2018 Fireworks Annual Report

Fireworks-Related Deaths, Emergency Department-Treated Injuries, and Enforcement Activities During 2018

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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 2018. The report also summarizes CPSC staff's enforcement activities during fiscal year 2018.[1]

Staff obtained information on fireworks-related deaths from news clippings and other sources in CPSC's Consumer Product Safety Risk Management System (CPSRMS). 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 between June 22, 2018 and July 22, 2018. The special study included collecting and analyzing more detailed incident information, such as the type of injury, the fireworks involved, the characteristics of the victim, and the incident scenario. About 62 percent of the estimated annual fireworks-related, emergency department-treated injuries for 2018 occurred during that period.

Highlights of the report:

Deaths and Injuries

- CPSC staff received reports of five nonoccupational fireworks-related deaths during 2018. All of these fatalities were associated with reloadable aerial devices, and all five victims died from direct impacts of fireworks. Reporting of fireworks-related deaths for 2018 is not complete, and the number of deaths in 2018 should be considered a minimum.

- Fireworks were involved in an estimated 9,100 injuries treated in U.S. hospital emergency departments during calendar year 2018 (95 percent confidence interval 7,000–11,100). The estimated rate of emergency department-treated injuries is 2.8 per 100,000 individuals in the United States.

- There is not a statistically significant trend in estimated emergency department-treated, fireworks-related injuries from 2003 to 2018.

- An estimated 5,600 fireworks-related injuries (or 62 percent of the total estimated fireworks-related injuries in 2018) were treated in U.S. hospital emergency departments during the 1-month special study period between June 22, 2018 and July 22, 2018 (95 percent confidence interval 3,900–7,200).

[1] Fiscal year 2018 refers to the period of October 1, 2017 through September 30, 2018.

Results from the 2018 Special Study[2]

- Of the 5,600 estimated fireworks-related injuries sustained, 64 percent were to males, and 36 percent were to females.

- Children younger than 15 years of age accounted for 36 percent of the estimated injuries. Similar to last year, nearly half of the estimated emergency department-treated, fireworks-related injuries were to individuals younger than 20 years of age.

- Children 10 to 14 years of age had the highest estimated rate of emergency department-treated, fireworks-related injuries (5.2 injuries per 100,000 people). Older teens, 15 to 19 years of age, had the second highest estimated rate (3.1 injuries per 100,000 people).

- There were an estimated 500 emergency department-treated injuries associated with sparklers and 200 with bottle rockets.

- There were an estimated 1,000 emergency department-treated injuries associated with firecrackers. Of these, an estimated 33 percent were associated with small firecrackers, an estimated 13 percent with illegal firecrackers, and an estimated 54 percent with firecrackers for which there was no specific information.

- The parts of the body most often injured were hands and fingers (an estimated 28 percent); legs (an estimated 24 percent); eyes (an estimated 19 percent); head, face, and ears (an estimated 15 percent); and arms (an estimated 4 percent).

- Forty-four percent of the emergency department-treated injuries were burns. Burns were the most common injury to hands, fingers, and arms.

- Approximately 81 percent of the victims were treated at the hospital emergency department and then released. An estimated 17 percent of patients were treated and transferred to another hospital, or admitted to the hospital.

- CPSC staff conducted telephone follow-up investigations on a selected sample of fireworks-related injuries reported in NEISS during the special study period to clarify information about the incident scenario or fireworks type. A review of data from the 20 completed follow-up investigations showed that most injuries were associated with misuse or malfunctions of fireworks. Most victims recovered or were expected to recover completely. However, there were victims who reported that their injuries may be long term.

[2] The percentages are calculated from the actual injury estimates.

Enforcement Activities

During fiscal year 2018, CPSC's Office of Compliance and Field Operations continued to work closely with other federal agencies to conduct surveillance on imported fireworks and to enforce the provisions of the Federal Hazardous Substances Act (FHSA) and regulations under the FHSA.

The Compliance and Field Operations staff, in cooperation with U.S. Customs and Border Protection (CBP), continues to conduct surveillance on imported shipments of consumer fireworks. With assistance from CBP, CPSC staff selectively sampled and tested shipments of imported fireworks in fiscal year 2018, to determine compliance with the FHSA requirements. Approximately 67 percent of the selected and tested shipments were found to contain fireworks that were noncompliant. These violative fireworks devices had an estimated import value of $523,000. The most frequent violations were due to overloaded report compositions and fuse violations, comprising approximately 72 and 19 percent of all violations in fiscal year 2018, respectively. CPSC staff requested corrective actions on these noncompliant fireworks; and in most cases, firms voluntarily destroyed the noncompliant fireworks.

1. Introduction

This report describes injuries and deaths associated with fireworks devices, as well as kits and components used to manufacture illegal fireworks, during calendar year 2018. Reports for earlier years in this series can be found at: https://www.cpsc.gov/Research--Statistics/Injury-Statistics#fuel-lighters--fireworks.

This report is organized into seven sections. Section 1 provides a description of the data and statistical methods used in this analysis. Section 2 summarizes the 2018 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 2018, and 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, 2018. Section 5 summarizes the telephone in-depth investigations of a subsample of the injuries during that period. Section 6 describes enforcement activities of CPSC's Office of Compliance and Field Operations during 2018. The report concludes with a summary of the findings in Section 7. Appendix A is a table on the relationship between fireworks-related injuries and fireworks imports between 2003 and 2018. Appendix B provides details on the completed telephone investigations.

Sources of Information

Information on nonoccupational fireworks-related deaths during 2018 was obtained from the CPSC's CPSRMS. CPSRMS combines the data from CPSC's Injury or Potential Injury Incident File (IPII), Death Certificate File (DTHS), and In-Depth Investigation File (INDP) into one incident database. 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 DTHS, neither data source can be considered complete for 2017 or 2018 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 the CPSC's NEISS. NEISS is a probability sample of U.S.

hospitals with emergency departments.[3] Injury information is taken from the emergency department 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, CPSC staff conducts a special study of fireworks-related injuries during the month around July 4 every year. 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 then included in the NEISS narrative. In 2018, the special study period lasted from June 22 to July 22.

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 additional 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-fifth to one-half of the cases assigned. Information on the final status of the telephone interviews conducted during the 2018 special study is 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 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. Additional information is typically available during the special study period 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 these different analyses in the report:

[3] 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.

- 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. Thus 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.[4]

- Detailed analyses of injury patterns
  The tables are based on the special study period only and describe fireworks type, body part injured, diagnosis, age and sex of injured people, and other relevant information. 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 provided in Appendix B. These summaries 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.[5] 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 totals 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

[4] 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).
[5] See Schroeder (2000).

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 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 2018

CPSC has reports of five nonoccupational, fireworks-related deaths that occurred during 2018. Reporting of fireworks-related deaths for 2018 is not complete, and the number of deaths in 2018 should be considered a minimum. Brief descriptions of the incidents, using wording taken from the incident reports, follow:

- A 16-year-old male from Florida died after a mortar tube exploded in his hand on July 5, 2018. According to the police report, the victim's cousin lit the charge of a mortar and placed it in the tube and backed away. The victim then picked up the tube and held it in his left hand. As the cousin went to tell the victim to put the tube down, the tube exploded in the victim's hand and knocked the victim down. The victim suffered a penetrating open wound, approximately 2 inches in diameter to the upper left chest, as well as, flash burns on his face, neck, and chest. In addition, the victim's left thumb was only attached to his hand by skin. The victim was transported to a hospital via an ambulance, and he was pronounced deceased in the emergency room. The cause of death was penetrating shrapnel wound of chest with perforation of heart and lung.

- On July 7, an 18-year-old male from Iowa was setting off fireworks with his friends at his residence. According to the sheriff's report, an adult friend decided to tape a tube to a football helmet using duct tape. This friend then placed the helmet on his head and launched several fireworks from the helmet. This friend did not experience any incidents while doing so. The victim stated he also wanted to launch fireworks from his head and taped a tube to a second helmet. The victim placed the helmet on his head, loaded the tube, and launched one mortar shell from the tube while it was atop of his head. The victim loaded the second mortar in the tube and ignited it, but the shell became stuck in the tube and didn't launch. The mortar exploded in the tube atop of the victim's head a few seconds later and caused the victim to fall to the ground. Bystanders provided first aid to the victim until first responders arrived. The victim was taken to a local hospital and later transported to a medical center where he died the next day due to his injuries.

- A 37-year-old male from Indiana died of massive head trauma caused by professional grade Class 1.3G mortar shells on July 7, 2018.[6] According to the police report, the victim and another man were at the end of a residential driveway together. They put 3-inch mortar shells with altered fuses into yellow PVC tubes and tied wicks together attempting to light them off at the same time. The original electronic fuse for the mortar shells was replaced with a length of cannon fuse and attached to the shells with blue painter tape. The victim stood directly over the tube and lit the fuse. The mortar ignited and struck the victim on the head causing a fatal injury. The other male suffered a serious injury to his head, as well, and was hospitalized. Law enforcement authorities confiscated all fireworks found at the scene.

[6] Class 1.3G fireworks are not within CPSC's regulatory jurisdiction.

- On the night of July 4, a 24-year-old male from South Carolina was fatally injured by a reloadable artillery firework at the common area of an apartment complex. According to the witnesses and police report, the victim put a mortar shell into a launching tube and lit the fuse, and then he held the tube in his right hand and pointed it towards the far end of the common area. The firework exploded in the tube and the victim fell to the ground. Bystanders called the county dispatch, and emergency first responders were dispatched to the location. The first responders provided life-saving measures to the victim. The victim was transported to a local emergency room where he was pronounced deceased later. The cause of death was determined to be blunt force injury of the chest.

- On the New Year's Eve of 2018, a 49-year-old male from Texas died of explosive injuries while shooting fireworks. The incident occurred at the victim's home. It was reported that the victim apparently launched artillery shells from a device on his shoulder. When the victim lit the firework device, there was a blast that caused injuries to the victim's shoulder and chest. The victim was transported to a local hospital but he died en route. The cause of death was explosive injuries, including fractures of multiple ribs, lacerations of the right lung and chest. According to the County Attorney, this incident is still under investigation, and no other information could be released.

Including the five deaths described above, CPSC staff has reports of 121 fireworks-related deaths between 2003 and 2018, for an average of 7.56 deaths per year.[7]

[7] See previous reports in this series (*e.g*., the report for 2017: Tu and Ng (2017)). In the most recent 3 years, the number of deaths included 12 deaths in 2015, 5 deaths in 2016, and 10 deaths in 2017. The data from 2015 to 2017 have been updated based on new incident reports received by CPSC staff during 2018, and may differ from what was reported in the previous reports.

3. National Injury Estimates for 2018

Table 1 and Figure 1 present the estimated number of nonoccupational, fireworks-related injuries treated in U.S. hospital emergency departments between 2003 and 2018.

Table 1
Estimated Fireworks-Related Injuries: 2003–2018

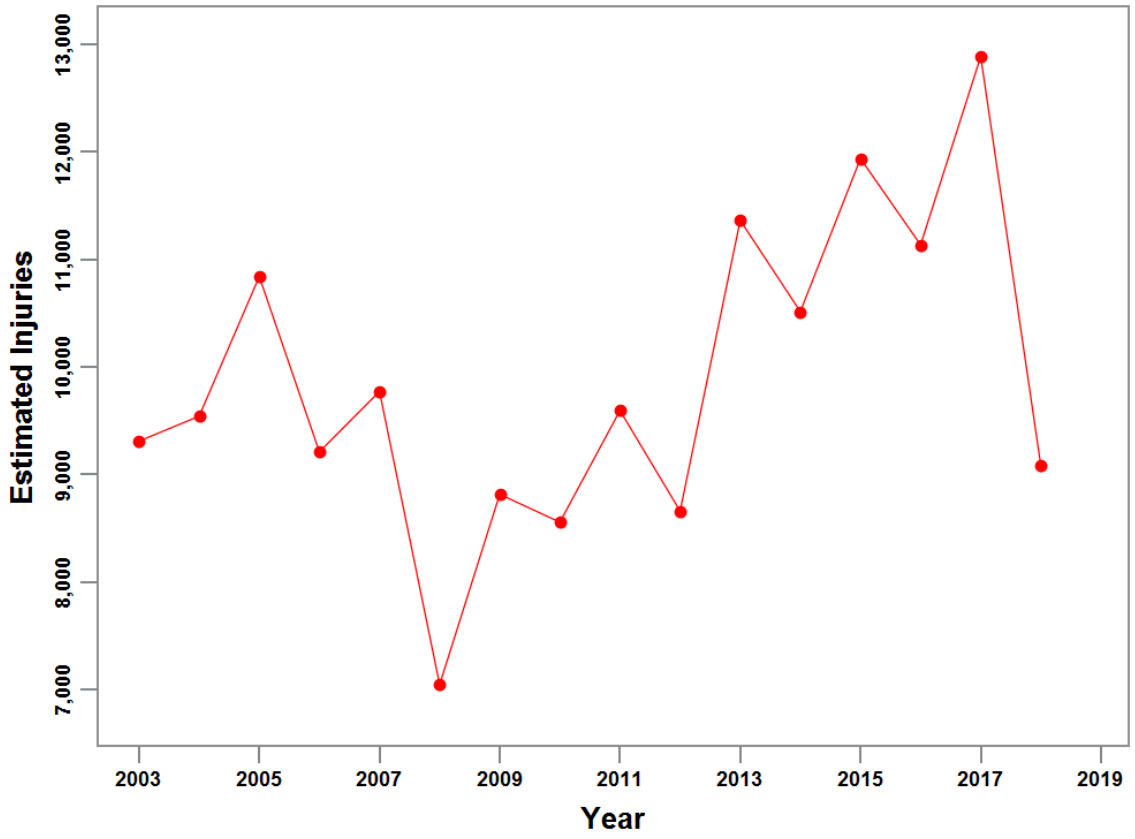
Year	Estimated Injuries	Injuries per 100,000 People
2018	9,100	2.8
2017	12,900	4.0
2016	11,100	3.4
2015	11,900	3.7
2014	10,500	3.3
2013	11,400	3.6
2012	8,700	2.8
2011	9,600	3.1
2010	8,600	2.8
2009	8,800	2.9
2008	7,000	2.3
2007	9,800	3.3
2006	9,200	3.1
2005	10,800	3.7
2004	9,500	3.3
2003	9,300	3.2

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 2018 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, 2018 (NST-EST2018-01), U.S. Census Bureau, Population Division. Release Date: December 2018. Population estimates for 2003 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.

There is not a statistically significant trend detected in the fireworks-related injury estimates from 2003 to 2018.[8] In calendar year 2018, there were an estimated 9,100 fireworks-related, emergency department-treated injuries (95 percent confidence interval 7,000–11,100). There were an estimated 12,900 injuries in 2017. The difference between the injury estimates for 2018 and 2017 is statistically significant.

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

Figure 1
Estimated Fireworks-Related, Emergency Department-Treated Injuries
2003–2018



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

Appendix A contains a table showing estimated fireworks-related injuries and fireworks imports between 2003 and 2018.

4. Injury Estimates for the 2018 Special Study: Detailed Analysis of Injury Patterns

The injury analysis in this section presents the results of the 2018 special study of fireworks-related injuries treated in hospital emergency departments between June 22, 2018 and July 22, 2018. During this period, there were an estimated 5,600 fireworks-related injuries (95 percent confidence interval 3,900–7,200), accounting for 62 percent of the total estimated fireworks-related injuries for the year, which is statistically different from the estimated 8,700 fireworks-related injuries in the 2017 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 22, 2018 to July 22, 2018.

Table 2
Estimated Fireworks-Related Injuries
By Type of Fireworks Device
June 22–July 22, 2018

Fireworks Device Type	Estimated Injuries	Percent
Total	5,600	100
All Firecrackers	1,000	19
Small	300	6
Illegal	100	2
Unspecified	600	10
All Rockets	300	6
Bottle Rockets	200	3
Other Rockets	200	3
All Other Devices	2,300	41
Sparklers	500	9
Fountains	*	*
Novelties	200	4
Multiple Tube	500	8
Reloadable Shells	700	12
Roman Candles	400	7
Homemade/Altered	*	*
Public Display	100	2
Unspecified	1,800	33

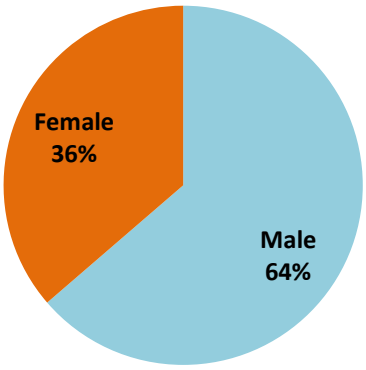
Source: NEISS, U.S. Consumer Product Safety Commission. Based on 146 NEISS emergency department-reported injuries between June 22, 2018 and July 22, 2018, and supplemented by 20 completed In-Depth Investigations (IDIs). Fireworks types are obtained from the IDI, when available; otherwise, fireworks types 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. Estimates are rounded to the nearest 100 injuries. Estimates of fewer than 50 injuries are denoted with an asterisk (*). 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.

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 and homemade/altered devices were involved in less than 1 percent of the total estimated injuries each during the 2018 special study period.

Gender and Age of Injured Persons

Males experienced an estimated 2.2 fireworks-related, emergency department-treated injuries per 100,000 individuals during the special study period. Females had 1.2 injuries per 100,000 people. Figure 2 shows the distribution of estimated fireworks-related injuries by gender.

Figure 2
Estimated Injuries by Gender

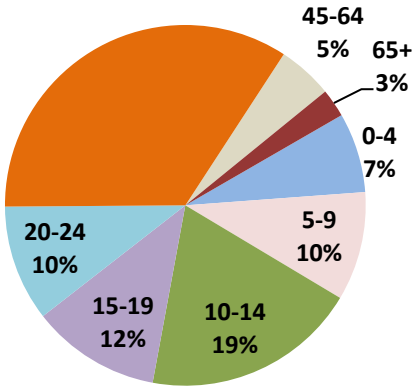


Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 22, 2018 and July 22, 2018.

Children under 5 years of age experienced an estimated 400 injuries (7 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 1,600 injuries. Breaking down that age group further, children 5 to 9 years of age had an estimated 500 injuries and children 10 to 14 years of age accounted for 1,100 injuries.[9]

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

Figure 3
Percentage of Injuries by Age Group



Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 22, 2018 and July 22, 2018.

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.

Table 3
Estimated Fireworks-Related Injuries
By Age and Gender
June 22–July 22, 2018

Age Group	Total	Per 100,000 People	Male	Female
Total	5,600	1.7	3,600	2,000
0–4	400	2.0	200	200
5–14	1,600	4.0	1,000	600
5–9	500	2.7	300	200
10–14	1,100	5.2	700	400
15–24	1,200	2.8	700	500
15–19	600	3.1	300	300
20–24	600	2.6	400	200
25–44	1,900	2.2	1,400	500
45–64	300	0.3	100	200
65+	100	0.3	100	*

Sources: NEISS, U.S. Consumer Product Safety Commission. NC-EST2017-AGESEX-RES: Annual Estimates of the Resident Population by Single Year of Age and Sex for the United States: April 1, 2010 to July 1, 2017. U.S. Census Bureau, Population Division. Release Date: June 2018. The oldest victim was 71 years of age. Estimates are rounded to the nearest 100 injuries. Estimates of fewer than 50 injuries are denoted with an asterisk (*). Age subcategory estimates may not sum to the category total due to rounding.

When considering injury rates (number of injuries per 100,000 people), children and young adults had higher estimated rates of injury than the other age groups during the 2018 special study period. Children 10 to 14 years of age had the highest estimated injury rate at 5.2 per 100,000 population. This was followed by 3.1 injuries per 100,000 people from older teens 15 to 19 years of age, and 2.7 injuries per 100,000 people from children 5 to 9 years of age.

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 of age, sparklers accounted for 54 percent of the total estimated injuries for that specific age group.[10]

[10] 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 22–July 22, 2018

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

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

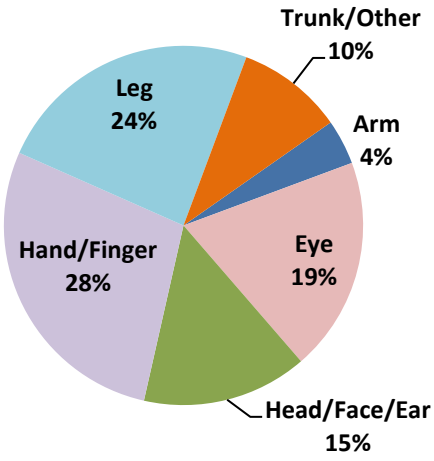
As shown previously in Figure 2, males accounted for 64 percent of the estimated fireworks-related injuries, and females comprised 36 percent. Males accounted for all the

estimated injuries from illegal firecrackers, fountains and homemade/altered devices. In addition, males were associated with a majority of the estimated injuries from small and unspecified firecrackers; sparklers; multiple tube devices; reloadable devices; and Roman candles. Females accounted for all the estimated injuries from public display of fireworks, as well as a majority of the estimated injuries from other rockets and novelty devices.

Body Region Injured and Injury Diagnosis

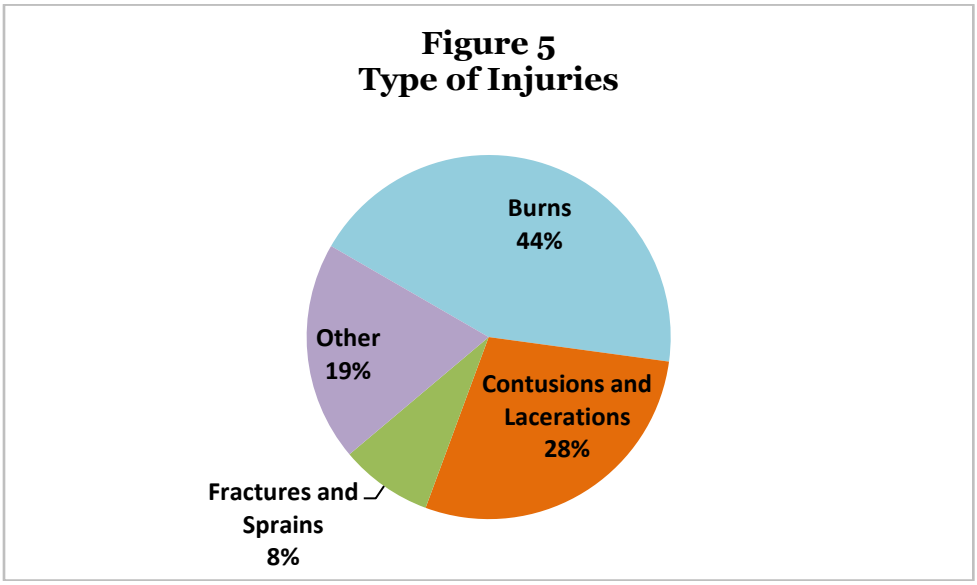
Figure 4 presents the distribution of estimated emergency department-treated injuries by the specific parts of the body to which the injury occurred. Hands and fingers, were associated with an estimated 1,600 injuries. These were followed by an estimated 1,300 leg injuries; 1,100 eye injuries; 800 injuries to the head/face/ear region; 500 injuries to trunk/other category; and 200 arm injuries.

Figure 4
Body Regions Injured



Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 22, 2018 and July 22, 2018. 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."

Figure 5 shows the diagnoses of the estimated injuries associated with fireworks devices. Burns, with 2,500 estimated injuries were the most frequent injury diagnosis. Contusions and lacerations were associated with 1,600 estimated injuries, and fractures and sprains were associated with 500 estimated injuries. The remaining 1,100 estimated injuries were attributed to other diagnoses.[11]



Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 22, 2018 and July 22, 2018. Fractures and sprains also include dislocations. Other diagnoses include all other injury categories. Percentages may not sum to 100 due to rounding.

As shown in Table 5, burns accounted for all the estimated injuries to arms, around half of the injuries to hands and fingers, legs, and head/face/ear regions, as well as over 60 percent of injuries to the trunk and other regions. Contusions and lacerations were the most frequent injuries to eyes, which included foreign bodies in the eye.

[11] Estimated injuries may not sum to total due to rounding. Percentages are calculated from the actual injury estimates and may not sum to 100 due to rounding.

Table 5
Estimated Fireworks-Related Injuries
By Body Region and Diagnosis
June 22–July 22, 2018

Body Region	Total	Diagnosis			
		Burns	Contusions Lacerations	Fractures Sprains	Other Diagnoses
Total	5,600	2,500	1,600	500	1,100
Arm	200	200	*	*	*
Eye	1,100	*	700	*	300
Head/Face/Ear	800	400	300	*	100
Hand/Finger	1,600	800	100	300	300
Leg	1,300	700	400	100	200
Trunk/Other	500	300	*	*	200

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

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 22–July 22, 2018

Fireworks Type	Total	Region of the Body Injured					
		Arm	Eye	Head/Face/Ear	Hand/Finger	Leg	Trunk/Other
Total	5,600	200	1,100	800	1,600	1,300	500
All Firecrackers	1,000	*	300	*	500	200	*
Small	300	*	300	*	100	*	*
Illegal	100	*	*	*	100	*	*
Unspecified	600	*	100	*	300	100	*
All Rockets	300	*	100	*	100	200	*
Bottle Rockets	200	*	100	*	100	*	*
Other Rockets	200	*	*	*	*	200	*
Other Devices	2,300	100	300	400	700	500	300
Sparklers	500	100	*	100	200	100	*
Fountains	*	*	*	*	*	*	*
Novelties	200	100	*	*	*	*	200
Multiple Tube	500	*	*	100	*	300	*
Reloadable	700	*	100	*	400	100	200
Roman Candles	400	*	200	100	100	*	*
Homemade/Altered	*		*	*	*	*	*
Public Display	100	*	*	100	*	*	*
Unspecified	1,800	100	400	400	300	600	200

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

Nearly all of the estimated injuries from illegal firecrackers involved hands and fingers. In addition, 51 percent of the estimated reloadable device injuries, 48 percent of the estimated bottle rocket injuries, and 40 percent of the estimated sparkler injuries involved the hands and fingers as well. A majority of the estimated injuries associated with small firecrackers affected the eyes.

Hospital Treatment

An estimated 81 percent of the victims of fireworks-related injuries in the special study period were treated at the emergency department and then released; about 12 percent were admitted to the hospital; approximately 6 percent of the victims were treated and transferred to another hospital; and 2 percent of the victims had other dispositions (i.e. left hospital without being seen or held for observation).[12] The treat-and-release percentage was lower compared to that for all consumer products in 2018, 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.[13]

[12] The percentages are calculated from actual injury estimates and may not sum to 100 due to rounding.
[13] For all injuries associated with consumer products in 2018, 88 percent of patients were treated and released; 9 percent were admitted to the hospital; 1 percent of patients were transferred to other hospitals; and 2 percent had other dispositions, including left hospital without being seen, held for observation, or dead on arrival.

5. Telephone Investigations of Fireworks-Related Injuries

CPSC staff conducted telephone in-depth investigations of a sample of fireworks incidents that occurred during the 1-month special study period surrounding the 4th of July holiday (June 22, 2018 to July 22, 2018). 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 146 emergency department-treated, fireworks-related injuries during the special study period, staff selected 95 cases for telephone investigations, of which 20 were completed and determined to be in scope, and 75 were incomplete. Table 7 shows the final status of these investigations, including the reasons why some investigations were incomplete.

Table 7
Final Status of Telephone Investigations

Final Case Status	Number of Cases	Percent
Total Assigned	95	100
Completed Investigation	20	21
In Scope	20	21
Incomplete Investigations	75	79
Failed to Reach Patient	49	52
Victim Name Not Provided by Hospital	7	7
Victim Refused to Cooperate	19	20

Short descriptions of the 20 completed in-scope 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 Released, and Left without Being Seen by A Doctor. Within dispositions, cases are in order of increasing age of the victim.

Summary Statistics[14]

Of the 20 completed in scope cases, 14 (70 percent) involved males, and 6 (30 percent) involved females. There were six victims (30 percent) ages 5 to 14 years old; six victims (30 percent) ages 15 to 24 years old; six victims (30 percent) ages 25 to 44 years old; one victim (5 percent) aged 45 to 64 years old; and one victim aged 65 years or older. As for emergency department dispositions, eight victims (40 percent) were admitted to the hospital; 11 victims (55 percent) were treated and released; and one victim (5 percent) left without being seen by a doctor.

The most frequently involved fireworks devices in these incidents were aerial shells,[15] which were associated with 12 incidents (60 percent). Roman candles and novelty devices each accounted for two incidents (10 percent). Bottle rockets; public display of fireworks; homemade devices; and unspecified devices each were involved in one incident (5 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 21 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.

[14] Percentages may not add to 100 due to rounding.
[15] The category "aerial shells" includes multiple tube, reloadable mortars and rockets, but excludes bottle rockets.

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

Hazard Pattern	Number of Cases	Percent
All	20	100
Misuse	6	30
Lighting Fireworks in Hand	2	10
Pointing Lit Fireworks at Someone	1	5
Lighting Fireworks Incorrectly	1	5
Setting Fireworks Improperly	1	5
Lighting Fireworks under Influence of Alcohol	1	5
Malfunction	12	60
Errant Flight Path	7	35
Tip-Over	2	10
Early Ignition	2	10
Blowout	1	5
Other	2	10
Unknown	2	10

Misuse (6 victims injured, 30 percent)

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

Lighting Fireworks in Hand

- In Case 2, an 11-year-old male and his friend found a homemade smoke bomb on a driveway in their neighborhood. The victim held the firework in his left hand while his friend lit it. As soon as the firework was ignited, it exploded in the victim's hand. The victim sustained amputation of his left index finger as well as exposed muscles and shattered bone in his left thumb. He also suffered burns in his face, eyes, neck, and chest.
- In Case 11, it was reported that a 13-year-old male ignited a golf ball-size smoke bomb, and the firework exploded into a ball of fire in the victim's hand. The victim suffered severe burns over his hand and a lot of skin came off. The victim also suffered burns on his face and nose.

Pointing Lit Fireworks at Someone

- In Case 1, an 8-year-old boy lost one eye when he was injured by a Roman candle. It was reported that the victim was on the sidewalk of his apartment complex, an adult male literally aimed a Roman candle at his eye, and the firework went directly into the victim's eye. The victim was transported to the emergency department and admitted to three hospitals for treatment and surgery.

The victim had to have his injured eye removed. In addition, his remaining eye began to close.

Lighting Fireworks Incorrectly

- In Case 10, an 11-year-old girl was injured by an unspecified firework. The victim's mother handed the victim an unspecified firework after the mother straightened the wick. The victim used a long barbecue lighter to ignite the firework. The victim lit the firework at the base instead of at the end of the wick, and there was a big flame from the lighter. The victim straddled over the firework instead of standing beside it when she lit the firework. As soon as she lit the firework, it blew up between her legs. The victim was wearing polyester leggings and some plastic from the firework melted on her skin. The victim sustained a second-degree burn about the size of a quarter on her left thigh and spark marks on her right thigh.

Setting Fireworks Improperly

- In Case 20, a 29-year-old female and her family were waiting to see a fireworks show. They brought their own fireworks to set off with children while waiting for the show. One relative put a multiple tube device type firework on top of a car and ignited it. The first shot went up, and then the firework device fell over shooting remaining four shots in all directions. One shot lodged between the victim's right foot and her footwear and exploded. The victim suffered a third-degree burn about the size of a softball on her right foot.

Lighting Fireworks under Influence of Alcohol

- In Case 7, a 40-year-old male was setting off mortar type of fireworks in the yard. The victim reported that he had consumed too much alcohol before the incident and felt that he was impaired. The victim lit a mortar and thought that the firework had not gone off, but it did actually. The victim put his hand out to deflect the firework away from his face when the mortar shot out the tube. The firework exploded and broke three fingers of the victim's hand.

Malfunction (12 victims injured, 60 percent)

Twelve victims were injured when fireworks reportedly malfunctioned. These injuries resulted from errant flight paths, tip-overs, early ignitions, and a 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 6, a 29-year-old male and his friends were setting off fireworks. The victim lit a mortar type firework but it did not go off, so he kicked it out of the way. About 30 minutes later, the victim tried to relight this firework. The victim crouched down and used a long torch lighter to light the firework at an arm-length. The mortar came out the tube at a weird angle and hit the victim in his eye

instead of going straight up. The firework blew out the victim's eyebrow ring and injured his eyeball.

- In Case 9, a 6-year-old boy was at a neighborhood gathering for the 4th of July. There was a neighborhood display of fireworks, and a lot of children gathered on the street. The victim's father set off a firework that was with a propeller and designed to spin up into the air and explode. The first firework went off as it was supposed to do. The father lit the second firework (same type), the firework flopped on its side instead of shooting up. The firework spun on the street and then shot into the crowd of the children, and it exploded on the victim. The victim suffered a first-degree burn on his chest, and first and second-degree burns on his inside upper arms and biceps.
- In Case 13, a 15-year-old male and his family were setting off fireworks in the backyard. When the last firework—a multiple tube device—was lit, the first shot discharged from the side instead of shooting up. The victim was struck in both legs by the explosion from this misfired shell. The victim sustained holes on his right leg and burns on both legs.
- In Case 14, a 16-year-old female and her family were at a parking lot watching a public display of fireworks set up by the city. Multiple fireworks malfunctioned and shot into the crowd instead of going up. Several people were hurt. The victim was hit in the left leg and forehead. The victim suffered a burn on her left leg and a bump with a burn on the forehead near the temple.
- In Case 15, a 22-year-old female and her boyfriend's family were setting off fireworks for the 4th of July in the backyard. A multiple tube device type of firework was lit on a platform that was a thick piece of wood. The first few shots fired correctly, but the next three shots went in completely different directions. Two went towards the woods, and one shot straight at the victim. As the victim had her hand up to block her face, the shell hit the victim in the head and not the face. The victim suffered three burns on the side of her arm, a burn on her right ear, and some of her hair was burned off. The victim also sustained a concussion.
- In Case 16, a 24-year-old male and his cousins were lighting off fireworks in the street. One cousin lit a bottle rocket about five to six feet away from the victim. The bottle rocket shot just up 2 to 3 feet in the air and then came towards the victim. The firework blew up as soon as the victim grabbed it. The victim suffered third-degree burns on his thumb and three fingers.
- In Case 17, a 31-year-old female was at a friend's house, and one person lit a Roman candle. The victim saw the firework going straight towards her son, so she pushed her son out of the way. The Roman candle hit the victim in her face before she could get away. The victim sustained permanent nerve damage in her face, partial eye loss in the right eye, as well as a hole about an inch in her face. In addition, the victim's seizure disorder had returned as a result. Furthermore, the victim will be losing six teeth because of an abscess developed in her mouth due to the treatment received at the emergency department.

<u>Tip-Over Incidents</u>

- In Case 12, a 13-year-old male, his cousin and the family were setting off fireworks at an open field. It was reported that a multiple tube device type

firework fell over and one shell struck the victim at the ankle. The shell did not explode, but it fractured his ankle.

- In Case 19, a 66-year-old male and his friend sat in a yard, and his friend's children and grandchildren were igniting fireworks across the street 40 yards away from them. The children lit a mortar and the mortar tipped over. The firework flew under a van, hit the sidewalk, bounced up, and then hit the victim on the side and exploded. The firework burned through the victim's shirt. The victim suffered first, second, and third-degree burns on the side of his upper body as well as burns on his stomach.

Early Ignition

- In Case 4, a 20-year-old male victim was given a mortar type firework. When the victim lit the mortar, it failed to launch and blew up the victim's right hand.
- In Case 18, a 41-year-old male was injured by a multiple tube device type firework. The victim and his family were setting off fireworks in the driveway. The victim lit the fuse of a 60-shot multiple tube device. As soon as the victim ignited the fuse, the firework went off into the victim's face as he stood up and walked away. The victim stated that although he got a little closer to the firework to see the fuse because it was getting darker, he did not stand over the firework device. The victim was hit four times in the face. The victim suffered separation of septum from inside of his nose and a few bruises on the left side of his face.

Blowout

- In Case 5, a 28-year-old male was seriously injured by fireworks. The victim and his friend were igniting mortars in a driveway. It was reported that the fireworks were yellow plastic cylinders about 5 inches long and were bought by his friend 3 or 4 years ago. The victim's friend set off four to five mortars with no problems. The victim stated that when he lit a mortar, both charges ignited at the same time and the firework exploded at the bottom of the launching tube. The explosion split the tube open and a piece of firework or plastic tubing shot and punctured the victim's left hand, and his left thumb was injured severely.

Other (Two victims injured, 10 percent)

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

Unknown

- In Case 3, a 17-year-old male's left hand was seriously injured by fireworks. The victim and his family were in an open field on a tribal land. They were setting off fireworks while watching other people doing the same. When they were ready to leave, they heard something coming towards them. As they turned around, a firework exploded on the victim. The victim sustained serious injuries on his left hand. The fingertips of his left index and middle fingers were amputated, the

thumb was shattered, and the ring finger was fractured at the base. Additionally, the victim suffered several abrasions in his cornea, face and abdomen.

- In Case 8, a 52-year-old female was hit by a rocket while walking a dog in a park. The victim was disorientated and suffered thermal burns on her right leg and knee. The victim stated that she did not see who set off the rocket or where the firework came from.

Long-Term Consequences of Fireworks-Related Injuries

Victims were asked whether there were any long-term consequences of their injuries. Most victims (12 of 20, or 60 percent) have experienced or expected complete recoveries with no long-term effects. Eight victims reported that they have experienced or might suffer long-term effects of the injuries, as follows:

- In Case 1, the victim was hit in the eye directly by a Roman candle, and his injured eye had to be removed as a result.
- In Case 2, the victim held a homemade firework while his friend ignited it. The firework exploded in the victim's hand. The victim sustained amputation of his left index finger as well as exposed muscles and shattered bone in his left thumb. The victim may not regain full function of his left hand.
- In Case 3, a firework exploded on the victim. The fingertips of the victim's left index and middle fingers were amputated, the thumb was shattered, and the ring finger was fractured at the base. The victim may not regain the full function of his left hand.
- In Case 4, a mortar failed to launch and blew up the victim's right hand. The victim stated that the wrist movement in his right hand was lost permanently as a result of the injury.
- In Case 5, a mortar exploded at the bottom of the launching tube, and a piece of firework or plastic tubing shot and punctured the victim's left hand. The victim reported that he suffered severe nerve loss and will not have the full mobility of his left hand as a result.
- In Case 6, a mortar came out the launching tube at a weird angle and hit the victim in his eye instead of going up. The firework blew out the victim's eyebrow ring and injured his eyeball. The victim lost one eye and suffered night vision impairment. The victim reported that he could no longer drive at night.
- In Case 7, the victim used his hand to deflect a mortar away from his face when the mortar shot out from the launching tube. The mortar exploded and broke three fingers of the victim's hand. The victim reported that he suffered some loss of mobility in his hand as a result.
- In Case 17, the victim was hit in the face by a Roman candle. The victim said that she sustained permanent nerve damage in her face and partial eye loss in the right eye.

Where Fireworks Were Obtained

Of the 20 telephone survey respondents, 15 (75 percent) knew where the fireworks were obtained. Among them, five respondents reported that the fireworks were purchased from a stand/tent; another five respondents stated that fireworks were acquired from a friend or a relative; three said that the fireworks were bought from a store; one reported that the fireworks was found on a driveway; and one respondent said that the fireworks were obtained at a tribal land.

Three victims (15 percent) stated 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. One (5 percent) victim was injured at a public display of fireworks. In the remaining case, the response for the question was not recorded due to technical problems.

6. Enforcement Activities

During fiscal year 2018, CPSC's Office of Compliance and Field Operations continued to work closely with other federal agencies to conduct surveillance on imported fireworks and to enforce the provisions of FHSA and FHSA regulations.

The Compliance and Field Operations staff, in cooperation with CBP, continues to conduct surveillance on imported shipments of consumer fireworks. With assistance from CBP, CPSC staff selectively sampled and tested shipments of imported fireworks in fiscal year 2018, for compliance with the FHSA requirements. Approximately 67 percent of the selected and tested shipments were found to contain fireworks that were noncompliant. These violative fireworks devices had an estimated import value of $523,000. The most frequent violations were due to overloaded report compositions and fuse violations, comprising approximately 72 and 19 percent of all violations in fiscal year 2018, respectively. CPSC staff requested corrective action on these noncompliant fireworks; and in most cases, firms voluntarily destroyed the noncompliant fireworks. Because CPSC's fireworks program stops noncompliant fireworks at import, fewer violative and dangerous imported fireworks are reaching retail stores and roadside stands.

CPSC staff's enforcement effort remains focused on reducing the number of fireworks-related deaths and injuries, by stopping the sale and distribution of consumer fireworks that violate mandatory regulations.

7. Summary

In calendar year 2018, there were five reported nonoccupational fireworks-related deaths. However, reporting for 2018 may not be complete at this time. Emergency department-treated injuries are estimated at 9,100 for calendar year 2018.

During the 1-month special study period from June 22, 2018 to July 22, 2018, there were an estimated 5,600 emergency department-treated fireworks-related injuries. Children under 15 years of age experienced about 36 percent of the estimated injuries, and males of all ages experienced 64 percent of the estimated injuries.

Additionally, similar to results from previous special study periods, 44 percent of the estimated injuries during the special study period in 2018 involved burns. Burns were the most frequent injury to fingers, hands and arms. The parts of the body most often injured were hands and fingers (an estimated 28 percent of the injuries); followed by legs (24 percent); eyes (19 percent); the head, face, and ears (15 percent); trunk (10 percent); and arms (4 percent). Most of the estimated injuries (81 percent) involved treat-and-release dispositions. An estimated 17 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, firecrackers accounted for 19 percent of the estimated injuries during the special study period; reloadable shells were involved in 12 percent; and sparklers were associated with 9 percent. Multiple tube devices were involved in 8 percent of the estimated injuries and Roman candles were related to 7 percent. Novelty devices were associated with 4 percent of the estimated injuries. Bottle rockets and other rockets each accounted for 3 percent of the estimated injuries. Public display of fireworks were involved in 2 percent of the estimated injuries. Fountains and homemade/altered devices each were associated with less than 1 percent of the estimated injuries.

A review of data from telephone follow-up investigations showed that the typical causes of injuries were as follows: misuse of fireworks; errant flight paths; tip-overs; early ignitions; and blowout. 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. Eight of the 20 victims interviewed reported that the effect of their injuries might be long term.

Finally, in fiscal year 2018, CPSC staff continued to actively monitor import shipments of fireworks and products in the marketplace. CPSC staff worked with CBP to sample imported fireworks. Compliance staff conducted inspections at fireworks retailers to collect samples for analysis and testing for compliance with mandatory requirements.

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Appendix A
Fireworks-Related Injuries and Fireworks Imported

Table A-1 shows that fireworks imports have generally risen over the period 2003–2007, 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 279.5 millions of pounds, which was the highest since 2003. It decreased to 262.3 and 247.0 million pounds in 2016 and 2017, respectively. In 2018, the fireworks imports increased to 278.1 million pounds, the second highest since 2003.

As for the number of estimated emergency department-treated fireworks-related injuries, year 2018 with 9,100 estimated injuries was the lowest since 2013. The highest three estimated fireworks-related injuries were 12,900 in 2017, 11,900 in 2015, and 11,400 in 2013.

As shown in Table A-1 below, the estimated number of injuries per 100,000 pounds of fireworks imported was 3.3 in 2018, which was the lowest since 2003. The highest three estimated number of injuries per 100,000 pounds of fireworks were 6.3 injuries in 2013, 5.2 injuries in 2017, and 4.8 injuries in 2014. For the other years, that number ranged between 3.4 injuries and 4.4 injuries per 100,000 pounds of fireworks imported.

Table A-1
Estimated Fireworks-Related Injuries and
Estimated Fireworks Imported into the U.S. 2003–2018

Year	Estimated Injuries	Estimated Fireworks Imports (millions of pounds)[¥]	Injuries Per 100,000 Pounds of Fireworks Imported
2018	9,100	278.1	3.3
2017	12,900	247.0	5.2
2016	11,100	262.3	4.2
2015	11,900	279.5	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	9,500	230.0	4.1
2003	9,300	214.6	4.3

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 6.6 percent of the total imports in 2018. 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 2019.
[¥] 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 overrepresents 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 2003 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	8	Male	Thermal Burns	Eye	Admit	Roman Candle	It was reported that the victim was on the sidewalk of his apartment complex. An adult male literally aimed a Roman candle at the victim's eye, and the firework went directly into the victim's eye. The victim was transported to the emergency department (ED) and admitted to three hospitals for treatment and surgery. The victim had to have his injured eye removed. In addition, his remaining eye began to close.	The victim had additional medical visits for surgery and treatment of an eye infection after discharge from the hospital. The victim was still recovering from his injuries at the time of the telephone interview.
2	11	Male	Amputation	Finger	Admit	Homemade	The victim and his friend found a homemade smoke bomb on a driveway in their neighborhood. The victim held the firework in his left hand while his friend lit it. As soon as the firework was ignited, it blew up in the victim's hand. The victim sustained amputation of his left index finger as well as exposed muscles and shattered bone in his left thumb. The victim also suffered burns on his face, eyes, neck and chest.	The victim was airlifted to the ED and was admitted for one night. After discharge, the victim had follow-up visits to get more X-rays, to change the bandage/dressing, and to check his eyes and the healing of his hand. The victim was still recovering at the time of the telephone interview. The victim's mother who answered the telephone interview indicated that the victim may need more surgeries later, and she did not know how long it will take for the victim to recover fully.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
3	17	Male	Amputation	Finger	Admit	Reloadable Aerial Shell	The victim and his family were in an open field on a tribal land. They were setting off fireworks while watching other people doing the same. When they were ready to leave, they heard something coming towards them. As they turned around, a firework exploded on the victim. The victim sustained serious injuries on his left hand. The fingertips of his left index and middle fingers were amputated, the thumb was shattered, and the ring finger was fractured at the base. In addition, the victim suffered several abrasions on his cornea, face and abdomen.	The victim was admitted to the hospital for 2 to 3 days. It took approximately 1 month for the victim to recover fully.
4	20	Male	Avulsion	Hand	Admit	Reloadable Aerial Shell	The victim was given a mortar type firework. When the victim lit the firework, it failed to launch and blew up the victim's right hand.	The victim was hospitalized for 14 to 15 days. After discharge from the hospital, the victim had additional follow-up visits, and he was expected to have a surgery to fuse the bones in his right wrist. When the victim was interviewed for this report, he was still recovering from the injuries. The victim stated that it will take 2 more months for him to recover fully.
5	28	Male	Amputation	Finger	Admit	Reloadable Aerial Shell	The victim and his friend were igniting mortars in a driveway. It was reported that the fireworks were yellow plastic cylinder about 5-inch long and were bought by his friend 3 or 4 years ago. The victim's friend set off four to five mortars with no problems. The victim stated that when he lit a mortar, both charges ignited at the same time and the firework exploded at the bottom of the launching tube. The explosion split the tube open and a piece of firework or plastic tubing shot and punctured the victim's left hand and severely injured his left thumb.	The victim was hospitalized for 4 days and his left thumb was reattached. After discharge, the victim had follow-up visits to remove the cast and to determine the next stage of surgery. At the time of the telephone interview, the victim was still undergoing treatment. The victim estimated that it may take 6 to 12 months for him to fully recover.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
6	29	Male	Other	Eye	Admit	Reloadable Aerial Shell	The victim and his friends were setting off fireworks. The victim lit a mortar type firework but it did not go off, so he kicked it out of the way. About 30 minutes later, the victim tried to relight this firework. The victim crouched down and used a long torch lighter to light the firework at an arm-length. The mortar came out the tube at a weird angle and hit the victim in his eye instead of going straight up. The firework blew out the victim's eyebrow ring and injured his eyeball.	The victim was admitted to the hospital for 3 days. After discharge from the hospital, the victim had weekly follow-up visits to have surgery and to check the progress of his eye. Doctors tried to save the victim's eyeball by stitching it, but they had to remove it eventually. The victim was still undergoing treatment when he was interviewed for this report, and he estimated it may take 4 to 5 months for him to recover fully.
7	40	Male	Fracture	Finger	Admit	Reloadable Aerial Shell	The victim was setting off mortar type fireworks in the yard. The victim reported that he had consumed too much alcohol before the incident and felt that he was impaired. The victim lit a mortar and thought that the firework had not gone off, but it did actually. The victim put his hand out to deflect the firework away from his face when the mortar shot out of the tube. The firework exploded and broke three fingers of the victim's hand.	The victim was admitted to the hospital for 3 to 4 days. After discharge, the victim had follow-up visits to have surgery and hand therapy. The victim had recovered fully in 3 months.
8	52	Female	Thermal Burns	Lower Leg	Admit	Rocket	The victim was walking a dog in a park when she was hit by a rocket type firework. The victim was disoriented and suffered thermal burns on her right leg and knee. The victim stated that she did not see who set off the rocket and where the firework came from.	The victim was admitted to the hospital for a few hours, and she had since fully recovered in a month and a half.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
9	6	Male	Thermal Burns	Upper Arm	Treat and Release	Novelty Device	The victim was at a neighborhood gathering for the 4th of July, and there was a neighborhood display of fireworks. A lot of children gathered on the street. The victim's father set off a firework that was with a propeller and designed to spin up into the air and explode. The first firework went off as it was supposed to do. The father lit the second firework (same type), the firework flopped on its side instead of shooting up into the air. The firework spun on the street and then shot into the crowd of the children, and it exploded on the victim. The victim suffered a first-degree burn on his chest, and first- and second-degree burns on his inside upper arms and biceps.	After the treatment at the ED, the victim had a follow-up visit to remove dead skin and to make sure the wounds are healing. The victim had fully recovered in about a week.
10	11	Female	Thermal Burns	Upper Leg	Treat and Release	Unspecified	The victim' mother handed the victim an unspecified firework after she straightened the wick for it. The victim used a long barbecue lighter to light the firework. The victim lit the firework at the base instead of at the end of the wick, and there was a big frame from the lighter. The victim straddled over the firework instead of standing beside it when she lit the firework. As soon as she ignited the firework, it blew up between her legs. The victim was wearing polyester leggings and some plastic from the firework melted on her skin. The victim suffered a second-degree burn about the size of a quarter on her left thigh and spark marks on her right thigh.	After being treated and released from the ED, the victim did not seek further treatment.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
11	13	Male	Thermal Burns	Hand	Treat and Release	Smoke Bomb	It was reported that the victim ignited a golf ball-size smoke bomb, and the firework exploded into a ball of fire in the victim's hand. The victim suffered severe burns over his hand, and a lot of skin came off. The victim also had burns on his face and nose.	The victim was taken to the ED for treatment. Doctors there had to clean and scrap off the burned skin form the victim's hand. The victim had follow-up visits to change bandage/dressing for the wounds and to have therapy for his hand. According to the victim's father who answered the telephone interview, the victim will recover fully when his skin grows back completely in 2 weeks.
12	13	Male	Fracture	Ankle	Treat and Release	Multiple Tube Device	The victim, his cousin and the family were setting off fireworks at an open field. It was reported that a multiple tube device type firework fell over and one shot struck the victim at the ankle. The shell did not explode, but it fractured his ankle.	The victim was taken to the ED and was put in a splint. The victim had follow-up visits with a pediatric orthopedic doctor to get a cast. The victim was in the cast for about 9 weeks before it was removed. According to the victim's mother who responded to the telephone survey, the victim had fully recovered but had a walking boot at the time of the telephone interview.
13	15	Male	Avulsion	Lower Leg	Treat and Release	Multiple Tube Device	The victim and his family were setting off fireworks in their backyard. When the last firework—a multiple tube device—was lit, the first shot discharged from the side instead of shooting up. The remaining 14 shots fired correctly. The victim was struck in both legs by the explosion from this misfired shell. The victim sustained holes on his right leg as well as burns on both legs.	The victim was treated at the ED and released. The victim had follow-up visits to remove debris and change bandage/dressing for his wounds. According to the victim's mother who answered the telephone survey, the victim was still healing from his injuries at the time of the telephone interview. The mother stated that the victim was expected to recover fully in about 8 weeks.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
14	16	Female	Thermal Burns	Face	Treat and Release	Public Display	The victim and her family were at a parking lot watching a public display of fireworks set up by the city. Multiple fireworks malfunctioned and shot into the crowd instead of going up. Several people were hurt. The victim was hit in left leg and the forehead. The victim sustained a burn on her leg and a bump with a burn on the forehead near the temple area.	After being treated at the ED, the victim had follow-up visits with her regular doctor to make sure that everything was healing correctly. According to the victim's mother who answered the telephone survey, the victim was still recovering at the time of the telephone interview. The victim's mother stated that she did not know how long it will take for the victim to recover fully.
15	22	Female	Concussions	Head	Treat and Release	Multiple Tube Device	The victim was with her boyfriend's family to celebrate her boyfriend's birthday and the 4th of July, and they were setting off fireworks in the backyard. A multiple tube device type firework was lit on a platform that was a thick piece of wood. The first few shots fired correctly, but the next three shots went in completely different directions. Two shots went towards the woods and the third one shot straight at the victim. The victim had her hand up to block her face, and the firework hit her in the head. The victim suffered three burns on the side of her arm, a burn on her right ear, and some of her hair was burned off. The victim sustained a concussion as well.	The victim was treated at the ED and released. When she was interviewed for this report, the victim stated that the burns had healed in 2 weeks but she was still recovering from the concussion.
16	24	Male	Thermal Burns	Hand	Treat and Release	Bottle Rocket	The victim was at his aunt and cousins' house, and they were setting off fireworks in the street. One cousin lit a bottle rocket about five to six feet away from the victim. The bottle rocket did not shoot up all the way (just up 2 to 3 feet in the air) and then came towards the victim. The firework blew up as soon as the victim grabbed it. The victim suffered third-degree burns on his thumb and three fingers.	The victim recovered fully in about a month and a half.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
17	31	Female	Nerve Damage	Face	Treat and Release	Roman Candle	The victim was at a friend's house, and one person set off a Roman candle. The victim saw that the firework was going straight towards her son, so she pushed her son out of the way. The firework hit the victim in her face before she could get away. The victim sustained permanent nerve damage in her face, partial eye loss in the right eye, as well as a hole about an inch in her face. In addition, the victim's seizure disorder had returned as a result. Furthermore, the victim will be losing six teeth because of an abscess developed in her mouth due to the treatment received at the ED.	The victim had follow-up visits to change bandage/dressing for her wounds. She was still healing at the time of the telephone interview. The victim stated that she will need plastic surgery to look normal, and she can no longer drive and has to be seizure free for 2 years to return to work. She did not know when she will be recovered fully.
18	41	Male	Contusions Abrasions	Face	Treat and Release	Multiple Tube Device	The victim and his family were setting off fireworks on the driveway. The victim lit the fuse of a 60-shot multiple tube device. As soon as the victim lit the fuse, the firework went off into his face as he stood up and walked away. The victim stated that he got a little closer to the firework to see the fuse because it was getting darker, but he did not stand over the firework device. The victim was hit four times in the face. He suffered separation of septum from inside of his nose and a few bruises on the left of his face.	The victim received a couple stitches on the outside of his nose at the ED. The victim had a follow-up visit to remove the stitches later. When the victim was interviewed for this report, he stated that he had a scar on the inside of his nose and did not know if he had fully recovered.
19	66	Male	Thermal Burns	Upper Trunk	Treat and Release	Reloadable Aerial Shell	The victim and his friend sat in a yard, and his friend's children and grandchildren were setting off fireworks across the street 40 yards away from them. The children lit a mortar and the mortar tipped over somehow. The firework flew under a van, hit the sidewalk, bounced up, and then hit the victim on the side and exploded. The firework burned through the victim's shirt. The victim sustained the first, second, and third-degree burns on the side of his upper body as well as burns on his stomach.	After the treatment at the ED, the victim sought additional treatments at a few other hospitals. The victim had a nurse come to change bandage/dressing for him three times of a week for about a month. At the time of the telephone interview, the victim was still recovering from his injuries. The victim stated that he will be able to go without bandages soon hopefully.

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Incident Description	Medical Treatment and Prognosis
20	29	Female	Thermal Burns	Foot	Left without Being Seen	Multiple Tube Device	The victim and her family were waiting to see a fireworks show. They brought some their own fireworks to set off with children while waiting for the show. One of the victim's relatives put a multiple tube device type firework on top of a car and ignited it. The first shot went up, and then the firework device fell over shooting remaining four shots in all directions. One shot lodged between the victim's right foot and her footwear and went off. The victim sustained a third-degree burn about the size of a softball on her right foot.	The victim waited for 4 days to go to the ED and was told to come back after her vacation. The victim had a follow-up appointment scheduled to determine if she needs a skin graft. The victim was still recovering at the time of the telephone interview and stated that it will 6 weeks for her to recover fully.