



2015 Fireworks Annual Report

Fireworks-Related Deaths and Emergency Department-Treated Injuries During 2015

June 2016

**Yongling Tu
Division of Hazard Analysis
Directorate for Epidemiology
U.S. Consumer Product Safety Commission**

This analysis was prepared by CPSC staff. It has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

CPSC 6(b)(1) CLEARED for PUBLIC

NO MFRS/PRVT LBLS OR
PRODUCTS IDENTIFIED

EXCEPTED BY: PETITION
RULEMAKING ADMIN. PRCDG

WITH PORTIONS REMOVED: _____

Executive Summary

This report provides the results of U.S. Consumer Product Safety Commission (CPSC) staff's analysis of data on nonoccupational, fireworks-related deaths and injuries during calendar year 2015

Staff obtained information on fireworks-related deaths from news clippings and other sources in the CPSC's Injury and Potential Injury Incident file (IPII) and the CPSC's Death Certificate File. Staff estimated fireworks-related injuries treated in hospital emergency departments from CPSC's National Electronic Injury Surveillance System (NEISS). CPSC staff conducted a special study of nonoccupational fireworks-related injuries occurring between June 19, 2015 and July 19, 2015. The special study included collection and analysis of more detailed incident information, such as the type of injury, the fireworks involved, and the characteristics of the victim and the incident scenario. About 67 percent of the estimated annual fireworks-related, emergency department-treated injuries for 2015 occurred during that period.

Highlights of the report:

Deaths and Injuries

- CPSC staff received reports of 11 nonoccupational fireworks-related deaths during 2015. Nine of the 11 fatalities in 2015 were related to reloadable aerial devices, and two were associated with manufacturing homemade devices. One victim died in a house fire caused by making homemade fireworks. Ten victims died from direct impacts of fireworks. Reporting of fireworks-related deaths for 2015 is not complete, and the number of deaths in 2015 should be considered a minimum.
- CPSC staff receives an average of 7.4 reports of fireworks-related deaths per year.
- Fireworks were involved in an estimated 11,900 injuries treated in U.S. hospital emergency departments during calendar year 2015 (95 percent confidence interval 9,100–14,800). The estimated rate of emergency department-treated injuries is 3.7 per 100,000 individuals in the United States.
- There is not a statistically significant trend in estimated emergency department-treated, fireworks-related injuries from 2000 to 2015.
- An estimated 8,000 fireworks-related injuries (or 67 percent of the total estimated fireworks-related injuries in 2015) were treated in U.S. hospital emergency departments during the 1-month special study period between June 19, 2015 and July 19, 2015 (95 percent confidence interval 5,500–10,400).

Results from the 2015 Special Study

- Of the fireworks-related injuries sustained, 61 percent were to males, and 39 percent were to females.
- Children younger than 15 years of age accounted for 26 percent of the estimated 2015 injuries. Forty-two percent of the estimated emergency department-treated, fireworks-related injuries were to individuals younger than 20 years of age.
- Young adults 15 to 19 years of age had the highest estimated rate of emergency department-treated, fireworks-related injuries (6.1 injuries per 100,000 people). Children 5 to 9 years of age had the second highest estimated rate (4.2 injuries per 100,000 people).
- There were an estimated 1,900 emergency department-treated injuries associated with sparklers and 800 with bottle rockets.
- There were an estimated 1,200 emergency department-treated injuries associated with firecrackers. Of these, an estimated 41 percent were associated with small firecrackers, an estimated 18 percent with illegal firecrackers, and an estimated 41 percent with firecrackers for which there was no specific information.
- The parts of the body most often injured were hands and fingers (an estimated 32 percent); head, face, and ears (an estimated 25 percent); eyes (an estimated 16 percent); legs (an estimated 15 percent); and arms (an estimated 4 percent).
- Sixty-five percent of the emergency department-treated 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 eyes occurred more frequently.
- Approximately 85 percent of the victims were treated at the hospital emergency department and then released. An estimated 15 percent of patients were treated and transferred to another hospital or admitted to the hospital.

CPSC staff conducted telephone follow-up investigations of fireworks-related injuries that were reported at NEISS hospital emergency departments during the 2015 special study period and that met certain criteria. Many of these cases were selected for follow-up interviews because they involved potentially serious injuries and/or hospital admissions. Cases were also selected to clarify information in the hospital record about the incident scenario or fireworks type. Thirty-one telephone interviews were completed.

A review of data from the 31 completed telephone follow-up investigations showed that most injuries were associated with misuse or malfunctions of fireworks. Misuse included: igniting fireworks too close to someone; lighting fireworks in one's hand; setting off fireworks improperly; having lit fireworks too close to other fireworks/explosives; and touching lit fireworks. Typical malfunctions included: errant

flight paths; early or late ignition; tip-over incidents; and blowout. In addition, debris from fireworks was involved in some of the injuries. According to the injury investigation reports, most victims recovered from their injuries or were expected to recover completely. However, several victims reported that their injuries might be long term.

1. Introduction

This report describes injuries and deaths during calendar year 2015, associated with fireworks devices, as well as kits and components used to manufacture illegal fireworks. Reports for earlier years in this series can be found at:

<http://www.cpsc.gov/en/Research--Statistics/Fuel-Lighters-and-Fireworks1/Fuel-Lighters-and-Fireworks-Reports/>.

This report is organized into six sections. Section 1 contains a description of the data and statistical methods used in this analysis. Section 2 summarizes the 2015 fireworks-related incidents that resulted in deaths. Section 3 provides an annual estimate of fireworks-related, emergency department-treated injuries in the United States for 2015, and the report compares that estimate with the estimated injuries for previous years. Section 4 analyzes emergency department-treated, fireworks-related injuries occurring during the month around July 4, 2015. Section 5 summarizes the telephone in-depth investigations of a subsample of the injuries during that period. The report concludes with a summary of the findings in Section 6. Appendix A presents a table on the relationship between fireworks-related injuries and fireworks imports between 2000 and 2015. Appendix B contains more detail on the completed telephone investigations.

Sources of Information

Information on nonoccupational fireworks-related deaths occurring during 2015 was obtained from the CPSC's Injury and Potential Injury Incidents (IPII) file and the CPSC's Death Certificate File. Entries in IPII come from a variety of sources, such as newspaper articles, consumer complaints, lawyer referrals, medical examiners, and other government agencies. CPSC staff from the Office of Compliance and Field Operations conducted in-depth investigations of the deaths to determine the types of fireworks involved in the incidents and the circumstances that led to the fatal injuries.

Because the data in IPII are based on voluntary reports, and because it can take more than 2 years to receive all death certificates from the various states to complete the Death Certificate File, neither data source can be considered complete for the number of 2014 or 2015 fireworks-related deaths at the time this report was prepared. Consequently, the number of deaths should be considered a minimum. Staff updates the number of deaths for previous years when new reports are received. Total deaths for prior years may not coincide with the numbers in reports for earlier years because of these updates.

The source of information on nonoccupational, emergency department-treated fireworks-related injuries is NEISS. NEISS is a probability sample of U.S. hospitals with emergency departments.¹ Injury information is taken from the emergency department

¹ For a description of NEISS, including the revised sampling frame, see Schroeder and Ault (2001). Procedures used for variance and confidence interval calculations and adjustments for the sampling frame change that occurred 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.

record. This information includes the victim's age and sex, the place where the injury occurred, the emergency department diagnosis, the 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.

To supplement the information available in the NEISS record, every year, during the month around July 4, CPSC staff conducts a special study of fireworks-related injuries. Staff focuses its efforts on fireworks incidents during this period because in most years, about two-thirds to three-quarters of the annual injuries occur then. During this period, hospital emergency department staffs show patients pictures of different types of fireworks to help them identify the type of fireworks device associated with their injuries. The type of fireworks involved in the incident is written into the NEISS narrative. In 2015, the special study period lasted from June 19 to July 19.

After reading the incident case records, including the narrative description of the fireworks device and the incident scenario, CPSC staff may assign a case for telephone investigation. Cases are usually selected because they involve the most serious injuries and/or hospital admissions. Serious injuries include: eye injuries, finger and hand amputations, and head injuries. Cases also may be assigned to obtain more information about the incident than what is reported in the NEISS narrative. In most years, phone interviewers are able to collect information for one-third to one-half of the cases assigned. Information on the final status of the telephone interviews conducted during the 2015 special study is found in Section 5 and Appendix B of this report.

In the telephone investigations, information is requested directly from the victim (or the victim's parent, if the victim is a minor) about the type of fireworks involved, where the fireworks were obtained, how the injury occurred, and the medical treatment and prognosis. When the fireworks device reported in the telephone investigation is different from what is reported in the NEISS emergency department record, the device reported in the telephone investigation is used in the data for this report.

As a result of this investigative process, three different levels of information may be available about a fireworks-related injury case. For the cases that occur before or after the July 4 special study period, the NEISS record is almost always the only source of information. Many NEISS records collected outside the special study period do not specify the type of fireworks involved in the incident. During the special study period, more information is available for analysis because the NEISS record collected by the emergency department usually contains the type of fireworks and additional details on the incident scenario. Finally, the most information is available for the subset of the special study cases where staff conducted telephone investigations. These different levels of information about injuries correspond to different analyses in the report, as follows:

- Estimated national number of fireworks-related, emergency department-treated injuries. This estimate is made using NEISS cases for the entire year, from records 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 is available 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 may include a small number of cases in which 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 to previous years.²

- Detailed analyses of injury patterns. The tables in this report, which 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-type information is taken from the telephone investigation or the NEISS comment field when there was no telephone investigation. When computing estimates for the special study period, staff does not include cases in which the fireworks device was not lit or no attempt was made to light the device.
- Information from telephone investigations. Individual case injury descriptions and medical prognosis information from the telephone investigations are listed in Appendix B. These listings also exclude cases in which the fireworks device was not lit or no attempt was made to light the device. These cases represent a sample of some of the most serious fireworks-related injuries and may not represent the typical emergency department-treated, fireworks-related injuries.

Statistical Methods

Injuries reported by hospitals in the NEISS sample were weighted by the NEISS probability-based 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 4. Confidence intervals were estimated, and other statistics were calculated using computer programs that were written to take into account the sampling design.³ Estimated injuries are rounded to the nearest 100 injuries. Estimates of fewer than 50 injuries are shown with an asterisk (*). Percentages are calculated from the actual estimates. Percentages may not add to subtotals or to the total in the tables or figures, due to rounding.

This report also contains a number of detailed tables about fireworks-related injuries during the special study period. National estimates in these tables were also made using the sampling weights. To avoid cluttering the tables, confidence intervals are not included. Because the estimates are based on subsets of the data, they have larger relative sampling errors (*i.e.*, larger coefficients of variation) than the annual injury estimate or the special study injury estimate. Therefore, interpretation and comparison of these

² The only exception to the practice of including all of the cases occurred in 2003, when nine cases representing an estimated 150 emergency department-treated injuries were excluded from the annual injury estimates. These cases resulted from a nightclub fire in West Warwick, RI, which also caused 100 deaths. For details see Greene and Joholske (2004).

³ See Schroeder (2000).

estimates with each other or with estimates from prior years should be made with caution. For example, when comparing subsets of the data—such as 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 is attributed to real differences in national injury totals.

2. Fireworks-Related Deaths for 2015

CPSC has reports of 11 nonoccupational, fireworks-related deaths that occurred during 2015. Reporting of fireworks-related deaths for 2015 is not complete, and the number of deaths in 2015 should be considered a minimum. Brief descriptions of the incidents, using wording taken from the incident reports, follow:

- On July 4, 2015, a 22-year-old male from Maine died of a head injury caused by fireworks. It was reported that the victim put a mortar tube on top of his head and ignited the fireworks with a small lighter. The explosion caused a fatal head trauma to the victim. The manner of death was reported as accidental by the coroner. This incident is still under investigation.
- On July 5, 2015, a 44-year-old male from Indiana died of blunt force trauma to his head. According to local officials, the victim launched a firework artillery shell from a mortar while holding the mortar tube above his head. The artillery shell blew off the bottom of the mortar tube, and the shell exploded on top of the victim's head. The victim was pronounced dead at the scene.
- On June 28, 2015, a 47-year-old male from Michigan died of blunt trauma to the back of his head. According to witnesses and officials, the victim placed a consumer mortar type firework—1-1/4" in diameter and 4" to 5" tall—in a tube to light it. The victim lit the fuse and placed the tube on top of his head. The firework exploded and the victim fell to the ground. The victim was pronounced dead on the scene. The victim had been consuming alcohol prior to the incident.
- In the evening of July 4, 2015, a 12-year-old boy from Tennessee was with other juveniles and an adult shooting bottle rockets and Roman candles in a neighborhood street. The adult had purchased several fireworks including a reloadable mortar device with 24 artillery shells. The adult saw one juvenile take a canister shell and walk away. The 12-year-old victim was asked to retrieve the shell. The police were told that the shell was tossed at the victim. It was not known if the shell hit the ground. It was reported that the shell was torn and a brown substance was leaking from the shell. The victim was holding the mortar tube at chest level when the incident shell was put in the tube and ignited. Witnesses reported hearing a "strange sound" after the shell was lit. Police believed the sound was the shell firing upside down in the mortar tube. The device went off, and there was a blowout in the tube. The debris hit the victim in

the chest area near the breast bone. The victim was taken to a hospital where he died.

- On July 7, 2015, a 30-year-old male from Texas died of chest injuries caused by fireworks. According to police and witnesses, the victim and his friends had been drinking alcoholic beverages and setting off fireworks for several hours at a fishing area along the Colorado River. The victim held the baseplate of a consumer mortar tube to his chest and ignited the shell using a cigarette lighter. After the firework went off, the victim took several steps back and then fell down. Bystanders attempted resuscitative measures and called 911. The victim was transported to an emergency room, and he died from his injuries later at the hospital.
- On July 4, 2015, a 32-year-old male from Montana died of a penetrating neck injury. According to witnesses and officials, the victim had been lighting consumer fireworks using a mortar tube. The victim reportedly lit four shells prior to the incident. The victim was holding the tube when each shell detonated. When the victim lit the fifth shell while holding the tube, the firework shot out and struck the victim in the neck. The victim was pronounced dead at the scene. It was reported that the victim had been drinking alcohol earlier in the day.
- On July 4, 2015, a 31-year-old male from North Dakota died at his residence from blunt force trauma caused by fireworks. The victim lit the fuse on a mortar/artillery type shell and put it in a launch tube, which was placed on a gravel surface. The firework failed to detonate and the victim proceeded to inspect. According to witnesses, the launch tube either fell over or the victim bent over to reach for the tube when the firework exploded. The shell shot from the tube and struck the victim in the abdominal area. The victim was taken to a local medical center where he died from his injury. According to the police, the launch tube had been used several times immediately prior to the incident without issues.
- In the evening of July 4, 2015, a 41-year-old male from Indiana set off fireworks in a parking lot in front of a crowd of roughly 150 people. At about 10:40 p.m., the victim lit an artillery shell in a mortar as the grand finale for his fireworks show. The shell failed to detonate. The victim then went over the mortar and looked down into the tube. The firework device ignited. The shell struck the victim in the face, with part of the shell casing becoming lodged in his left eye cavity. The victim died shortly after being transported to a local hospital. The cause of death was blunt force trauma to the head.
- According to a medical examiner's report, a 46-year-old male from Florida was shooting off different types of fireworks out of a mortar tube on December 31, 2015 during New Year celebrations. The projectile was supposed to shoot approximately 100 feet into the air from the mortar. When the victim realized that the projectile was not going to eject from the tube, he did not have time to throw it into the air. The projectile exploded in the tube about one foot away from the

victim's face and chest. A witness stated that the victim started gasping for air and was bleeding from his throat. The victim was taken to a hospital where he was pronounced deceased at 1:15 a.m. on January 1, 2016.

- On July 21, 2015, a 25-year-old male from Oregon died in a residential fire, which was caused by manufacturing homemade illegal fireworks. Several other people were also injured in the incident. According to police, the victim used various aliases/names and accounts to acquire an unknown amount of explosive powder from the internet. While manufacturing the homemade fireworks, the victim apparently ignited the explosive powder that led to an explosion and subsequent fire in the dwelling where he lived. This incident is still under investigation.
- On June 27, 2015, a 40-year-old male from Washington State died of multiple blast injuries from manufacturing pipe bomb device(s) using fireworks as a source for explosive ingredients. According to local officials, around 9:00 p.m. on June 27, the victim was in a cluttered unattached garage behind his residence by himself. A loud explosion was heard throughout the neighborhood. A neighbor saw smoke and went to the garage where he found the victim lying prone with major head and hand trauma. There were several pieces of bomb making parts and equipment next to the victim. Possible fuses and several sparklers with the incendiary portions removed were found as well. In addition, there were several unopened boxes of sparklers, numerous pipes, and open shotgun shells with no contents were found in a smaller room attached to the garage. The victim was believed to have manufactured a fireworks-based pipe bomb device by stripping the incendiary portion from sparklers, stuffing it into metal pipes, and then attaching a fuse. Local law enforcement indicated that they were aware that the victim was most liked manufacturing this type of device but had not yet caught him in the action. This case remains open with the Sheriff's Office.

Including the 11 deaths described above, CPSC staff has reports of 119 fireworks-related deaths between 2000 and 2015, for an average of 7.4 deaths per year.⁴

⁴ See previous reports in this series (*e.g.*, the report for 2014: Tu and Granados (2015)). In the most recent 3 years, the number of deaths included six deaths in 2012, eight deaths in 2013, and 13 deaths in 2014.

3. National Injury Estimates for 2015

Table 1 and Figure 1 present the estimated number of nonoccupational, fireworks-related injuries treated in U.S. hospital emergency departments between 2000 and 2015.

Table 1
Estimated Fireworks-Related Injuries: 2000–2015

Year	Estimated Injuries	Injuries per 100,000 People
2015	11,900	3.7
2014	10,500	3.3
2013	11,400	3.6
2012	8,700	2.8
2011	9,600	3.1
2010	8,600	2.8
2009	8,800	2.9
2008	7,000	2.3
2007	9,800	3.3
2006	9,200	3.1
2005	10,800	3.7
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

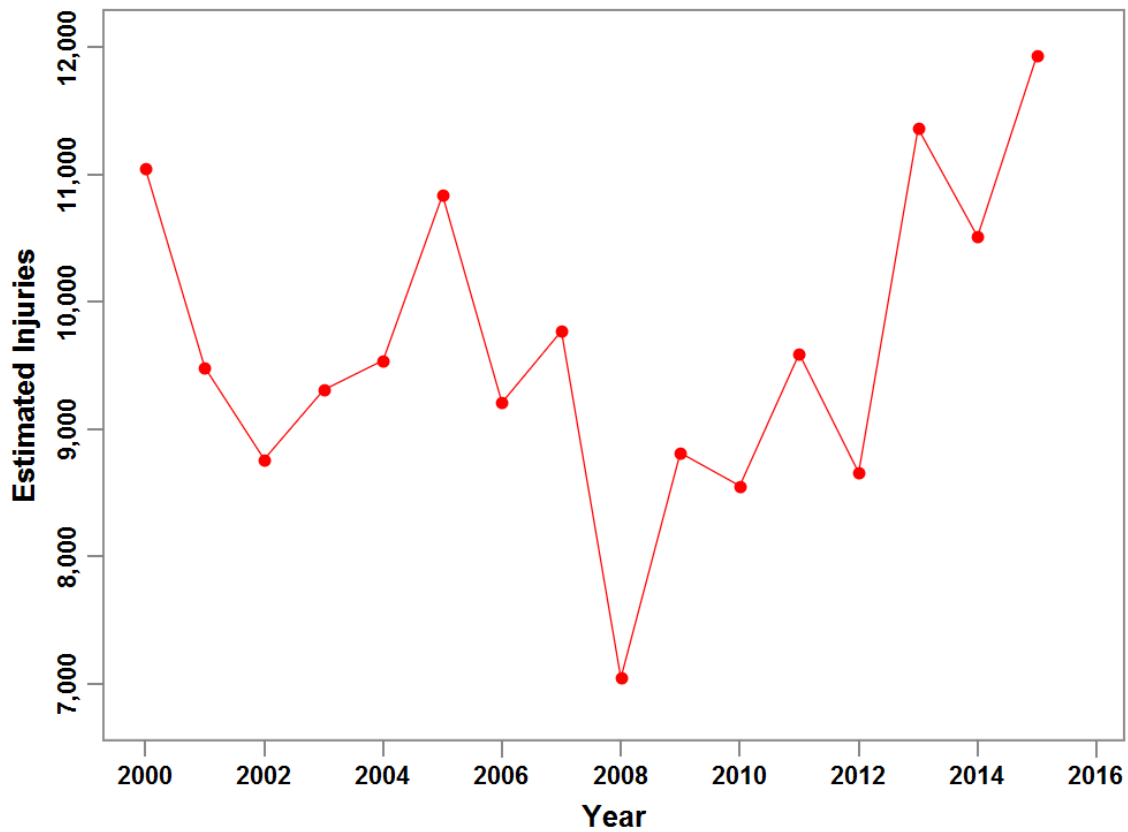
Source: NEISS, U.S. Consumer Product Safety Commission. The estimate for 2003 excludes an estimated 150 emergency department-treated injuries following the nightclub fire in West Warwick, RI. Population estimates for 2010 to 2015 are from Table 1. Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2015 (NST-EST2015-01), U.S. Census Bureau, Population Division. Release Date: December 2015. Population estimates for 2000 to 2009 are from Table 1. Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2009 (NST-EST2009-01). Population Division, U.S. Census Bureau.

In calendar year 2015, there were an estimated 11,900 fireworks-related, emergency department-treated injuries (95 percent confidence interval 9,100–14,800). There were an estimated 10,500 injuries in 2014. The difference between the injury estimates for 2015 and 2014 is not statistically significant.

Figure 1 shows that the highest estimated number of annual fireworks-related injuries was 11,900 in 2015, followed by 11,400 estimated injuries in 2013, 11,000 estimated injuries in 2000, 10,800 estimated injuries in 2005, and 10,500 estimated injuries in 2014. For the other years, the estimated number of injuries fluctuated between 7,000 and 9,800. In 2008, the estimated number of fireworks-related injuries was 7,000,

which was the lowest between 2000 and 2015. There is not a statistically significant trend detected in the fireworks-related injury estimates from 2000 to 2015.⁵

Figure 1
Estimated Fireworks-Related, Emergency Department-Treated Injuries
2000–2015



Source: NEISS, U.S. Consumer Product Safety Commission.

Appendix A contains a table showing estimated fireworks-related injuries and fireworks imports between 2000 and 2015.

⁵ For details on the method to test a trend that incorporates the sampling design, see Schroeder (2000) and Marker et al. (1999).

4. Injury Estimates for the 2015 Special Study: Detailed Analysis of Injury Patterns

The injury analysis in this section presents the results of the 2015 special study of fireworks-related injuries treated in hospital emergency departments between June 19, 2015 and July 19, 2015. During this period, there were an estimated 8,000 fireworks-related injuries (95 percent confidence interval 5,500–10,400), accounting for 67 percent of the total estimated fireworks-related injuries for the year, which is not statistically different from the estimated 7,000 fireworks-related injuries in the 2014 special study period.

The remainder of this section provides the estimated fireworks-related injuries from this period, broken down by fireworks device type, victims' demographics, injury diagnosis, and body parts injured.

Fireworks Device Types and Estimated Injuries

Table 2 shows the estimated number and percent of emergency department-treated injuries by type of fireworks device during the special study period of June 19, 2015 to July 19, 2015.

Table 2
Estimated Fireworks-Related Injuries
By Type of Fireworks Device
June 19–July 19, 2015

Fireworks Device Type	Estimated Injuries	Percent
Total	8,000	100
All Firecrackers	1,200	16
Small	500	6
Illegal	200	3
Unspecified	500	6
All Rockets	800	11
Bottle Rockets	800	10
Other Rockets	100	1
All Other Devices	3,700	47
Sparklers	1,900	24
Fountains	100	1
Novelties	300	4
Multiple Tube	400	5
Reloadable Shells	800	9
Roman Candles	300	3
Homemade/Altered	200	3
Public Display	200	3
Unspecified	1,700	21

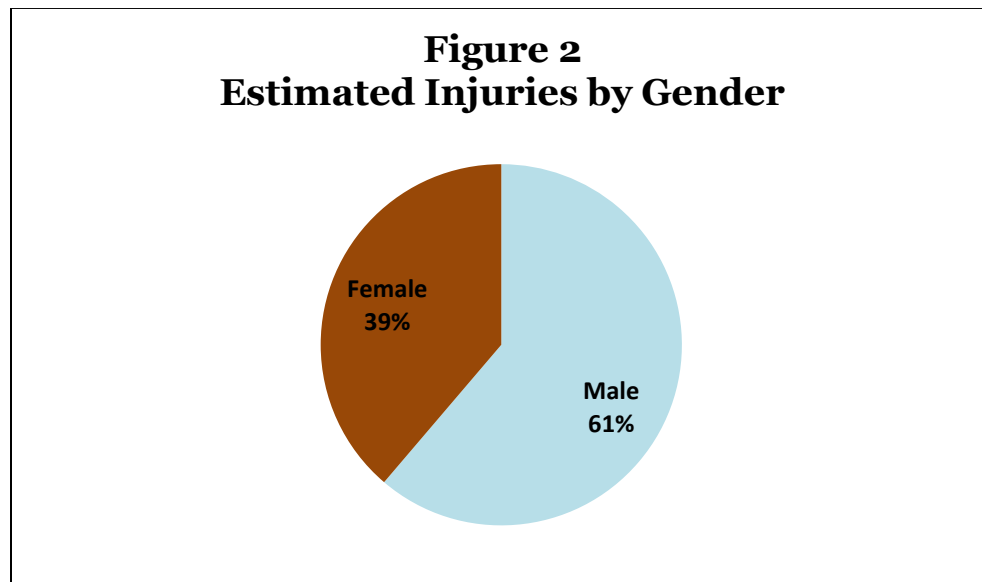
Source: NEISS, U.S. Consumer Product Safety Commission. Based on 208 NEISS emergency department-reported injuries between June 19, 2015 and July 19, 2015, and supplemented by 31 completed In-Depth Investigations (IDIs). Fireworks types are obtained from the IDI, when available; otherwise, fireworks types are identified from information in victims' reports to emergency department staff that were contained in the NEISS narrative. Illegal firecrackers include M-80s, M-1000s, Quarter Sticks, and other firecrackers that are banned under the Federal Hazardous Substances Act (FHSA) (16 C.F.R. § 1500.17). Fireworks that may be illegal under state and local regulations are not listed as illegal, unless they violate the FHSA. Subtotal estimates are presented below the estimates for firework type. Estimates are rounded to the nearest 100 injuries. Estimates may not sum to subtotal or total due to rounding. Percentages are calculated from the actual estimates, and they may not add to subtotals or the total due to rounding.

As shown in Table 2, sparklers accounted for an estimated 1,900 emergency department-treated injuries, which represents 24 percent of the total fireworks-related injuries during the special study period. Firecrackers were associated with 1,200 estimated injuries, 16 percent of the total. Small firecrackers were involved in 500 injuries. The estimate for illegal firecracker-related injuries was 200. However, some of the estimated 500 unspecified firecracker-related injuries, and some of the estimated 1,700 unspecified fireworks-related injuries also may have involved illegal firecrackers. Rockets were involved in 800 estimated injuries, 11 percent of the total. Almost all of the injuries from rockets were related to bottle rockets. Reloadable shells were associated

with 800 estimated injuries, 9 percent of the total. Multiple tube devices accounted for 400 estimated injuries, 5 percent of the total. Novelty devices were associated with 300 estimated injuries, 4 percent of the total. Roman candles were associated with 300 estimated injuries, as well. Homemade or altered devices and public display fireworks each accounted for 200 estimated injuries, 3 percent of the total. Although public display fireworks are not associated with a large number of injuries, the larger load in these devices makes them involved disproportionately in serious injuries. Fountains were involved in 1 percent of the estimated fireworks-related injuries during the 2015 special study period.

Gender and Age of Injured Persons

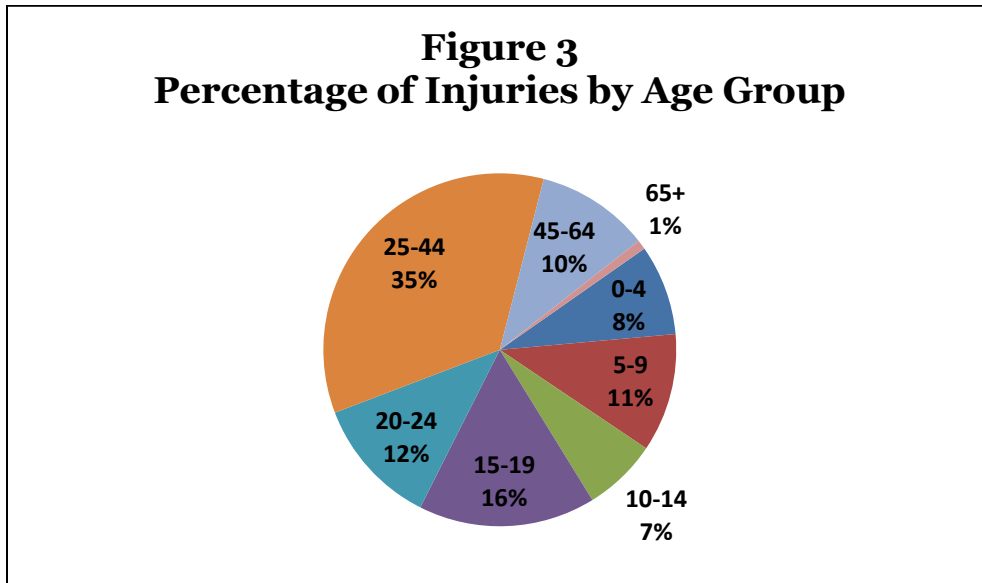
Some 4,900 of the estimated fireworks-related injuries were to males, representing 61 percent of the total injuries. Males experienced an estimated 3.1 fireworks-related, emergency department-treated injuries per 100,000 individuals during the special study period. Females, with an estimated 3,100 emergency department-treated injuries, had 1.9 injuries per 100,000 people. Figure 2 shows the distribution of estimated fireworks-related injuries by gender.



Source: NEISS, U.S. Consumer Product Safety Commission.

Children and young adults under age 20 constituted 42 percent of the fireworks-related injuries. Children under 5 years old experienced an estimated 700 injuries (8 percent of all fireworks-related injuries during the special study period), as shown in Figure 3 and Table 3. Children in the 5- to 14-year-old age group experienced an

estimated 1,400 injuries (18 percent of all fireworks-related injuries).⁶ Breaking down that age group further, children 5 to 9 years old had an estimated 900 injuries and children 10 to 14 years old accounted for 500 injuries. In the aggregate, children under 15 years old accounted for 26 percent of the estimated fireworks-related injuries.



Source: NEISS, U.S. Consumer Product Safety Commission. Percentages may not sum to 100 due to rounding.

The detailed breakdown by age and gender is shown in Table 3. The concentration of injuries among males and people under 25 has been typical of fireworks-related injuries for many years.

⁶ The percentages are calculated from actual injury estimates, and age subcategory percentages may not sum to the category percentage due to rounding.

Table 3
Estimated Fireworks-Related Injuries
By Age and Gender
June 19–July 19, 2015

Age Group	Total	Per 100,000 People	Male	Female
Total	8,000	2.5	4,900	3,100
0–4	700	3.3	400	300
5–14	1,400	3.4	900	500
5–9	900	4.2	500	300
10–14	500	2.6	400	200
15–24	2,200	5.1	1,400	800
15–19	1,300	6.1	800	500
20–24	900	4.1	600	300
25–44	2,800	3.3	1,500	1,300
45–64	800	1.0	600	200
65+	100	0.1	*	100

Sources: NEISS, U.S. Consumer Product Safety Commission. Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2014, U.S. Census Bureau, Population Division. Release Date: June 2015. The oldest victim was 75 years old. Estimates are rounded to the nearest 100 injuries. Age subcategory estimates may not sum to the category total due to rounding.

When considering per capita injury rates, children and young adults had higher estimated rates of injury than the other age groups during the 2015 special study period. Young adults 15 to 19 years old had the highest estimated per capita injury rate at 6.1 injuries per 100,000 population. This was followed by children 5 to 9 years old at 4.2 injuries and adults 20 to 24 years old at 4.1 injuries per 100,000 people.

Age and Gender of the Injured Persons by Type of Fireworks Device

Table 4 shows the ages of those injured by the type of fireworks device associated with the injury. For children under 5 years old, sparklers accounted for 65 percent of the total estimated injuries for that specific age group.⁷

⁷ The percentages are calculated from the actual injury estimates.

No clear relationship between age and fireworks type is suggested by the data in Table 4. It is worth noting that the number of estimated injuries does not completely represent the usage pattern because victims are often injured by fireworks used by other people. This is especially true for rockets and aerial shells (*e.g.*, fountains, multiple tube, and reloadable devices), which can injure people located some distance away from where the fireworks are launched.

Table 4
Estimated Fireworks-Related Injuries
By Device Type and Age Group
June 19–July 19, 2015

Fireworks Type	Total	<u>Age Group</u>					
		0–4	5–14	15–24	25–44	45–64	65+
Total	8,000	700	1,400	2,200	2,800	800	100
All Firecrackers	1,200	*	300	400	500	*	*
Small	500	*	100	200	200	*	*
Illegal	200	*	*	100	100	*	*
Unspecified	500	*	200	*	200	*	*
All Rockets	800	*	200	200	200	200	*
Bottle Rockets	800	*	200	200	200	200	*
Other Rockets	100	*	*	*	*	*	
Other Devices	3,700	600	600	700	1,400	300	100
Sparklers	1,900	400	300	200	700	200	*
Fountains	100	*	100	*	*	*	*
Novelties	300	100	100	*	100	*	*
Multiple Tube	400	100	*	200	200	*	*
Reloadable	800	*	*	200	400	*	100
Roman Candles	300	*	200	100	*	*	*
Homemade/Altered	200	*	100	100	*	*	*
Public Display	200	*	*	100	100	*	*
Unspecified	1,700	*	100	600	600	300	*

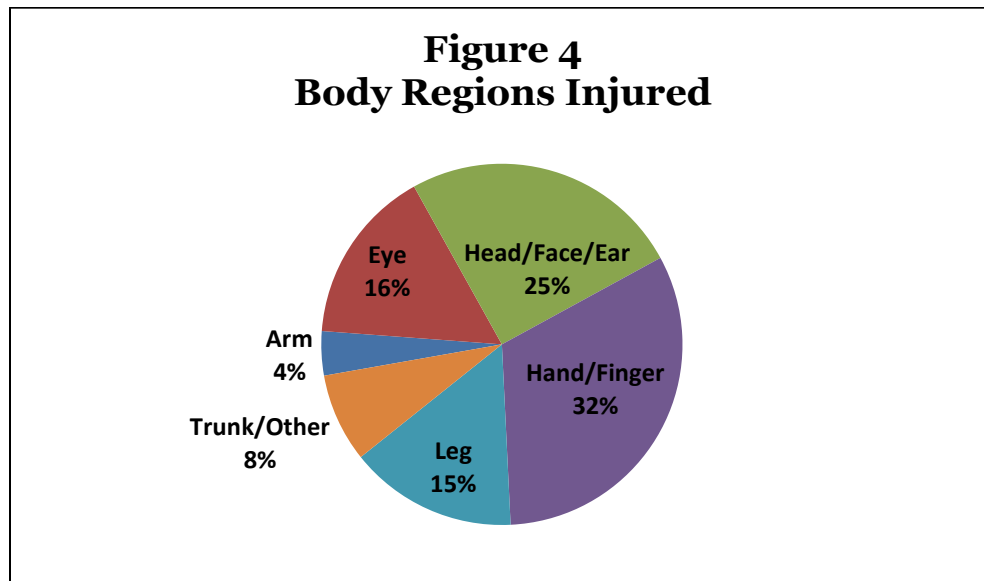
Source: NEISS, U.S. Consumer Product Safety Commission. Estimates are rounded to the nearest 100 injuries. Estimated injuries may not sum to subtotals or totals due to rounding. Estimates of fewer than 50 injuries are denoted with an asterisk (*).

As shown previously in Figure 2, males accounted for 61 percent of the estimated fireworks-related injuries, and females comprised 39 percent. Males accounted for a

majority of the estimated injuries from firecrackers; bottle rockets; sparklers; novelties; reloadable devices; homemade or altered devices; and unspecified devices. In addition, males were associated with all the estimated injuries from fountains. Females were involved in more estimated injuries from multiple tube devices; Roman candles; and public display fireworks.

Body Region Injured and Injury Diagnosis

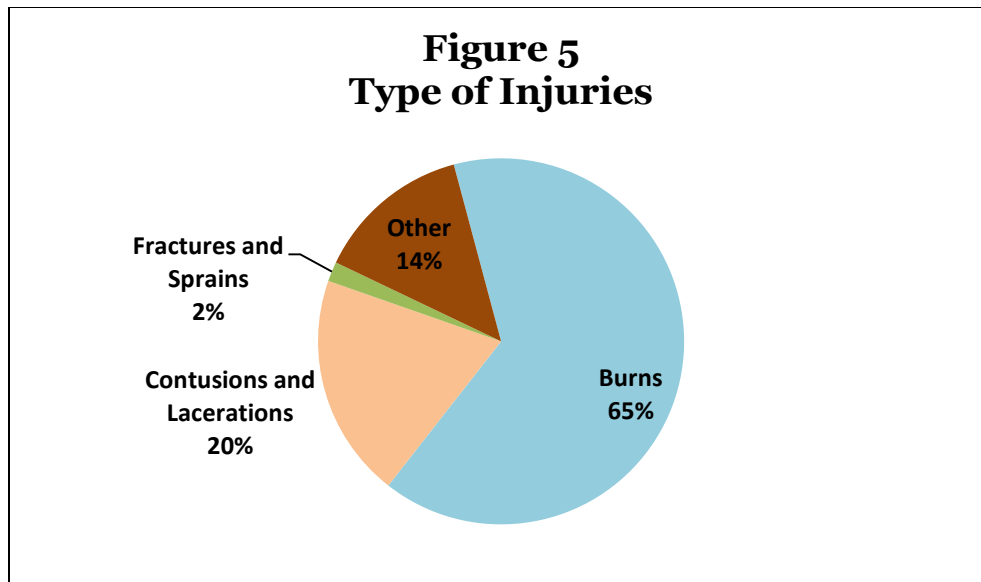
Figure 4 presents the distribution of estimated emergency department-treated injuries by the specific parts of the body to which the injury occurred. Hands and fingers, with an estimated 2,600 injuries, accounted for 32 percent of the total injuries. These were followed by an estimated 2,000 injuries to the head/face/ear region (25 percent); 1,300 eye injuries (16 percent); 1,200 leg injuries (15 percent); 600 injuries to the trunk/other category (8 percent); and 300 arm injuries (4 percent).



Source: NEISS, U.S. Consumer Product Safety Commission.

Figure 5 shows the diagnoses of the estimated injuries associated with fireworks devices. Burns, with 5,100 estimated injuries (65 percent), were the most frequent injury diagnosis. Contusions and lacerations were associated with 1,600 estimated injuries (20 percent), and fractures and sprains were associated with 100 estimated injuries (2 percent). The remaining 1,100 estimated injuries (14 percent) were attributed to other diagnoses.⁸

⁸ Percentages are calculated from the actual injury estimates and do not sum to 100 due to rounding.



Source: NEISS, U.S. Consumer Product Safety Commission. Percentages may not sum to 100 due to rounding.

As shown in Table 5, burns were the most frequent injuries to all body parts except for eye injuries, which were contusions, lacerations, and other diagnoses that included foreign bodies in the eye.

Table 5
Estimated Fireworks-Related Injuries
By Body Region and Diagnosis
June 19–July 19, 2015

Body Region	Total	Burns	<u>Diagnosis</u>		
			Contusions Lacerations	Fractures Sprains	Other Diagnoses
Total	8,000	5,100	1,600	100	1,100
Arm	300	200	100	*	*
Eye	1,300	100	800	*	300
Head/Face/Ear	2,000	1,100	400	100	400
Hand/Finger	2,600	2,200	200	*	100
Leg	1,200	1,000	100	*	100
Trunk/Other	600	500	*	*	100

Source: NEISS, U.S. Consumer Product Safety Commission. Fractures and sprains also include dislocations. Other diagnoses include all other injury categories. Arm includes NEISS codes for upper arm, elbow, lower arm, shoulder, and wrist. Head/Face/Ear regions include eyelid, eye area, nose, neck, and mouth but not the eyeball. Leg includes upper leg, knee, lower leg, ankle, foot, and toe. Trunk/other regions include chest, abdomen, pubic region, “all parts of body”, internal, and “25–50 percent of body”. Estimates are rounded to the nearest 100 injuries. Estimated injuries may not sum to subtotals or totals due to rounding. Estimates of fewer than 50 injuries are denoted with an asterisk (*).

Type of Fireworks Device and Body Region Injured

Table 6 presents estimated injuries by the type of fireworks device and body region injured.

Table 6
Estimated Fireworks-Related Injuries
By Type of Fireworks Device and Body Region Injured
June 19–July 19, 2015

Fireworks Type	Total	Arm	Eye	Region of the Body Injured			
				Head/Face/Ear	Hand/Finger	Leg	Trunk/Other
Total	8,000	300	1,300	2,000	2,600	1,200	600
All Firecrackers	1,200	100	100	300	500	200	*
Small	500	*	100	200	100	100	*
Illegal	200	100	*	*	100	*	*
Unspecified	500	*	*	100	200	*	*
All Rockets	800	*	200	400	100	*	100
Bottle Rockets	800	*	200	400	100	*	100
Other Rockets	100	*	*	*	*	*	*
Other Devices	3,700	100	600	600	1,500	600	300
Sparklers	1,900	*	200	200	1,200	300	*
Fountains	100	*	*	*	*	100	*
Novelties	300	*	100	*	*	100	100
Multiple Tube	400	100	200	*	*	100	100
Reloadable	800	*	100	200	100	100	100
Roman Candles	300	*	*	100	100	*	*
Homemade/Altered	200	*	*	200	*	*	*
Public Display	200	100	*	*	*	100	*
Unspecified	1,700	*	300	500	400	300	200

Source: NEISS, U.S. Consumer Product Safety Commission. Estimates are rounded to the nearest 100 injuries. Estimated injuries may not sum to subtotals or totals due to rounding. Estimates of fewer than 50 injuries are denoted with an asterisk (*).

Sixty-three percent of the estimated sparkler injuries involved the hands and fingers. Fireworks devices that fly or emit sparks were primarily associated with eye, head, and face injuries. These included sparklers, rockets, Roman candles, multiple tube and reloadable devices.

Hospital Treatment

An estimated 85 percent of the victims of fireworks-related injuries were treated at the emergency department and then released; about 8 percent of victims were treated and transferred to another hospital; and approximately 7 percent were admitted to the hospital. The treat-and-release percentage was lower compared to that for all consumer products in 2015, and the percentages of the treated and transferred and the admitted were higher for the fireworks-related injuries in the special study period than those for all consumer products.⁹

5. Telephone Investigations of Fireworks-Related Injuries

CPSC staff conducted telephone in-depth investigations of some fireworks incidents that occurred during the 1-month special study period surrounding the 4th of July holiday (June 19, 2015 to July 19, 2015). Completed telephone investigations provided more detail about incidents and injuries than the emergency department information summarized in the narrative in the NEISS record. During the telephone interview, respondents were asked how the injury occurred (hazard pattern); what medical care they received following the emergency-department treatment; and what long-term effects, if any, resulted from their injury. Respondents were also asked detailed questions about the fireworks involved in the incident, including their type, markings, and where they were obtained.

Cases were selected for telephone investigations based on the information provided in the NEISS narrative and coded information in the NEISS records. The selection criteria included: (1) unusual hazard patterns, (2) severity of the injury, and (3) lack of clear information in the narrative about the type of fireworks associated with the injury. For these reasons, and because many victims did not respond, the telephone investigation cases cannot be considered typical of fireworks-related injuries.

From the 224 emergency department-treated, fireworks-related injuries during the special study period, staff selected 130 cases for telephone investigations, of which 31 were completed and determined to be in scope; and 99 were incomplete. Table 7 shows the final status of these investigations, including the reasons why some investigations were incomplete.

⁹For all injuries in 2015, 91 percent of patients were treated and released; 1 percent of patients were transferred to other hospitals; 7 percent were admitted to the hospital; and 1 percent had other dispositions, including left hospital without being seen, held for observation, or dead on arrival.

Table 7
Final Status of Telephone Investigations

Final Case Status	Number of Cases	Percent
Total Assigned	130	100
Completed Investigation	31	24
In Scope	31	24
Incomplete Investigations	99	76
Failed to Reach Patient	41	32
Victim Name Not Provided by Hospital	30	23
Victim Refused to Cooperate	28	22

Note: Percentages may not add to subtotals or the total due to rounding.

Short descriptions of the 31 completed cases are found in Appendix B. The cases are organized in order of emergency department disposition, with Admitted (to the hospital) first, followed by Treated and Transferred, and Treated and Released. Within dispositions, cases are in order of increasing age of the victim.

Summary Statistics¹⁰

Of the 31 completed in scope cases, 17 (55 percent) involved males, and 14 (45 percent) involved females. There were three victims (10 percent) younger than 5 years of age; nine victims (29 percent) ages 5 to 14 years old; 10 victims (32 percent) ages 15 to 24 years old; six victims (19 percent) ages 25 to 44 years old; one victim (3 percent) ages 45 to 64 years old; and two victims (6 percent) ages 65 or older. As for emergency department dispositions, six victims (19 percent) were admitted to the hospital; one victim (3 percent) was treated at the emergency department and transferred to another hospital; 24 victims (77 percent) were treated and released.

The most frequently used fireworks devices in these incidents were aerial shells,¹¹ which were associated with 12 incidents (39 percent). Unspecified devices were associated with four incidents (13 percent). Public display of fireworks was also involved in four incidents (13 percent). Firecrackers accounted for two incidents (6 percent), one (3 percent) was related to large illegal firecrackers and another was associated with unspecified firecrackers. Bottle rockets, sparklers, and homemade or altered devices each

¹⁰ Percentages may not add to 100 due to rounding.

¹¹ The category “aerial shells” includes multiple tube, reloadable mortars and rockets, but excludes bottle rockets.

were involved in two incidents (6 percent) as well. Roman candles, fountains, and novelty devices each accounted for one incident (3 percent).

Note that the distribution of the types of fireworks and the emergency department dispositions differ from the special study data in Section 4. These differences reflect the focus in the telephone investigation on more serious injuries and incompletely specified NEISS records. Note also that only 24 percent of the victims selected for the telephone investigations responded.

Hazard Patterns

The hazard patterns described below are based on the incident descriptions obtained during the telephone investigations and summarized in Appendix B. When an incident has two or more hazard patterns, the hazard pattern most likely to have caused the injury was selected. Hazard patterns are presented in Table 8, below, and a detailed description of the incidents follows Table 8. Case numbers refer to the case numbers shown in Appendix B.

Table 8
Hazard Patterns, as Described in Telephone Investigations of Fireworks-Related Injuries

Hazard Pattern	Number of Cases	Percent
All	31	100
Misuse	16	52
Igniting Fireworks Too Close to Someone	7	23
Holding Fireworks in Hand	4	13
Setting Fireworks Improperly	2	6
Touching Lit Fireworks	1	3
Holding Lit Fireworks too Close to Other Fireworks	1	3
Dropping Lit Fireworks on Other Explosives	1	3
Malfunction	11	35
Errant Flight Path	4	13
Early or Late Ignition	4	13
Tip-over	2	6
Blowout	1	3
Other	4	13
Debris	4	13

Note: Percentages may not add to subtotals or the total due to rounding.

Misuse (16 victims injured, 52 percent).

Sixteen victims were injured when fireworks were used in ways that departed from proper usage.

Igniting Fireworks too Close to Someone.

- In Case 4, a 32-year-old male was sitting in a lawn chair in his yard and watching fireworks set off by his neighbors. One mortar landed in the victim's lap and burned his groin area.
- In Case 7, a 2-year-old girl was burned by a Roman candle. The victim's mother lit a Roman candle and thought the firework would go off from the opposite end that she ignited. But the Roman candle blew up bolts from the same end that she just lit. The victim was very close to the Roman candle, and one of the bolts hit the victim's leg. The victim sustained third-degree burns on the inside of her leg and outside of her calf.
- In Case 9, a 4-year-old boy and his family were at a local park to watch a fireworks display set up by the city. The display was cancelled and the police presence left the park. People began lighting fireworks from all directions. The victim was standing with his family when they were all hit from the side while watching other fireworks in front of them. The victim was the only one injured. He suffered a second-degree burn to his ankle when an unspecified firework went into his shoe and blew up.
- In Case 15, an 11-year-old female was in a pool and people were setting off fireworks. When the victim was getting out of the pool, an unspecified firework shot directly at her and struck her in the right eye. The victim sustained retinal damage from blunt force trauma.
- In Case 16, a 13-year-old male was coming down the steps of his apartment complex, and some young boys from another complex were throwing bottle rockets from their porch. One of the rockets went down the victim's t-shirt and undershirt. The victim's clothing was burned, and the victim suffered a second-degree burn on his shoulder and a third-degree burn on his neck.
- In Case 19, an 18-year-old male was standing next to his friend who lit a modified bottle rocket. The firework was modified as most of the rocket was cut off. It was just a big ball with no propulsion and barely had a fuse. The victim told his friend not to light the altered firework, but his friend did. The victim suffered perforated eardrum and several lacerations to his chest and hand.
- In Case 24, a 24-year-old male was standing outside in an alley when he was hit by a mortar type firework. The victim saw the explosion and tried to run away. The victim sustained second-degree burns to his left hand and right foot.

Holding Fireworks in Hand.

- In Case 5, a 38-year-old male ignited an M-80 type firework while holding it in his left hand. The M-80 had a 5" fuse, but it exploded as soon as it was lit. The explosion fractured the victim's left hand and broke four fingers.

- In Case 14, an 11-year-old boy played with other older boys against his mother's instruction. The boys were playing with a firework that they had found. It was reported that the firework was homemade—a big round circle the size of a tennis ball with a very short fuse. The victim had the firework in his hand when it exploded. The victim suffered second-degree burns to his hand and lacerations to his leg.
- In Case 23, a 23-year-old female had a stick rocket in her hand instead of putting it on the ground. The victim ignited the rocket and threw it. Because the victim was so close to the rocket, the noise affected her hearing and she suffered headaches.
- In Case 28, a 38-year-old male held a 2" mortar in his right hand and ignited it. The victim was going to throw the firework, but it exploded in his hand right away. The victim sustained second-degree burns on his right hand.

Setting Fireworks Improperly.

- In Case 6, a 70-year-old male sat on a picnic table in a garage at his friend's house. His friend's fiancé dropped three aerial mortars into a cannon and ignited the fireworks at the end of the driveway. The victim thought that one of the mortars was put in upside down. The fireworks caught fire, exploded and shot sideways in different directions. The victim was the only person present who could not get out of the way. The fireworks exploded near the victim's eye, and the victim sustained a laceration and his eye was full of blood.
- In Case 21, a 20-year-old female was at a barbecue with her friends. One friend put a mortar in the tube upside down by accident and lit it. Instead of going up in the air, the mortar exploded near the victim's head and made a loud bang. The victim suffered temporary hearing loss.

Touching Lit Fireworks.

- In Case 8, a 3-year-old girl was holding a lit sparkler in one hand and holding her mother's hand in the other. The victim let go of her mother's hand to touch the sparkler with her finger. The victim suffered a thermal burn on her finger.

Holding Lit Fireworks too Close to Other Fireworks.

- In Case 1, a 9-year-old boy was holding a lit sparkler in his hand while having firecrackers in the pocket of his shorts. The sparkler ignited the pocket and lit the firecrackers. The victim sustained first-degree burns on his right hand and second- and third-degree burns to his upper leg from groin to knee.

Dropping Lit Fireworks on Other Explosives.

- In Case 2, a 12-year-old male was at an Indian reservation to help his brother who was selling fireworks. The victim held lit sparklers. The fuses were very short and burned quickly. The victim dropped the lit sparklers to the ground, and that ignited a cake of gunpowder residue left on the ground. The victim sustained third-degree burns over 25 percent of his body surface when the fireworks blew up in front of him.

Malfunction (11 victims injured, 35 percent).

Eleven victims were injured when fireworks reportedly malfunctioned. These injuries resulted from errant flight paths, early or late ignitions, tip-overs, and blowout. Note that some of the errant flight path injuries may have involved tip-overs, but victims may have been unable to observe the tip-over if they were far from the fireworks.

Errant Flight Path.

- In Case 3, a 15-year-old female was watching a public display of fireworks. The victim was hundreds of feet away on the edge of a large field next to a church. A firework struck the victim and ignited her shorts and tops. The victim dropped and rolled to smother the rapidly spreading clothing fire. The victim sustained second- and third-degree burns to her arm, abdomen, and thighs.
- In Case 11, a 7-year-old boy and his family were outside watching fireworks set off by the next door neighbor. A firework ricocheted off the house and exploded near the porch from where the victim was observing the fireworks. It was dark and the victim did not see the firework coming. The victim's guardian witnessed the incident and thought that the firework involved was a fountain type. The victim's calves were injured and both his legs were burned.
- In Case 20, a 20-year-old male was at his girlfriend's house. A family member had bought some fireworks. A cardboard box with multiple shells was ignited on the ground. The first six shells shot upward, but the seventh shell shot sideways and hit the victim in the face. The victim sustained a laceration below his eye.
- In Case 27, a 30-year-old female was at a friend's house. This friend ignited a multiple tube device type firework on the ground in the backyard. The first shot went upwards, but the second one went sideways and hit the victim in the lower arm and waist. The victim suffered a second-degree burn on her abdomen and a thermal burn on her right lower arm.

Early or Late Ignition.

- In Case 10, a 6-year-old girl and others were lighting up bottle rockets. They had several out, one for each child. The victim's bottle rocket did not go off. The victim was told not to pick up the can used to hold the rocket, but she reached down to the can and the firework blew off. The victim suffered burns between her fingers.
- In Case 12, a 7-year-old boy and his 11-year-old brother were outside in the yard. The victim's brother pulled the string of a grenade to pop it, but the grenade did not go off. The boys came inside but the victim was determined to set the firework off. The victim went back outside and the firework exploded in his hand. The victim sustained second-degree burns to his palm.
- In Case 18, a 17-year-old male ignited a mortar type firework that was a leftover from last year. The fuse burned very quickly, and the mortar shot up only a foot before it exploded. The victim did not get away far enough when the mortar exploded. The victim suffered second-degree burns to his hand and wrist.

- In Case 22, a 22-year-old male ignited the first tube of a multiple tube device type firework on the street. The firework exploded right away. The ashes went into the victim's eyes and caused abrasions in both his eyes.

Tip-Over Incidents.

- In Case 17, a 16-year-old female and her father were at a friend's house. They were igniting fireworks outside. A box that contained fireworks was put on the ground. The victim lit fireworks, the box fell over and the fireworks hit the victim's upper left arm. The victim suffered a first-degree burn the size of a tennis ball on her left arm.
- In Case 31, a 68-year-old female sat in her backyard while her son was setting off what was described as reloadable aerial shells. The fireworks were in a pipe in the ground. Several shells shot upward and then the pipe fell over. One of the shells went onto the victim's lap and left upper leg. The victim sustained a thigh hematoma and a second-degree burn on her leg.

Blowout.

- In Case 30, a 45-year-old male and his friends were igniting mortar type fireworks in an open field at the same time. One mortar tube exploded and blew apart. The victim was 10 feet away from the tube, and his eardrum was ruptured from the noise of the explosion.

Other (four victims injured, 13 percent).

There were four victims whose injuries were related to fireworks, based on the NEISS incident narrative and telephone IDI. However, the telephone IDIs did not yield enough information to pinpoint definitively the hazard associated with the incidents.

Debris.

- In Case 13, a 10-year-old girl and her mother were at a public display of fireworks. Some debris from the fireworks went into the victim's eye causing an irritation to her eye.
- In Case 25, a 24-year-old female was at a public display of fireworks. There was a slight breeze and it was more prevalent higher in the air. The victim stared straight up looking at fireworks in the evening sky, and she felt a fragment from fireworks get into her eye. The victim did not feel symptoms until the next day. The victim's eye was scratchy and painful.
- In Case 26, a 25-year-old female felt something get into her eye during a fireworks display set up by her town. The victim suffered blurred vision and felt a sensation in her right eye, and she developed Adie's tonic pupil syndrome shortly after watching the fireworks show. The victim stated that she did not know if her Adie's tonic pupil syndrome was related to the fireworks show.

- In Case 29, a 40-year-old female was at an Indian reservation where fireworks were sold. Fireworks were displayed in a separate area as well. The victim was there to watch the fireworks display, but she was not near the display area. The victim felt something from the sky land on her foot, and she sustained third-degree burns on her foot.

Long-Term Consequences of Fireworks-Related Injuries

Victims were asked whether there were any long-term consequences of their injuries. Most victims (27 of 31, or 87 percent) have experienced or expected complete recoveries with no long-term effects. One victim refused to answer the question. Three victims reported that they have experienced or might suffer long-term effects of the injuries, as follows:

- In Case 5, the explosion from an M-80 fractured the victim's left hand and broke his four fingers. The victim did not know if there would be any long-term effect from his injuries.
- In Case 6, the victim suffered a laceration in his eye and his eye was full of blood when fireworks exploded near his eye. The victim stated that he might lose his eye from the injury.
- In Case 15, the victim sustained retinal damage from blunt force trauma when a firework struck her in the right eye. The victim lost vision in her right eye.

Where Fireworks Were Obtained

Of the 31 telephone survey respondents, 14 (45 percent) knew where the fireworks were obtained. Seven respondents reported that the fireworks had been obtained from a friend or a relative; four stated that fireworks were acquired from a stand; two said that the fireworks were bought from a store; and one reported that the fireworks were obtained from an Indian reservation.

Thirteen victims (42 percent) reported that they did not know the source of the fireworks. This is typically the situation when the victim did not purchase or light the fireworks device that caused the injury. The remaining four victims (13 percent) declared that they were injured at a public display of fireworks.

6. Summary

In 2015, there were 11 reported fireworks-related deaths. However, reporting for 2015 may not be complete at this time. Emergency department-treated injuries are estimated at 11,900 for 2015.

During the 1-month special study period from June 19, 2015 to July 19, 2015, there were an estimated 8,000 emergency department-treated injuries. Children under 15 years old experienced about 26 percent of the estimated injuries, and males of all ages experienced 61 percent of the estimated injuries.

Additionally, similar to previous years, more than half of the estimated injuries during the special study period in 2015 involved burns. Burns were the most frequent injury to all parts of the body, except the eyes, where contusions, lacerations, and other diagnoses (mainly foreign bodies in the eye) occurred more frequently. The parts of the body most often injured were hands and fingers (an estimated 32 percent of the injuries); followed by the head, face, and ears (25 percent); eyes (16 percent); legs (15 percent); trunk (8 percent); and arms (4 percent). Most of the estimated injuries (85 percent) involved treat-and-release dispositions. An estimated 15 percent were treated and transferred to another hospital or admitted to the hospital where the emergency department was located.

Among the different types of fireworks, sparklers were associated with 24 percent of the estimated injuries. Firecrackers accounted for 16 percent of the estimated injuries; bottle rockets were involved in 10 percent of the estimated injuries; reloadable shells were associated with 9 percent of the injuries; multiple tube devices were related to 5 percent of the injuries; novelty devices were associated with 4 percent of the injuries; Roman candles, homemade or altered devices and public display fireworks each accounted for 3 percent of the injuries; and fountains were involved in less than 1 percent of the injuries.

A review of data from telephone follow-up investigations showed that the typical causes of injuries were as follows: (1) misuse of fireworks; (2) errant flight paths; (3) early or late ignition; and (4) debris associated with eye irritations. At the time of the telephone investigation, which was conducted typically 1 to 2 months after the injury, most victims had recovered from their injuries. Three of the 31 victims interviewed reported that the effect of their injuries might be long term.

References

Greene MA and Joholske J (2004), "2003 Fireworks Annual Report: Fireworks-Related Deaths, Emergency Department-Treated Injuries, and Enforcement Activities During 2003," U.S. Consumer Product Safety Commission, Washington DC.

<http://www.cpsc.gov/PageFiles/110093/2003fwreport.PDF>

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 by Westat, Inc. Rockville, MD.

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

Schroeder T and Ault K (2001), "The NEISS Sample (Design and Implementation), 1997 to Present" U.S. Consumer Product Safety Commission, Washington, DC.

<http://www.cpsc.gov/PageFiles/106617/2001d011-6b6.pdf>

Appendix A

Fireworks-Related Injuries and Fireworks Imported

Table A-1 shows that fireworks imports have generally risen over the period 2000–2007, peaking in 2005 at 275.1 million pounds. From 2008 to 2014, fireworks imports have been relatively steady with modest changes for some years. In 2015, the fireworks imports soared to 279.2 millions of pounds, which was the highest since 2000. As for the number of estimated emergency department-treated fireworks-related injuries, year 2015 with 11,900 estimated injuries was also the highest since 2000. The other three highest estimated fireworks-related injuries were 11,400 in 2013, 11,000 in 2000, and 10,800 in 2005. As shown in Table A-1 below, the number of injuries per 100,000 pounds of fireworks has declined from 7.5 injuries per 100,000 pounds in 2000, to 3.4 injuries per 100,000 pounds in 2006 and 2008. From 2009 to 2015, the number of injuries per 100,000 pounds of fireworks was noticeably stable at about 4.3 injuries per 100,000 pounds except for 2013 and 2014. In 2013, the estimated injuries per 100,000 pounds of fireworks imported were 6.3, and in 2014 that number was 4.8.

Table A-1
Estimated Fireworks-Related Injuries and
Estimated Fireworks Imported into the U.S. 2000–2015

Year	Estimated Injuries	Estimated Fireworks Imports (millions of pounds) [¥]	Injuries Per 100,000 Pounds
2015	11,900	279.2	4.3
2014	10,500	219.6	4.8
2013	11,400	180.2	6.3
2012	8,700	201.0	4.3
2011	9,600	228.1	4.2
2010	8,600	199.6	4.3
2009	8,800	200.2	4.4
2008	7,000	208.3	3.4
2007	9,800	260.1	3.8
2006	9,200	272.1	3.4
2005	10,800	275.1	3.9
2004	9,600	230.0	4.2
2003	9,300	214.6	4.3
2002	8,800	175.3	5.0
2001	9,500	155.3	6.1
2000	11,000	146.2	7.5

Source: Injuries from NEISS, U.S. Consumer Product Safety Commission. See Table 1 for further details. Estimated fireworks imports data from the U.S. International Trade Commission (ITC), using Harmonized Tariff Schedule (HTS code 3604.10). Imports include consumer fireworks (1.4G HTS code 3604.10.90.10 and 3604.10.90.50) and display fireworks (1.3G HTS code 3604.10.10.00). Display fireworks were about 6.1 percent of the total imports in 2015. In addition to imported fireworks used in the United States, there is also a small amount of fireworks manufactured in the United States for domestic consumption; the data for these fireworks is not available from the International Trade Commission and is not shown in this table. Fireworks imports data were downloaded from ITC website in April 2016.

[¥]Fireworks imports data subject to change by ITC. These changes have typically been minor.

Although the table suggests a relationship between weight and the number of injuries, it should be interpreted with caution. First, the logical unit of exposure is the number of fireworks devices used, instead of the collective weight of the devices because a person is exposed to injury when a device is consumed (*i.e.*, lit). Injuries per 100,000 fireworks devices imported might be more meaningful, but the number of devices imported is not available. Moreover, using weight over represents heavy devices and underrepresents 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 things other than just the amount of explosive material.

In addition, international trade statistics do not provide weight by fireworks device types. Thus, it is not possible to associate injuries with the weight of different types of fireworks imported. As shown in Table 2 earlier in this report, different fireworks devices have different numbers of injuries. Thus, the decrease in injuries per 100,000 pounds between 2000 and 2008 may be due to different mixtures of types of fireworks imported over time, or an overall decrease in injuries among all types of fireworks. Similarly, the increase in injuries per 100,000 pounds in 2013 may have resulted from different fireworks mixtures, a decrease in importation of fireworks, or just statistical variation. The data do not provide enough information to determine the relative contribution of these factors.

Appendix B
Completed Telephone Investigations

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
1	9	Male	Thermal Burns	Hand	Admit	Firecracker	The victim was holding a lit sparkler in his hand while having firecrackers in the pocket of his shorts. The sparkler ignited the pocket and lit the firecrackers. The victim sustained first-degree burns on his right hand, and second- and third-degree burns to the upper leg from his groin to his knee.	The victim was admitted to the hospital for 1 day. The victim had additional medical treatments after he was discharged from the hospital. The victim had not recovered fully at the time of the telephone interview.
2	12	Male	Thermal Burns	25-50% of Body	Admit	Sparkler	The victim was at an Indian reservation to help his 18-year-old brother who was selling fireworks. The victim held lit sparklers. The fuses were very short and burned quickly. The victim dropped the lit sparklers to the ground and that ignited a cake of gunpowder residue left on the ground. The victim sustained third-degree burns over 25 percent of his body surface when the fireworks blew up in front of him.	The victim was admitted to the hospital for 8 days. After the discharge, the victim had additional medical visits to change the bandage or dressing for his wounds. The victim was still recovering at the time of the telephone interview. The victim's parent stated that it would take up to 3 years for the victim to recover fully.
3	15	Female	Thermal Burns	Upper Leg	Admit	Public Display	The victim was watching a public fireworks display with friends, and she was hundreds of feet away on the edge of a large field next to a church. A firework struck the victim and ignited her shorts and tops. The victim dropped and rolled to smother the rapidly spreading clothing fire. The victim sustained second- and third-degree burns to her arm, abdomen, upper legs and thighs.	The victim was admitted to the hospital for 1 night. After the discharge, the victim had follow-up visits to check, clean, and remove bandages/stitches for her wounds. The victim was still recovering at the time of the telephone interview. The interview respondent—the victim's parent—stated that the victim might need skin grafts.
4	32	Male	Thermal Burns	Pubic Region	Admit	Reloadable Aerial Shell	The victim was sitting in a lawn chair in his yard and watching fireworks set off by his neighbors. One mortar landed on the victim's lap and the victim sustained burns to his groin area.	The victim was admitted and hospitalized for 1 month. The victim was still recovering at the time of the telephone interview. The victim had no idea how long it would take for him to recover fully and stated it might be up to a year.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
5	38	Male	Fracture	Hand	Admit	Large Firecracker	The victim ignited an M-80 type firework while holding it in his left hand. The M-80 had a 5" fuse but it exploded as soon as it was lit. The explosion fractured the victim's left hand and broke his four fingers.	The victim was admitted to the hospital for 3 days. After the discharge, the victim had additional medical visits because the doctor wanted to examine how the victim's hand and fingers were healing. The victim was still recovering when he was interviewed for this report. The victim was not sure how long it would take for him to recover fully but stated it would be at least 2 months.
6	70	Male	Laceration	Face	Admit	Reloadable Aerial Shell	The victim sat on a picnic table in a garage at his friend's house. The friend's fiancé dropped three aerial mortars into a cannon and ignited the fireworks at the end of the driveway. The victim thought that one of the mortars was put in upside down. The fireworks caught fire, exploded and shot different sideways. The victim was the only one who could not get out of the way. The fireworks exploded near the victim's eye, and the victim suffered a laceration and his eye was full of blood.	The victim was hospitalized for 4 days. After the discharge, the victim had two surgeries. The victim was still recovering when he was interviewed for this report, and he stated during the interview that he will have a third surgery on July 30. The victim was not sure how long it would take for him to recover fully, and he was afraid that he might lose his eye from the injury.
7	2	Female	Thermal Burns	Lower Leg	Treat and Transfer	Roman Candle	The victim's family bought a variety pack of fireworks from a store. The victim's mother lit a Roman candle. The mother thought the firework would go off from the opposite end that she ignited, but the Roman candle blew up bolts from the same end that she just lit. The victim was very close to the lit Roman candle, and one of the bolts hit the victim's leg. The victim sustained third-degree burns on the inside of her leg and outside of her calf.	The victim was treated at the emergency department (ED) and then was transferred to another hospital for more care. The victim was admitted there for 1 day. After the discharge, the victim had a follow-up visit to check the healing of her wound and to see if she would need a skin graft. The victim had since fully recovered in at least 1 month but less than 2 months.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
8	3	Female	Thermal Burns	Finger	Treat and Release	Sparkler	The victim and her parents were at a friend's house. The friend had bought sparklers for the children. The victim was holding a lit sparkler in one hand and holding her mother's hand in another. The victim let go of her mother's hand to touch the sparkler with her finger. The victim suffered a thermal burn on her finger.	The victim recovered fully in 7 days.
9	4	Male	Thermal Burns	Ankle	Treat and Release	Unspecified	The victim and his family were at a local park to watch a fireworks display set up by the city. The display was cancelled and the police presence left the park. People began lighting fireworks from all directions. The victim was standing with his family when they all were hit from the side while watching other fireworks in front of them. The victim was the only one got injured. The victim suffered a second-degree burn to his ankle when a firework went into his shoe and blew up.	The victim recovered fully in 7 days.
10	6	Female	Thermal Burns	Finger	Treat and Release	Bottle Rocket	The victim and others were lighting up bottle rockets. They had several out, one for each child. The victim's bottle rocket did not go off. The victim was told not to pick up the can used to hold the rocket, but she reached down to the can and the firework blew off. The victim suffered burns between her fingers.	After the treatment at the ED, the victim had a follow-up visit to change the bandage or dressing for her wound. The victim recuperated fully in 1 week.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
11	7	Male	Thermal Burns	Lower Leg	Treat and Release	Fountain	The victim and his family were outside watching the fireworks set off by the next door neighbor. A firework ricocheted off the house and exploded near the porch where the victim was observing the fireworks from. It was dark and the victim did not see it coming. The interview respondent—the guardian of the victim—witnessed the incident and thought that the firework was a fountain type. The victim's calves were injured and both his legs were burned.	After being treated at the ED, the victim had additional medical visits to check the healing of his legs. The victim was still recovering at the time of the telephone interview, and he was expected to recover fully in 2 to 3 weeks.
12	7	Male	Thermal Burns	Hand	Treat and Release	Novelty Device	The victim and his 11-year-old brother were outside in the yard. The victim's brother pulled the string of a grenade to pop it but the grenade did not go off. The boys came inside but the victim was determined to set the firework off. The victim went back outside and the firework exploded in his hand. The victim sustained second-degree burns to his palm.	After the treatment at the ED, the victim had a follow-up visit to change the bandage or dressing to his wound. The victim's hand had healed fully in a month.
13	10	Female	Foreign Body	Eye	Treat and Release	Public Display	The victim and her mother were at a public display of fireworks. Some debris from the fireworks went into the victim's eye causing an irritation to the eye.	The victim was taken to the ED and the eye was flushed. The victim recovered fully in 2 days.
14	11	Male	Thermal Burns	Hand	Treat and Release	Homemade	The victim went against his mother's instruction and crossed the street to play with neighbor older boys. The boys were playing with a firework they had found. It was reported that the firework was homemade—a big round circle the size of a tennis ball with a very short fuse. The victim had the firework in his hand when it exploded. The victim suffered second-degree burns to his hand and lacerations to his leg.	The victim was still recovering at the time of the telephone interview. The victim's mother stated that it might take a couple more weeks or a month for the victim to recuperate fully.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
15	11	Female	Thermal Burns	Eye	Treat and Release	Unspecified	The victim was out of state visiting her father for the 4th of July. The interview respondent—the victim’s female guardian—did not have all the details about the incident. The guardian stated that the victim was in a pool and people were setting off fireworks. When the victim was getting out of the pool, a firework shot directly at her and struck her in the right eye. The victim sustained retinal damage from blunt force trauma. The victim’s father did not seek medical attention for the victim until 48 hours later. The respondent drove to bring the victim home as soon as she could.	Since the victim was brought home, she had seen ophthalmologists and was still under medical care at the time of the telephone interview.
16	13	Male	Thermal Burns	Neck	Treat and Release	Bottle Rocket	The victim was coming down the steps of his apartment complex, and some young boys from another complex were throwing bottle rockets from their porch. One of the rockets went down the victim’s T-shirt and undershirt. The victim’s clothing was burned, and the victim sustained a second-degree burn on his shoulder and a third-degree burn (about the size of a dollar) on his neck.	After the treatment at the ED, the victim had additional medical visits to see how his burns were healing. The victim had not recovered fully at the time of the telephone interview. His guardian stated during the interview that the victim might need a skin graft for the wound on his neck.
17	16	Female	Thermal Burns	Upper Arm	Treat and Release	Unspecified	The victim was with her father at a friend’s house. The friend had bought fireworks. They were lighting fireworks outside. A box that contained fireworks was put on the ground. The victim ignited the fireworks, the box fell over and the fireworks hit the victim’s upper left arm. The victim suffered a first-degree burn the size of a tennis ball on her upper left arm.	After the treatment at the ED, the victim went to her own doctor to check the burn and to make sure that was healing properly. The victim was still recovering when the telephone interview was conducted, and she was expected to recover fully in 1.5 months.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
18	17	Male	Thermal Burns	Lower Arm	Treat and Release	Reloadable Aerial Shell	The victim ignited a mortar firework that was a leftover from last year. The fuse burned very quickly and the mortar only shot up a foot before it exploded. The victim did not get away far enough when the mortar exploded. The victim sustained second-degree burns to his hand and wrist.	The victim had a follow-up visit to check on the healing of his wounds after the treatment at the ED. The victim had recuperated fully in 3 weeks.
19	18	Male	Internal Injury	Ear	Treat and Release	Homemade	The victim was standing next to his friend who lit a modified bottle rocket. The firework was modified as most of the rocket was cut off. It was just a big ball with no propulsion and barely had a fuse. The victim told his friend not to light the firework, but his friend did. The firework exploded in his friend's hand. The victim sustained a perforated eardrum and several lacerations to his chest and hand.	After the treatment at the ED, the victim saw an audiologist to check his hearing. The victim was still recovering when he was interviewed for this report.
20	20	Male	Laceration	Face	Treat and Release	Reloadable Aerial Shell	The victim was at his girlfriend's house. A family member had bought some fireworks. A cardboard box with multiple shells was ignited on the ground. The first six shells shot upward, but the seventh shell shot sideways and hit the victim in the face. The victim sustained a laceration below his eye.	The victim went to the ED and had his wound stitched. After the treatment at the ED, the victim had a follow-up visit to remove the stitches. The victim recovered fully in 3 weeks.
21	20	Female	Other	Ear	Treat and Release	Reloadable Aerial Shell	The victim was at a barbecue with her friends. One friend put a mortar in a tube upside down by accident and ignited it. Instead of going up in the air, the mortar exploded near the victim's head and made a loud bang. The victim sustained a hearing loss.	The victim had not recovered when she was interviewed for this report, and she stated that it would take one more month for her to recover fully.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
22	22	Male	Contusions Abrasions	Eye	Treat and Release	Multiple Tube Device	The victim was at his brother's house and another relative had bought some fireworks. The victim ignited the first tube of a multiple tube device type firework on the street outside the house, and it exploded right away. The ashes went into the victim's eyes and caused corneal abrasions in both his eyes.	The victim recovered fully in 33 days.
23	23	Female	Other	Head	Treat and Release	Stick Rocket	The victim held a stick rocket in her hand instead of putting it into the ground. The victim ignited the rocket and threw it. Because the victim was so close to the rocket when she lit it, the noise affected her hearing and she had headaches from it for 5 days.	The victim recuperated fully in 5 days.
24	24	Male	Thermal Burns	Hand	Treat and Release	Reloadable Aerial Shell	The victim was standing outside in an alley when he was hit by a mortar type firework. He saw the explosion and tried to run away. The victim suffered second-degree burns to his left hand and right foot.	The victim had a follow-up visit to change the bandage or dressing for his wounds after the treatment at the ED, and he recovered fully in a month.
25	24	Female	Contusions Abrasions	Eye	Treat and Release	Public Display	The victim was at a public display of fireworks. There was a slight breeze and it was more prevalent higher in the air. The victim stared straight up looking at the fireworks in the evening sky, and she felt a fragment from fireworks got into her eye. The victim did not feel symptoms until the next day. Her eye was scratchy and painful.	The victim recovered fully in 2 to 3 days.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
26	25	Female	Foreign Body	Eye	Treat and Release	Public Display	The victim felt something went into her eye during a fireworks display set up by her town. She suffered blurred vision and sensation in her right eye and developed Adie's tonic pupil shortly after watching the fireworks show. The victim did not know if it was related to the fireworks show.	The victim had a follow-up visit to a doctor, and she was fine when she woke up the next morning.
27	30	Female	Thermal Burns	Lower Arm	Treat and Release	Multiple Tube Device	The victim was at a friend's house. The friend ignited a multiple tube device type fireworks on the ground in the backyard. The first shot went upwards, but the second one went sideways and hit the victim in the lower arm and waist. The victim sustained a second-degree burn on her abdomen and a thermal burn on her right lower arm.	The victim was still recovering when she was interviewed for this report. The victim expected to recover fully in 2 months.
28	38	Male	Thermal Burns	Hand	Treat and Release	Reloadable Aerial Shell	The victim held a 2" mortar in his right hand and ignited it. The victim was going to throw the firework, but it exploded in his hand right away. The victim sustained second-degree burns on his hand. The victim stated that he should have put the mortar in the tube on the ground.	After being treated at the ED, the victim had a follow-up visit with his doctor to make sure that his hand was healing properly. The victim recuperated fully in 21 days.
29	40	Female	Thermal Burns	Foot	Treat and Release	Unspecified	The victim was at a reservation where fireworks were being sold. Fireworks were displayed in a separate area as well. The victim was there to watch the fireworks display, and she was not near the display area. The victim felt something from the sky landed on her foot, and she suffered third-degree burns on her foot.	After being treated at the ED, the victim had additional medical treatments for her injury. The victim had not recovered when she was interviewed for the report, and she expected to recover fully in a couple more weeks.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
30	45	Male	Internal Injury	Ear	Treat and Release	Reloadable Aerial Shell	The victim and his friends were igniting mortar type fireworks in an open field at the same time. One mortar tube exploded and blew apart. The victim was 10 feet away from the tube, and his eardrum was ruptured from the noise of the explosion.	The victim recovered fully in 2 weeks.
31	68	Female	Thermal Burns	Upper Leg	Treat and Release	Reloadable Aerial Shell	The victim sat in her backyard while her son was igniting reloadable aerial shells. The fireworks were in a pipe in the ground. Several shells shot upward and then the pipe fell over. One of the shells went onto the victim's lap and left upper leg. The victim suffered a thigh hematoma and a second-degree burn on her leg.	The victim recovered fully in 3 weeks.