device associated with their injury.

After reading the case records, CPSC staff may then assign cases for telephone investigations. Most 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. Of the cases selected, about one-third of the telephone investigations were completed.

In a telephone investigation, information is requested directly from the victim or the victim's parent about the type of fireworks involved, where it was obtained, how the injury occurred, the medical treatment and prognosis. When the fireworks device reported is different from that reported in the emergency department record, the device reported in the telephone investigation is used.

As a result of this process, there are three different levels of information that may be available about a fireworks-related injury case. For the cases that occur outside the July 4th special study period, the NEISS record is almost always the only information. During the special study period, the NEISS record contains additional information on the type of fireworks and the incident scenario. In addition, there is a subset of the special study cases for which we have telephone investigations. 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 cases for the entire year, where fireworks were specified as one of the consumer products involved. For cases outside the special study period, as noted above, there is usually no information on the fireworks type and limited information on the incident scenario.

Consequently there is not enough information to determine the role played by the fireworks in the incident. This means that the annual injury estimate includes a small number of cases where the fireworks device was not lit or no attempt was made to light the device. Calculating the annual estimates without removing these cases makes the estimates comparable with previous years.²

- Detailed analyses of injury patterns. The tables in the report that describe fireworks type, body part injured, diagnosis, age and sex of injured people and other such information are based on the special study period only. Fireworks types are taken from the telephone investigation or the NEISS comment field, when there was no telephone investigation. When computing estimates for the special study period, we remove cases where the fireworks device was not lit or no attempt was made to light the device.
- Information from the telephone investigations. Individual case injury descriptions and medical prognosis information from the telephone investigations are listed in Appendix B. These listings also exclude cases where the fireworks device was not lit or the victim was not attempting to light the device. These cases represent a sample of the most serious fireworks-related injuries.

Statistical Methods

Injuries reported by NEISS sample hospitals were multiplied by the associated sampling weights to develop an estimate of total U. S. emergency department-treated fireworks-related injuries for the year and for the special study month around July 4th. Confidence intervals were estimated and other statistics were calculated using computer programs that were written to take into account the sampling design.³ 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 were made using the sampling weights. To avoid cluttering the tables, we do not include confidence intervals 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

² The only exception was in 2003 where 9 cases representing an estimated 150 emergency department treated injuries were excluded from the annual injury estimates. These cases resulted from the nightclub fire in West Warwick, Rhode Island, that also caused 100 deaths. For details see Greene and Joholske (2004).

³ See Schroeder (2000).

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 fewer than 50 injuries are shown with an asterisk (*). Totals may not add due to rounding.

Fireworks-Related Deaths for 2005

CPSC has reports of 4 fireworks-related deaths that occurred in 2005. Brief descriptions of the incidents are as follows:

- Two Florida males, one 17 and the other 18, were riding in a truck that had several boxes of fireworks in the cab. It is not known exactly how the fireworks ignited, but according to witnesses, the cab of the truck filled up with smoke. The 17-year-old driver then lost control of the truck and ran into a light pole. The truck then caught on fire. The 17-year-old suffered burns on his hands and arms but has since recovered. The 18-year-old passenger died at the scene.
- A Virginia male and a Virginia female, both 18 years old, were riding in a car. The male passenger had a bag of fireworks either on his lap or on the floor between his legs. It is not known how the fireworks ignited. The fire was confined to the interior of the car. Both occupants suffered second and third degree burns. The male died 14 days after the incident.
- A 37-year-old Colorado man was standing on his apartment balcony with a friend holding a launching tube that was loaded with an artillery shell type firework. After the fuse was lit, the firework exploded but may not have launched from the tube. After the explosion, the victim dropped to the balcony. According to police there was a bruise on the victim's chest that matched the base on the launcher tube. The victim died from a torn aorta.
- A 36-year-old California man placed a professional display aerial shell in a launching tube. He was kneeling behind the launching tube to light the shell. According to witnesses, the fuse burned very quickly. The victim was still over the tube when the shell launched. The shell struck him in the face causing the victim to fall backward to the ground. The victim had inhalation burns to his lungs and throat and had surgery the next day for a major head injury. He died in the hospital several days later.

We reported on 8 fireworks-related deaths in 2004, 6 fireworks-related deaths in 2003, 4 deaths in 2002 and 4 in 2001. According to the Centers for Disease Control and

Prevention, there were 89 fireworks-related deaths (an average of 6 deaths annually) between 1988 and 2002.⁴

National Injury Estimates for 2005

Table 1 and Figure 1 present the estimated number of fireworks-related injuries for 1991-2005 that were treated in U. S. hospital emergency departments.

Table 1
Estimated Fireworks-Related Injuries 1991-2005

Year	Estimated Injuries	Injuries per 100,000 people
2005	10,800	3.6
2004	9,600	3.3
2003	9,300	3.2
2002	8,800	3.1
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

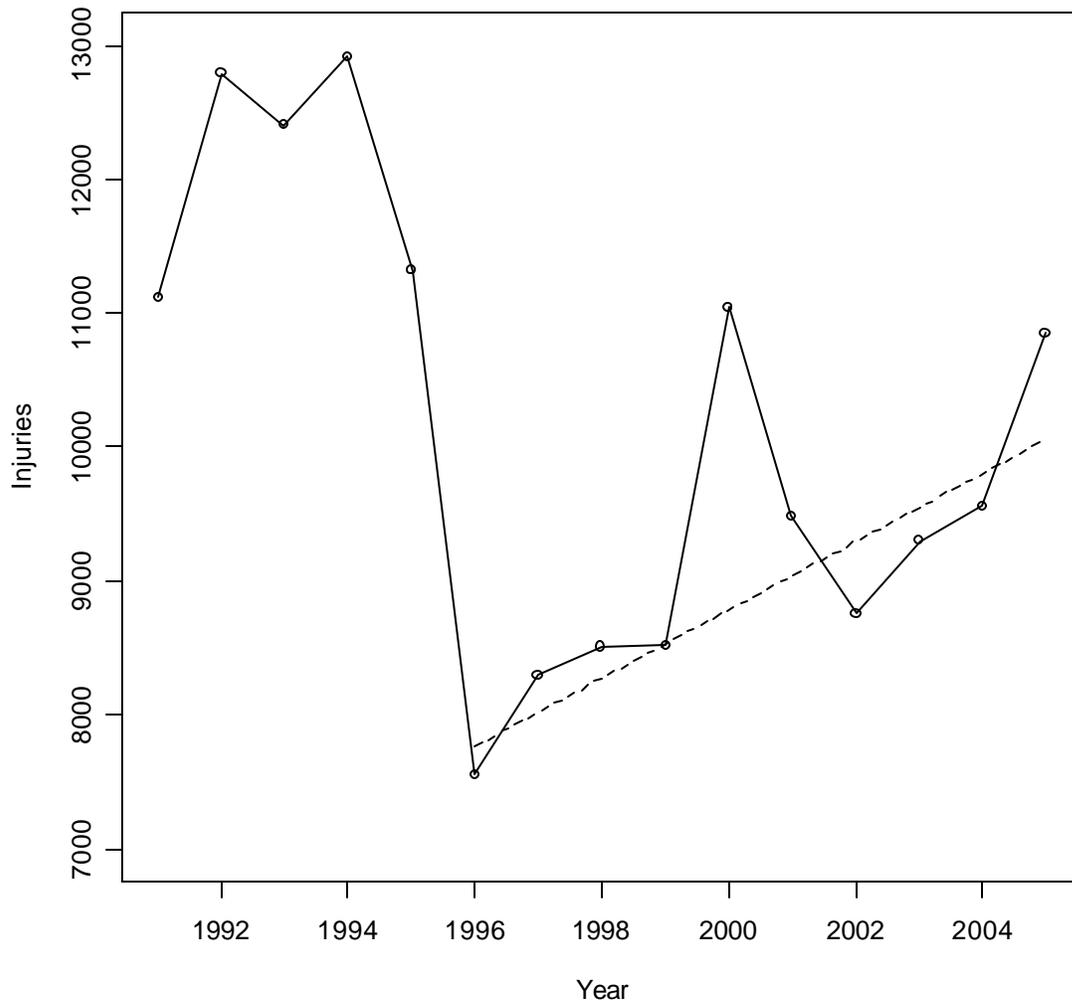
Source: NEISS, U. S. Consumer Product Safety Commission/EPHA. The estimate for 2003 excludes an estimated 150 emergency department-treated injuries following the nightclub fire in West Warwick, Rhode Island. Estimates for 1991-1996 were revised to adjust for the new sampling frame and do not match values published in reports for 1997 or earlier. U. S. population estimates from 1991-1999 were obtained from the U. S. Bureau of the Census at <http://www.census.gov/popest/archives/1990s/nat-total.txt> and population projections for 2000-2005 from <http://www.census.gov/popest/states/NST-ann-est.html>.

In calendar 2005, there were an estimated 10,800 fireworks-related injuries (95 percent confidence interval 8,600 – 13,100). Total emergency department-treated injuries and per capita injuries were larger than 2004, but the difference is not statistically significant.

⁴ Data from CDC for ICD 9 code 923.0 (1988-1998) and ICD 10 code W39 (1999-2002). See <http://wonder.cdc.gov/mortsql.html>. Different from CPSC statistics, the CDC statistics include both work-related and non work-related fireworks deaths.

Figure 1 below shows that the greatest annual estimated injuries were between the years 1991 and 1995, followed by lower numbers of injuries between 1996 and 1999. Injuries rose to 11,000 in the millennium year (2000) and then decreased to 9,500 in 2001. From the lowest annual estimate of 7,300 in 1996 to the 2005 estimate of 10,800, there has been a statistically significant upward trend.⁵ The trend line from 1996 to 2005 is shown in the figure as a dashed line.

Figure 1. Estimated Fireworks-Related Injuries 1991-2005



Appendix A presents a table showing estimated fireworks-related injuries and estimated fireworks consumption between 1996 and 2005.

⁵ The regression line from 1996 to 2005 has a significant positive slope of 255.26 injuries per year (standard error = 109.23, $t=2.34$ at 8 *df*, $p = 0.0476$, two tails). The regression procedure incorporates the sampling design. For details see Schroeder (2000) and Marker et al (1999).

Injury Estimates for the 2005 Special Study

The injury analysis in this section presents the results of the 2005 special study of fireworks-related injuries that were treated between June 18 and July 18, 2005. During this period, there were an estimated 6,500 fireworks-related injuries (95% confidence interval 4,900 – 8,100), accounting for about 60 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 Estimated Injuries

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 18-July 18, 2005

Fireworks Device Type	Estimated Injuries	Percent
Total	6,500	100
All Firecrackers	1,700	26
Small	900	15
Illegal	*	*
Unspecified	700	11
All Rockets	1,100	17
Bottle Rockets	900	14
Other Rockets	200	3
All Other Devices	2,200	34
Sparklers	1,100	17
Fountains	200	2
Novelties	100	1
Multiple Tube	200	3
Reloadable	400	6
Roman Candles	300	5
Homemade/Altered	100	1
Public Display	100	1
Unspecified	1,400	21

Source: NEISS, U. S. Consumer Product Safety Commission/EPHA. Based on 211 NEISS emergency department reported injuries between June 18, 2005 and July 18, 2005 and supplemented by 27 In-Depth Investigations. Fireworks types are reported by victims to emergency department staff or reported to telephone investigators. Subtotals include categories listed directly below. Estimates of fewer than 50 injuries are shown with an asterisk (*). Estimates rounded to nearest 100 injuries. Percentages computed on unrounded estimated injuries. Totals may not add due to rounding.

As shown in Table 2, firecrackers accounted for an estimated 1,700 emergency department-treated injuries, which was 26 percent of the total fireworks-related injuries. Most of these were small firecrackers. The estimate for illegal firecracker-related injuries was less than 50, however, some of the unspecified firecracker-related injuries and some of the unspecified injuries may have involved illegal firecrackers. After firecrackers, sparklers accounted for about 1,100 injuries, 17 percent of the total. Rockets also accounted for about 1,100 injuries, 17 percent of the total. Almost all the rocket injuries

involved bottle rockets. In most years, firecrackers, sparklers and bottle rockets have been associated with about equal proportions of the injuries.

Table 2 shows that victims knew that the device was a firecracker but did not know if it was a small or large firecracker for about 700 injuries (11 percent of total estimated injuries). These are listed in Table 2 as “Firecrackers: Unspecified.” The fireworks device was unreported for another 1,400 injuries (21 percent), listed on the last row of the table as “Unspecified.” This occurs when the victim does not know the type of device because the victim did not purchase or light the firework. Estimates from previous years have shown a similar number of injuries where fireworks types were unknown.

There were a small number of injuries associated with public display fireworks and with homemade or altered devices. This is also in keeping with previous years.

Age and Sex of Injured Persons

Children under 5 experienced about 900 injuries (14 percent of all fireworks-related injuries) as shown in Table 3. The injury rate was 4.4 injuries per 100,000 for these children. Children in the 5 to 14 age group accounted for 2,000 injuries (30 percent). Their rate was 5.0 injuries per 100,000. This was composed of 3.6 injuries per 100,000 for children 5 to 9 and 6.2 injuries per 100,000 for children 10-14. Together, children under 15 accounted for about 45 percent of the fireworks injuries. Children and young adults under 20 had 55 percent of the injuries.

The age group 15 to 24 had about 28 percent of the injuries (1,800) slightly more than the 25 to 44 age group with 24 percent (1,600 injuries). Young adults 15 to 24 years old experienced 4.3 injuries per 100,000 people. The injury rate declined for older people; for example people between 25 and 44 had 1.9 injuries per 100,000 and those 45 to 64 had 0.3 injuries per 100,000.

Males had 4,500 injuries, representing about 70 percent of the total. This pattern and the concentration of injuries among people under 25 have been typical of fireworks-related injuries for previous years.

Table 3
 Estimated Fireworks-Related Injuries
 By Age and Sex
 June 18-July 18, 2005

Age Group	Total	Male	Female	Per 100,000 People
Total	6,500	4,500	2,000	2.2
0 to 4	900	500	400	4.4
5 to 14	2,000	1,400	500	5.0
5 to 9	700	500	200	3.6
10 to 14	1,300	900	300	6.2
15 to 24	1,800	1,400	400	4.3
15 to 19	700	500	200	3.3
20 to 24	1,100	900	200	5.3
25 to 44	1,600	1,100	500	1.9
45 to 64	200	100	100	0.3

Sources NEISS, U. S. Consumer Product Safety Commission/EPHA , U. S. population from <http://www.census.gov/ipc/www/usinterimproj/usproj2000-2050.xls>; file description in <http://www.census.gov/ipc/www/usinterimproj/usproj2000-2050.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. More than half the estimated 900 injuries to children under 5 were from sparklers. For children ages 5-14, firecrackers accounted for the largest number of estimated injuries at 700.

Table 4
 Estimated Fireworks-Related Injuries
 By Device Type and Age Group
 June 18-July 18, 2005

Fireworks Type	Total	0-4	5-14	15-24	25-44	45+
Total	6,500	900	2,000	1,800	1,600	200
All Firecrackers	1,700	*	700	500	500	*
Small	900	*	400	300	300	*
Illegal	*	*	*	*	*	*
Unspecified	700	*	300	200	200	*
All Rockets	1,100	200	300	300	200	*
Bottle Rockets	900	200	300	300	100	*
Other Rockets	200	*	*	*	200	*
Other Devices	2,200	600	500	500	500	100
Sparklers	1,100	500	200	200	200	100
Fountains	200	*	100	*	100	*
Novelties	100	*	100	*	*	*
Multiple Tube	200	*	0	100	100	*
Reloadable	400	100	0	200	100	*
Roman Candles	300	*	100	100	100	*
Homemade/Altered	100	*	100	*	*	*
Public Display	100	*	100	*	*	*
Unspecified	1,400	100	400	500	400	100

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

Females had relatively more injuries associated with sparklers (25 percent) than males (13 percent), while males had relatively more injuries associated with bottle rockets (16 percent) than females (8 percent). Another 27 percent of the injuries among males were associated with firecrackers while 22 percent of the injuries to females were associated with firecrackers. About 23 percent of males and 18 percent of females did not know the type of fireworks that was associated with their injury.

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 2,000 injuries, accounted for 31 percent of the total injuries, followed by eye injuries at 1,600, and head/face/ear injuries at 1,300.

Burns, with 3,500 estimated injuries (55 percent), were the most frequent injury diagnosis. Contusions and lacerations, at 1,900 injuries and 30 percent of the total, were the second most frequent. Hand and finger injuries, leg injuries and injuries to the trunk were for the most part burn injuries, while about half the injuries to the head and face were burns. Most eye injuries were contusions and lacerations, and other diagnoses that included foreign bodies in the eye.

Table 5
Estimated Fireworks-Related Injuries
By Body Part and Diagnosis
June 18-July 18, 2005

Body Part	Total	Burns	Contusions Lacerations	Fractures Sprains	Other Diagnoses
Total	6,500	3,500	1,900	100	1,000
Arm	200	200	*	*	*
Eye	1,600	*	1,000	*	600
Hand/Finger	2,000	1,400	500	*	100
Head/Face/Ear	1,300	600	300	*	300
Leg	1,000	800	100	*	*
Trunk	500	500	*	*	*

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 18-July 18, 2005

Fireworks Type	Total	Arm	Eye	Head/Face	Hands/Fingers	Leg	Trunk
Total	6,500	200	1,600	1,300	2,000	1,000	500
All Firecrackers	1,700	*	300	400	700	100	200
Small	900	*	200	200	300	100	100
Illegal	*	*	*	*	*	*	*
Size Unk	700	*	100	200	300	*	100
All Rockets	1,100	*	300	300	200	200	*
Bottle Rockets	900	*	300	200	200	200	0
Other Rockets	200	*	*	100	*	100	0
Other Devices	2,200	*	400	300	700	500	200
Sparklers	1,100	*	200	*	400	300	100
Fountains	200	*	*	*	100	100	*
Novelties	100	*	100	*	*	0	*
Multiple Tube	200	*	*	100	*	0	100
Reloadable	400	*	*	200	100	0	*
Roman Candles	300	*	100	*	*	100	*
Homemade/Altered	100	*	*	100	*	*	*
Public Display	100	*	*	*	*	*	*
Unspecified	1,400	100	500	200	400	100	100

Source: NEISS, U. S. Consumer Product Safety Commission/EPHA. See notes for Table 2 and Table 5.
Totals may not add due to rounding.

More than a third of sparkler injuries involved the hands and more than one-quarter involved the legs; most sparkler injuries involved burns. Firecracker injuries involved hands and fingers; like sparklers, most also involved burns. Injuries with rockets involved almost all body regions and included contusions and lacerations as well as burns.

Hospital Treatment

Although most of the fireworks-related injuries were characterized as “treat and release,” an estimated 5 percent (300 estimated emergency department-treated injury cases) were treated and transferred to another hospital, admitted or held for observation. This is about the same as consumer products in general.

Telephone Investigations of Fireworks-Related Injuries

CPSC staff assigned telephone investigations of some fireworks injuries that occurred during the one month special study period surrounding the July 4 holiday (June 18 – July 18). Completed telephone investigations provide more detail about the incident and the injury than the emergency department record in NEISS. In the telephone questionnaire, respondents were asked about the hazard patterns associated with the injury, the medical care following the emergency department treatment and about the long term effects, if any, of the injury. Also, respondents were asked about the source of the fireworks that caused the injury.

Most of the cases selected for telephone investigations were selected because the injuries were among the most severe that were reported by the NEISS hospitals and we wanted to know about the scenarios where severe injuries occurred.

From the 211 emergency department-treated fireworks-related injuries during the special study period, 80 cases were assigned for investigations. Table 7 below shows the disposition of these cases.

Table 7
Final Status for Telephone Investigations

Final Case Status	Number of Cases	Percent
Total Assigned	80	100
Completed	27	34
Failed to Reach Patient	8	10
Investigation Lost	1	1
Questionnaire Mailed but not Returned	9	11
No Patient ID Received from Hospital	28	35
Patient Refused to Cooperate	7	9

Of the 80 cases, 27 investigations were completed (34 percent). In 8 cases, the telephone interviewers were unable to reach a knowledgeable party. In one case, the

paper investigation was accidentally lost. In 9 cases, there were problems contacting the victim by telephone, so an attempt was made to contact the victim by mail instead. There were no responses to the mail inquiries. In 28 cases (35 percent), the NEISS hospital refused or was unable to provide victim identification. Finally in 7 cases (9 percent), a knowledgeable party was reached but that person refused to be interviewed.

Because these cases were selected on the basis of severity and because only about one-third of the assignments resulted in responses, the cases cannot be considered as representative of typical fireworks injuries or even representative of severe fireworks injuries.

Summaries of the completed investigations are found in Appendix B. The cases are organized in order of emergency department disposition representing decreasing injury severity as follows: Admit, Treat and Transfer, Hold for Observation, and Treat and Release. Within disposition, cases are organized by the age of the victim.

Summary Statistics

Of the 27 cases, 19 cases (70 percent) were males and 8 cases (30 percent) were females. Fifteen cases (55 percent) were 15 or younger and the oldest victim was 40. One case involved admission to the hospital, four were treat and transfer to another hospital, one was hold for observation and the remaining cases were treat and release dispositions.

Hazard Patterns

Seven cases involved aerial fireworks on errant flight paths. A 5-month-old male was struck in the forehead by an aerial shell that was launched sideways in case 7.⁶ He was treated at the emergency room and released. In case 15, the brother of the 11-year-old male victim lit a fountain firework that ignited other fountain fireworks. One went into the victim's tennis shoe resulting in burns to his foot. Case 16 involved a 12-year-old male victim struck in the eye by a rocket that had been launched by one of his friends. The victim had eye surgery and has since recovered. In case 20 after an aerial shell had been lit, it fell to the ground instead of going up. The shell then exploded on the ground resulting in second degree burns to the 20-year-old male victim. In case 21, a Roman candle bounced off a building and then hit the 20-year-old victim in the arm, resulting in second degree burns. The 28-year-old female victim in case 24 reported a ringing sensation in her ear after a rocket launched sideways and flew close to her ear. Finally, neighborhood children were lighting fireworks near the 40-year-old victim's home in case 27. The victim was struck in the eye by a bottle rocket. After the emergency department treatment for a corneal abrasion, she had further treatment. It is not known if she will fully recover her vision.

Three cases involved aerial fireworks that tipped over when they were launched. In case 8, a 4-year-old female was hit in the face by an aerial shell that tipped over and

⁶ Case numbers are the order of the cases shown in Appendix B.

traveled horizontally instead of going into the air. She had serious burns on her face, but recovered shortly after the medical treatment. In case 9, the 4-year-old male victim's father was lighting multiple aerial shell type devices. One tipped over, broke into pieces and then exploded. One piece hit the victim on his thigh resulting in first degree burns. A similar case, case 26, involved injuries to a 38-year-old female. The first of three rockets on a base launched, but the base tipped over resulting in the other rockets launching horizontally. One hit the victim in the legs, resulting in second and third degree burns.

In seven other cases, the victims were injured when the fireworks exploded either earlier or later than expected. In case 1, the 14-year-old male victim was holding a bottle rocket in each hand. When he lit the rocket in his right hand, the other rocket also ignited resulting in third degree burns to his hand. The victim was admitted to the hospital. A mortar shell exploded in case 4, when the 22-year-old male victim picked it up. He had lit it but did not believe that it had been lit successfully. He was transferred to another hospital for treatment of burns including skin grafts. In case 6, a 21-year-old female received second degree burns on her right ankle after the Roman candle that she was holding exploded immediately when lit. When an 8-year-old male, in case 13, picked up a ground popper that had been thrown on the ground, it exploded resulting in particles lodged in his eye. In case 17, a 12-year-old male found a fountain type fireworks in the woods. He lit it and it exploded immediately causing first degree burns to his face. Case 23 involved a 25-year-old female who lit an aerial shell that she was holding in her hand, rather than using a launching tube. The shell immediately exploded, resulting in first and second degree burns. Finally, in case 25, a 29-year-old male was tapping the firework while holding it in his hand. The firework then exploded resulting in a fractured wrist.

One case involved both tip over and an early explosion. In case 5, the 39-year-old male victim lit the first of three rockets. When the rocket launched, the base tipped over. As the victim leaned down to pick up the base, the second rocket launched hitting him in the throat. The victim received 30 stitches in the throat and had burns to his face and left eye.

Four cases resulted in injuries from fireworks debris or sparks. In case 10, a 5-year-old male was injured while watching fireworks launched by his neighbor. Some debris from the fireworks got in his eye. In case 11, people were lighting fountain type fireworks when a spark flew about 25 yards into another box of fireworks. The box exploded showering sparks on the 5-year-old male victim causing burns to his arm and chest. In case 12, somebody threw a ground popper on a sawdust-covered floor. The explosion threw up some sawdust which got into the 7-year-old female victim's eye. In case 19, the 19-year-old male victim and a friend were lighting bottle rockets. The victim grabbed a lit rocket from his friend. Sparks from the rocket resulted in second degree burns to the victim's right arm.

In four cases, the injuries were associated with obvious misuses of the product. The 6-year-old male victim in case 2 was trying to break open a firecracker. The device exploded when he hit it with a rock resulting in burns to both arms. The victim was

transferred to another hospital for further treatment. In case 3, a 12-year-old male victim and a friend unwrapped an aerial shell type firework. They emptied the powder on the ground. Then they lit the powder, which flashed and burned the victim's face. In case 14, the 11-year-old victim and his friends put drain cleaner in a plastic bottle, then put a small firecracker on top of the bottle. The victim then lit the firecracker, which exploded, burning her fingers. Finally, in case 18, the 15-year-old male victim was carrying some firecrackers in his pants pocket. A friend threw a lit bottle rocket into the pocket where it ignited the firecrackers. The victim had second and third degree burns on his leg.

Finally, one case had a unique hazard pattern. In case 22, the 20-year-old male victim was cleaning debris that had been left by children who were setting off fireworks. He picked up a plastic bottle that had a firework in it. The firework then exploded resulting in lacerations to the victim's hand.

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 more serious injuries were as follows:

- Case 4. A 22-year-old male was seriously burned when the mortar shell that he thought had not been lit then exploded. He was in the hospital for 6 days, received skin grafts and physical therapy. The victim reported that he expected to recover completely in a year.
- Case 5. A 39-year-old male was struck in the throat by a rocket that was launched after the base tipped over. He received 30 stitches to his throat as well as treatment for burns to the face and throat. The victim said he was uncertain if he will recover completely from this injury.
- Case 16. A 12-year-old male had eye surgery after being struck in the eye by a rocket. The victim expected to recover full vision.
- Case 25. A 29-year-old male had a fractured wrist after the aerial shell he was holding in his hand exploded. After medical treatments, the victim recovered.
- Case 27. A 40-year-old female was treated for a corneal abrasion after a bottle rocket hit her in the eye. She reported to the interviewer that she was unsure if her vision would be completely normal.

Where Fireworks Were Obtained

In the telephone interviews, victims were asked where the fireworks associated with their injuries were obtained. Of the 27 respondents, 13 knew the sources of the devices. Seven incidents involved fireworks that were sold from a stand, that is a

temporary place to sell fireworks, usually only in operation during the period around July 4. Six incidents involved fireworks purchased at stores. No one reported purchasing fireworks by mail order or over the internet.

Enforcement Activities

CPSC's Office of Compliance and Field Operations enforces regulations for fireworks devices that are sold to consumers under provisions of the Federal Hazardous Substances Act. CPSC staff'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 2005 to keep unsafe fireworks from consumers.

CPSC staff continues to work closely with the Bureau of Customs and Border Protection (Customs) to conduct surveillance on imported shipments of fireworks. Fireworks were selected for testing based on their past violation history, the type of device, and whether the item had been sampled previously. With assistance from Customs, staff from CPSC selectively sampled and tested 296 shipments of fireworks in fiscal year 2005 to determine if they were in compliance with CPSC regulations. Of those, approximately 41% were found to contain violative fireworks. These shipments accounted for more than 1.3 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 and quartersticks.

CPSC staff also participated in several multi-state criminal investigations. Staff worked with other Federal agencies, including the Bureau of Alcohol, Tobacco, Firearms and Explosives, 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 cases involving the distribution of illegal explosive devices and the illegal diversion of professional fireworks to consumers.

Summary

In 2005, reported deaths were about the same as previous years. There were 4 reported deaths in 2005, 8 in 2004, 6 in 2003, and 4 in 2002 and 2001. Estimated emergency department-treated injuries were greater in 2005 than 2004, continuing the gradual upward trend from 9,500 estimated injuries in 2001, 8,800 in 2002, 9,300 in 2003, 9,600 in 2004 and 10,800 in 2005. The upward trend from 1996 to 2005 is statistically significant.

During the one-month special study period of June 18-July 18, 2005 there were an estimated 6,500 emergency department-treated injuries, slightly less than the 2004

estimate of 6,600 and the 2003 estimate of 6,800. Consistent with previous years, in 2005 children under 15 experienced almost half the injuries and males were estimated to have twice as many emergency-department treated injuries as females.

Also consistent with previous years, more than half the injuries in 2005 involved burns. Burns were the most common injury to all parts of the body except the eyes, where contusions, lacerations, and foreign bodies occurred more frequently. The parts of the body most often injured were hands (estimated 2,000 injuries), eyes (1,600 injuries) and the head, face and ear (1,300 injuries). Most injuries involved treat and release dispositions. An estimated 5 percent were treated and transferred to another hospital, admitted or held for observation.

Among different types of fireworks, firecrackers were associated with the greatest number of estimated injuries at 1,700. Rockets and sparklers were associated with 1,100 injuries each. Sparklers accounted for almost half the injuries to children under 5.

A review of data from telephone follow-up investigations showed that the typical causes of injuries were (1) fireworks exploding earlier or later than expected, (2) errant flight paths of aerial fireworks, and (3) debris or sparks from fireworks devices. According to the investigations, most victims already had recovered from their injuries or were expected to recover completely. The most serious reported medical treatments included one victim with skin grafts, one with eye surgery, one receiving stitches and one treated for a fracture.

Finally, in 2005, CPSC staff's enforcement activities remained at a high level. CPSC's Office of Compliance and Field Operations worked with U.S. Customs to sample imported fireworks and to seize illegal shipments. Staff provided legal, field, and technical support in cases involving the distribution of illegal explosive devices and the illegal diversion of professional fireworks to consumers.

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Appendix A Fireworks-Related Injuries and Consumption

Table A-1 below shows that during the last 10 years, the amount of fireworks (in weight) available in the U.S. has more than doubled. Except for the millennium year of 2000, the number of estimated emergency department treated injuries has fluctuated between 7,300 and 10,800 with increases in 2003, 2004 and 2005. During this same period, as shown in the table below, the number of injuries per 100,000 pounds of fireworks consumed has declined steadily between 2000 and 2005 from 6.9 injuries per 100,000 pounds to 3.8 injuries per 100,000 pounds. This is a decrease of about 45 percent.

The estimate of 3.8 injuries per 100,000 pounds of fireworks in 2005 is the same as that for 2004.

Table A-1
Estimated Fireworks-Related Injuries and
Estimated Fireworks Consumed 1996-2005

Year	Estimated Injuries	Estimated Fireworks Consumption (millions of pounds)	Injuries Per 100,000 Pounds
2005	10,800	283.2	3.8
2004	9,600	253.4	3.8
2003	9,300	236.5	3.9
2002	8,800	189.8	4.6
2001	9,500	169.6	5.6
2000	11,000	159.0	6.9
1999	8,500	159.2	5.3
1998	8,500	134.9	6.3
1997	8,300	114.7	7.2
1996	7,300	120.3	6.1

Source: Injuries from NEISS, U. S. Consumer Product Safety Commission/EPHA. See Table 1 for further details. Estimated fireworks consumption derived from data from the U. S. International Trade Commission and the U. S. Department of Commerce and provided by the CPSC Directorate for Economic Analysis. Estimated fireworks consumption includes consumer and display fireworks. Consumption is calculated as reported imports less exports plus domestic shipments. This assumes that all fireworks imported into the U. S. and manufactured in the U. S. during the year are consumed during the same year. Domestic shipments are estimated as 11 percent of imports. The coding system for fireworks imports was different before 1996 making it impossible to obtain consistent estimates for imports before 1996.

This table should be interpreted with caution. First, the logical unit of exposure is number of devices consumed instead of the weight of the fireworks, because a person is exposed to injury when a device is consumed (i.e., lit). Injuries per 100,000 fireworks devices consumed might be more meaningful. Weight is a proxy for the number of

fireworks devices consumed, but it may not be a good proxy. Weight over-represents heavy devices and under-represents light devices. There is no reason to assume that a heavy device is inherently more dangerous than a light device because the weight of the device includes other things than just the amount of explosive material.

Second, we do not have data to break down consumption statistics in Table A-1 by fireworks device types. As shown above in Table 2, different fireworks devices have different numbers of injuries. As a result, we don't know if the increase in consumption in recent years is across the board, greater in the larger display shells that historically have produced few injuries, or in firecrackers and sparklers or some mixture of these devices.

Appendix B Completed Telephone Investigations

Case	Age	Sex	Diagnosis	Disposition	Body Part	Fireworks Type	Incident Description	Medical Treatment and Prognosis
1	14	Male	Thermal Burns	Admit	Hand	Bottle Rocket	Victim was holding a bottle rocket in each hand. When he lit the rocket in his right hand, the rocket in his left hand also ignited.	Third degree burns to victim's hand. Medical follow-up and full recovery in a month.
2	6	Male	Thermal Burns	Treat and Transfer	Lower Arm	Firecracker	The victim was trying to break open a firecracker. The firecracker exploded when he hit it with a rock.	Burns on both arms. Some additional medical treatment required. Victim fully recovered 2 weeks after the injury.
3	12	Male	Thermal Burns	Treat and Transfer	Face	Aerial Shell	Victim and his friend unwrapped a firework and put the powder on the ground. They lit the powder, which flashed and burned the victim's face.	Victim had 2nd degree burns on his face, right arm and shin. He had additional medical treatment. Unknown how long until full recovery.
4	22	Male	Thermal Burns	Treat and Transfer	25-50% of Body	Aerial Shell	Mortar shell exploded when the victim picked it up, not believing that it had been lit successfully.	Hospitalized for 6 days for treatment of burns including skin grafts. After physical therapy and other treatment, victim expects a full recovery in a year.
5	39	Male	Thermal Burns	Treat and Transfer	25-50% of Body	Aerial Shell	Victim lit the first of three rockets that were to be launched from a base. The base tipped over when the first rocket went off. When the victim leaned over to pick up the base, the second rocket fired hitting him in the throat.	Victim had 30 stitches to his throat, burns on his face, throat and left eye. Continued medical treatment after emergency department visit. Full recovery uncertain.
6	21	Female	Thermal Burns	Hold for Observation	Ankle	Roman Candle	Victim lit a roman candle that immediately exploded.	Second degree burn on her right ankle. After medical treatment, full recovery uncertain.
7	5 months	Male	Contusions, Abrasions	Treat and Release	Face	Aerial Shell	Aerial shell launched sideways hitting the victim in the forehead.	Victim was treated at the emergency room and released. No additional information provided.

8	4	Female	Thermal Burns	Treat and Release	Face	Aerial Shell	Neighbor lit a shell that tipped over and traveled horizontally instead of going up into the air. The shell exploded near the victim.	Victim had 1st, 2nd and 3rd degree burns on her face, neck, ear and temple. Had some further medical treatment. Fully recovered two weeks after the injury.
9	4	Male	Thermal Burns	Treat and Release	Upper Leg	Aerial Shell	Victim's father was lighting multiple aerial shell type fireworks, when one tipped over, broke into pieces and exploded. A piece hit the victim.	Victim had 1st degree burns on his thigh. He had some medical follow up. Full recovery two weeks after the injury.
10	5	Male	Foreign Body	Treat and Release	Eye	Unknown, probably Aerial Shells	Victim standing in front yard watching fireworks launched by neighbor. Some debris from fireworks got in the victim's eye.	Victim's eye flushed at emergency room. Fully recovered.
11	5	Male	Thermal Burns	Treat and Release	Upper Trunk	Fountain	People were lighting fireworks when a spark flew about 25 yards into another box of fireworks. The box exploded setting off sparks that burned the victim.	Second degree burns on his arms and chest. After medical treatment, full recovery expected between six months and a year.
12	7	Female	Contusions, Abrasions	Treat and Release	Eye	Ground Popper	Ground popper thrown on sawdust covered floor exploded throwing up sawdust into the victim's eye.	Treated in the emergency room. Fully recovered in a week.
13	8	Male	Foreign Body	Treat and Release	Eye	Ground Popper	The victim picked up a popper that had been thrown on the ground. It then exploded in his face.	Treated in the emergency department for particles in his eye. Fully recovered.
14	11	Female	Thermal Burns	Treat and Release	Finger	Small Firecracker	Victim and friends put drain cleaner in a plastic bottle, then put a firecracker into the top of the bottle. The victim lit the firecracker which then exploded burning her fingers.	Treated in the emergency room. Fully recovered in a week.
15	11	Male	Thermal Burns	Treat and Release	Foot	Fountain	A fountain firework was lit by the victim's younger brother that then ignited other fountains. One went into the victim's tennis shoe.	Victim had a small second degree burn on his foot. No further treatment was required after the emergency room and victim fully recovered.
16	12	Male	Laceration	Treat and Release	Eye	Aerial Shell (possibly a Bottle Rocket)	Victim struck in the left eye by a rocket that had been launched by one of his friends.	Victim had eye surgery. Expects full recovery in a month.
17	12	Male	Contusions, Abrasions	Treat and Release	Eye	Fountain	Victim found a fountain firework in the woods. It exploded immediately when he lit it.	First degree burns of the face. Victim fully recovered.

18	15	Male	Thermal Burns	Treat and Release	Upper Leg	Bottle Rocket and Small Firecracker	A friend threw a bottle rocket into the victim's pants pocket where it ignited some firecrackers.	Victim had 2nd and 3rd degree burns on his leg. Had subsequent medical treatment and was fully recovered in a month.
19	19	Male	Thermal Burns	Treat and Release	Upper Arm	Bottle Rocket	Victim and a friend were lighting bottle rockets. Victim grabbed a lit rocket from the friend.	Sparks from the bottle rocket resulted in 2nd degree burns on his upper right arm. No further treatment required and victim fully recovered.
20	20	Male	Thermal Burns	Treat and Release	Face	Aerial Shell	An aerial shell was lit that then fell to the ground instead of going into the air. The shell then exploded on the ground.	Victim had 2nd degree burns on his face. After medical treatment, full recovery within a month.
21	20	Male	Thermal Burns	Treat and Release	Upper Arm	Roman Candle	Friend launched a roman candle, which bounced off a wall and then hit the victim in the arm.	Treated for 2nd degree burns. Fully recovered.
22	20	Male	Laceration	Treat and Release	Hand	Unknown	Victim was cleaning debris that had been left by children who were setting off fireworks. He picked up a plastic bottle and a firework in the bottle exploded.	After treatment at the emergency room, victim fully recovered.
23	25	Female	Thermal Burns	Treat and Release	Hand	Aerial Shell	Victim lit an aerial shell that she was holding in her hand. The shell exploded.	Treated for 1st and 2nd degree burns to her right hand. No information provided about future treatment or prognosis.
24	28	Female	Other/Not Stated	Treat and Release	Ear	Aerial Shell	Victim's neighbor lit a rocket that went sideways and flew close to the victim's ear.	The victim reported a ringing sensation in her ear. She went to the emergency room, was examined and released.
25	29	Male	Fracture	Treat and Release	Wrist	Aerial Shell	The victim was tapping the firework while holding it in his hand. The firework exploded.	Fractured wrist and lacerations. Victim recovered following two months of medical treatments.
26	38	Female	Thermal Burns	Treat and Release	Lower Leg	Aerial Shell	Three rockets on a base were lit at about the same time. The first rocket launched causing the base to tip over resulting in the other two rockets launching horizontally. One of these rockets hit the victim in the legs.	Victim had second and third degree burns on both legs. Victim had further treatment and recovered fully in a month.
27	40	Female	Contusions, Abrasions	Treat and Release	Eye	Bottle Rocket	Neighborhood children were lighting fireworks near the victim's home. Victim was struck in the eye	Treated for corneal abrasion. Victim had further medical treatment. Unknown if will fully recover.