United States
Consumer Product Safety Commission

2021 Fireworks Annual Report

Fireworks-Related Deaths, Emergency Department-Treated Injuries, and Enforcement Activities During 2021

June 2022

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

Executive Summary

This report provides the results of U.S. Consumer Product Safety Commission (CPSC) staff's analysis of data on non-occupational, fireworks-related deaths and injuries during calendar year 2021. The report also summarizes CPSC staff's enforcement activities during fiscal year 2021.[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 also estimated fireworks-related injuries treated in hospital emergency departments from CPSC's National Electronic Injury Surveillance System (NEISS). Finally, CPSC staff conducted a special study of non-occupational, fireworks-related injuries between June 18, 2021, and July 18, 2021. 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 74 percent of the estimated annual fireworks-related, emergency department-treated injuries for 2021 occurred during that period.

Highlights of the report

Deaths and Injuries

- CPSC staff received reports of 9 non-occupational, fireworks-related deaths during 2021. Six of the deaths were associated with firework misuse; one death was associated with a mortar launch malfunction; and two incidents were associated with unknown circumstances. Reporting of fireworks-related deaths for 2021 is not complete, and the number of deaths identified for 2021 should be considered a minimum.
- Fireworks were involved with an estimated 11,500 injuries treated in U.S. hospital emergency departments during calendar year 2021 (95 percent confidence interval 8,300–14,700). The estimated rate of emergency department-treated injuries is 3.5 per 100,000 individuals in the United States, a decrease from 4.7 estimated injuries per 100,000 individuals in 2020.
- There is a statistically significant trend in estimated emergency department-treated, fireworks-related injuries from 2006 through 2021. This trend estimates an increase of 274 fireworks injuries per year (p-value = 0.0004).
- An estimated 8,500 fireworks-related injuries (or 74 percent of the total estimated fireworks-related injuries in 2021) were treated in U.S. hospital emergency departments during the 1-month special study period between June 18, 2021, and July 18, 2021 (95 percent confidence interval 5,600–11,300).

[1] The 2021 federal fiscal year refers to the period of October 1, 2020, through September 30, 2021.

Results from the 2021 Special Study

- Of the 8,500 estimated fireworks-related injuries sustained, 59 percent were to males and 41 percent were to females.
- Adults 25 to 44 years of age experienced about 32 percent of the estimated injuries, and children younger than 15 years of age accounted for 29 percent of the estimated injuries. Seniors 65+ years of age experienced a small percent of the estimated injuries at only 4 percent.
- Young adults 20 to 24 years of age had the highest estimated rate of emergency department-treated, fireworks-related injuries (5.1 injuries per 100,000 people). Children, 5 to 9 years of age, had the second highest estimated rate (4.5 injuries per 100,000 people). A general decrease is noted comparing the 2021 rates to the 2020 rates, except for children 5 to 14 years of age, which saw an increase from 3.3 injuries to 4.2 injuries per 100,000 people.
- There were an estimated 1,500 emergency department-treated injuries associated with firecrackers and 1,100 with sparklers.
- The parts of the body most often injured were hands and fingers (an estimated 31 percent); head, face, and ears (an estimated 21 percent); legs (an estimated 15 percent); eyes (an estimated 14 percent); trunk/other regions (an estimated 10 percent); and arms (an estimated 8 percent).
- An estimated 32 percent of the emergency department-treated injuries were burns. Burns were the most common injury to hands and fingers. Contusions and lacerations, accounting for 21 percent of the emergency department-treated injuries, were the most common injury to the head, face, and ears.
- Approximately 83 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 they were 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 11 completed follow-up investigations showed that most injuries were associated with misuse or malfunction of fireworks. Most victims recovered or were expected to recover completely. However, there were victims who reported that their injuries might be long-term.

Enforcement Activities

During fiscal year 2021, CPSC's Office of Compliance and Field Operations continued to work closely with federal agencies to conduct surveillance on consumer fireworks and to enforce the provisions of the Federal Hazardous Substances Act.

Approximately 31 percent of the selected and tested products were found to contain noncompliant fireworks. The noncompliant fireworks devices had a combined estimated import value of $326,000. The violations consisted of fuse violations, presence of prohibited chemicals, and pyrotechnic materials overload.

Table of Contents

1. Introduction

This report describes injuries and deaths during calendar year 2021 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: https://cpsc.gov/Research--Statistics/Fuel-Lighters-and-Fireworks1.

This report is organized into seven sections. Section 1 describes the data and statistical methods used in this analysis. Section 2 summarizes the 2021 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 2021, and it compares that estimate to previous years. Section 4 analyzes emergency department-treated, fireworks-related injuries during the month around July 4, 2021. Section 5 summarizes the telephone in-depth investigations of a subsample of the injury incidents that occurred during that period. Section 6 describes enforcement activities of CPSC's Office of Compliance and Field Operations (EXC) during fiscal year 2021. The report concludes with a summary of the findings in Section 7. Appendix A is a table depicting the relationship between fireworks-related injuries and fireworks imports between 2006 and 2021. Appendix B provides details on the completed telephone investigations.

Sources of Information

Staff obtained information on non-occupational, fireworks-related deaths during 2021 from CPSC's CPSRMS. CPSRMS combines 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 the death certificates from the various states to complete the DTHS, neither data source can be considered complete for 2020 or 2021 fireworks-related deaths at the time this report was prepared. Consequently, the number of deaths should be considered a minimum. Staff updates the total number of deaths for previous years when new reports are received. Total deaths for prior years may not coincide with the number in reports for earlier years because of these updates.

The source of information on non-occupational, emergency department-treated fireworks-related injuries is CPSC's NEISS. NEISS is a probability sample of the U.S. hospitals with emergency departments.[2] 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 narrative of 140 to 400 characters[3] in length and 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 every year during the month around July 4. 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 staff shows 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 are then included in the NEISS narrative. In 2021, the special study period lasted from June 18 to July 18.

After reading the incident case records, including the narrative descriptions of the fireworks device and the incident scenario, CPSC staff may assign a case for additional telephone investigation. Staff usually selects cases that 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 can collect information for one-fifth to one-half of the cases assigned. Information on the final status of the telephone interviews conducted during the 2021 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

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[2] 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. 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.

[3] The maximum available number of characters changed from 142 to 400 characters on January 1, 2019.

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 records collected by the emergency departments usually contain 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:

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.

Detailed analyses of injury patterns

The tables are based on the special study period only, and they 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, CPSC 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 the sampling design into consideration.[4] 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 several 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 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 2021

CPSC has reports of 9 non-occupational, fireworks-related deaths that occurred during 2021.[5] Reporting of fireworks-related deaths for 2021 is not complete, and the number of deaths in 2021 should be considered a minimum. Brief descriptions of the incidents, using wording taken from the incident reports, follow:

> In June, a 31-year-old male was fatally injured from a fireworks blast inside his home. The house explosion occurred while the victim was manufacturing firework devices in his basement. The blast caused a wall of the residence to detach leaving the second floor in a state of collapse. The victim's pregnant wife and four children were all home during the incident. All but the victim managed to escape with limited injuries. After emergency services arrived, they continued to hear explosions from the structure delaying assistance to the victim. Once medical services could safely enter, the victim was found lying supine on the basement floor. The victim was noted to have severe thermal injuries throughout. The victim's official cause of death was listed as extensive blast and thermal injuries.

[4] *See Schroeder (2000).*

[5] *CPSC staff excludes incidents that are indirectly fireworks-related. For instance, fireworks that start fires and lead to deaths are excluded based on the logic that the fire is directly responsible for the death.*

In July, a 23-year-old male was fatally injured while shooting off fireworks. The victim was lighting the device and holding it at an angle above his head. One of the devices discharged from the bottom of the tube striking the victim in the chest and exploding. The victim immediately ran toward the porch before collapsing. Witnesses performed CPR until emergency personnel arrived. The victim was transported to a local hospital where he was pronounced dead.

In July, a 55-year-old male was critically injured after lighting off fireworks utilizing a quick match fuse. A loud boom was heard before the victim was found lying in the street. The victim was pronounced dead at the scene. The medical examiner reports that the victim experienced significant head injuries with near decapitation present. The official cause of death is listed as head trauma due to a fireworks explosion. Another victim was hospitalized with life-threatening injuries and later recovered.

In July, a 24-year-old male was fatally injured from an errant fireworks mortar blast. The device tilted slightly and began firing towards the people nearby. The victim was in a hot tub and attempted to escape with several other people. The victim was taken to the hospital by emergency services and later pronounced dead. Immediately after the incident, the cause of death was mistakenly believed to have been from the victim slipping and hitting his head on concrete while running from the device. This was later clarified after autopsy and was determined that chest trauma was the official cause of death.

In July, a 34-year-old male was fatally injured while lighting commercial grade fireworks in his front yard with his 10-year-old son. A nearby neighbor heard a loud bang and saw smoke coming from the ground but did not see a firework launch into the air. The witness ran to the yard and saw the victim with a fatal head injury. The witness took the victim's son, physically unharmed, into their home to call for emergency services. When sheriffs arrived, they observed the victim's body on the ground, his feet near the base of a metal launching tube partially buried into the ground. The victim was pronounced dead at the scene. The victim did not have proper licenses to handle regulated commercial fireworks.

In July, a 41-year-old male was fatally injured while lighting a mortar style firework device with friends while camping. The victim was holding the mortar tube in his left hand and ignited a shell with his right. There was believed to be a malfunction with the mortar and shell causing the mortar to rupture, projecting the firework backwards toward the victim. The shell struck the victim in his left side/leg area and ruptured his femoral artery. Police were contacted by the victim's friends and arrived at the scene noticing the victim had very shallow breathing and massive abdominal hemorrhaging. Blood appeared to be

coming from the victim's pelvic area. Emergency medical services arrived and attempted life saving measures to no avail. The victim was pronounced dead at the scene.

In July, a 55-year-old male was shooting fireworks from a paddle boat in the middle of a bay when he was fatally injured. The victim lit a fireworks device which exploded unexpectedly. Witnesses reported seeing the victim fall out of the boat shortly after the explosion. When witnesses pulled the victim from the water, he was unresponsive. Emergency responders were contacted by nearby onlookers and transported the victim to a local hospital, where he was then pronounced dead.

In July, an 8-year-old male was fatally injured by an illegal firework. The victim was attending an unofficial block party where several illegal mortar-style fireworks were launched. One of the fireworks malfunctioned and hit the victim in the upper body. The victim was taken to the hospital to be treated, but he died from his injuries.

In November, a 35-year-old male was fatally injured after lighting a large firework device in his hands. After the firework exploded the victim immediately fell to the ground. Emergency responders were contacted by nearby witnesses, who pronounced the victim deceased at the scene due to explosive head trauma. The victim has been known to frequently light fireworks.

Including the 9 deaths described above, CPSC staff has reports of 158 fireworks-related deaths between 2006 and 2021, for an average of 9.9 deaths per year.[6]

[6] *See previous reports in this series (e.g., the report for 2020: Marier, Smith and Lee (2021)). In the most recent 3 years, the number of deaths included 6 deaths in 2018, 20 deaths in 2019, and 26 deaths in 2020. The data from 2018 to 2020 have been updated based on new incident reports received by CPSC staff during 2021 and may differ from previous reports.*

3. National Injury Estimates for 2021

Table 1 and Figure 1 present the estimated number of non-occupational, fireworks-related injuries treated in U.S. hospital emergency departments between 2006 and 2021.

Table 1

Estimated Fireworks-Related, Emergency Department-Treated Injuries: 2006-2021

Year	Estimated Injuries	Injuries per 100,00 People
2021	11,500	3.5
2020	15,600	4.7
2019	10,000	3.0
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

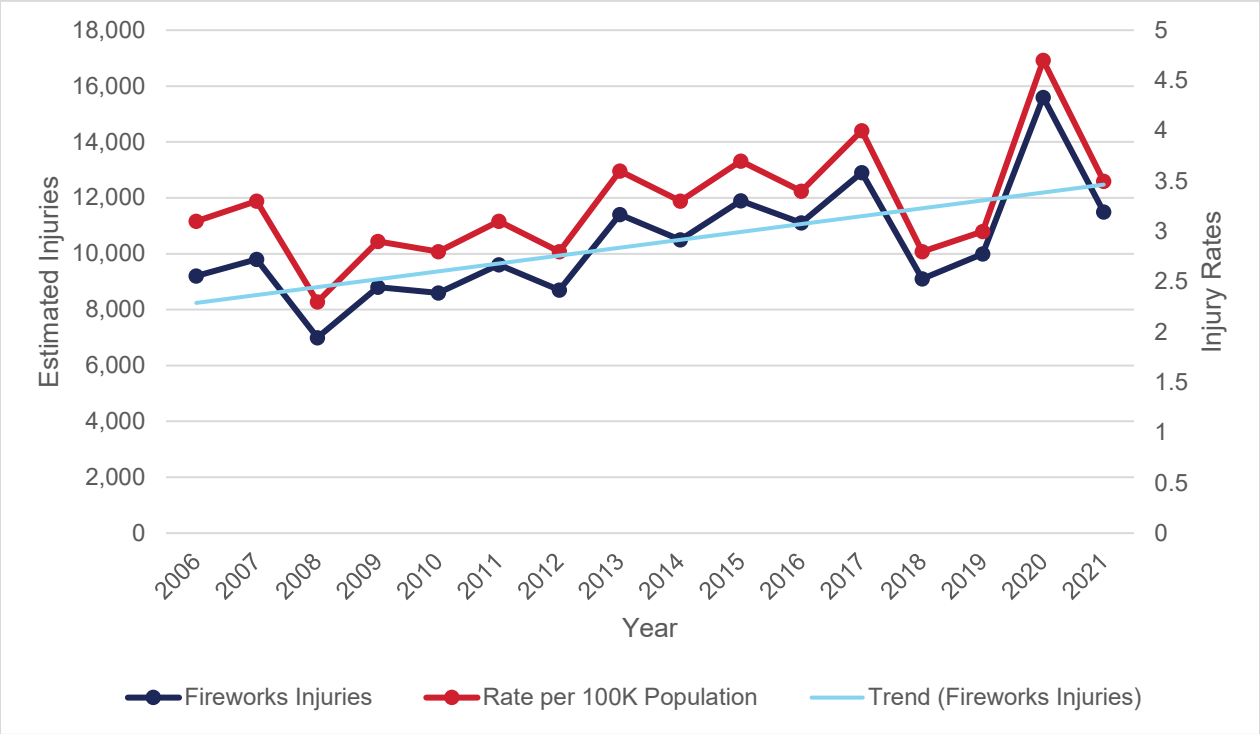
Source: NEISS, U.S. Consumer Product Safety Commission. Population Estimates for 2010 to 2021 are from Annual Estimates of the Resident Population for the United States, States, and the District of Columbia: April 1, 2010 to July 1, 2020 (NST-EST2020) with a 2021 extension: April 1, 2020 to July 1, 2021. U.S. Census Bureau. Population Division. Population estimates for 2005 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). Population Division, U.S. Census Bureau.

There is a statistically significant increasing trend in the fireworks-related injury estimates from 2006 through 2021 (p-value=0.0004).[7] The slope of the fitted trend line shows an

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

increase of about 274 injuries per year. In calendar year 2021, there were an estimated 11,500 fireworks-related, emergency department-treated injuries (95 percent confidence interval 8,300 – 14,700). There were an estimated 15,600 such injuries in 2020. The difference between the injury estimates for 2020 and 2021 is statistically significant (p-value = 0.0015). The 26 percent decrease in emergency department-treated injuries may stem from the increased reopening of public fireworks displays that were closed due to the COVID-19 pandemic in 2020.

Figure 1: Estimated Fireworks-Related, Emergency Department-Treated Injuries: 2006-2021



Source: NEISS, U.S. Consumer Product Safety Commission. Population Estimates for 2010 to 2021 are from Annual Estimates of the Resident Population for the United States, States, and the District of Columbia: April 1, 2010 to July 1, 2020 (NST-EST2020) with a 2021 extension: April 1, 2020 to July 1, 2021. U.S. Census Bureau. Population Division. Population estimates for 2005 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). Population Division, U.S. Census Bureau.

Appendix A contains a table showing estimated fireworks-related, emergency department-treated injuries and fireworks imports between 2006 and 2021.

Table 2 shows that each year, the number of victims treated are mostly white, followed by victims of an unknown race, black victims, and victims of an “other” race. The “other” race category contains Asian, Pacific Islander/Native Hawaiian, and American Indian/Alaskan Native individuals. CPSC began collecting ethnicity information in 2018, which includes information

about whether a victim is Hispanic; as a result, ethnicity information cannot be included at this time for the full 2006-2021 period.[8]

Figure 2 shows the trend by race across years; there is a statistically significant upward trend for white victims (p = 0.0031), but not black or "other" race victims. Between the years 2020 and 2021, there was a significant decrease in the number of white victims (p=0.0077) and neither black nor "other" race victims experienced a significant change.

When comparing the proportion of victims with a known race to the US population,[9] there were proportionately fewer white victims (70.9% of victims, 75.9% of the U.S. population identifies as white), proportionately more black victims (21.5% of victims, 13.6% of the U.S. population identifies as black), proportionately fewer victims associated with an "other" race (7.6% of victims, 7.7% of the U.S. population identifies as another race).These percentages are calculated using only the victims where race was collected. Victims with unknown race values accounted for over 31% of all fireworks incidents in 2021.

[8] *The ethnicity indicator is missing for 29 percent of the fireworks victims in 2021, and thus ethnicity is excluded from this report.*

[9] *Total U.S. Population race estimates obtained from Census 2020 monthly report estimates (NC-EST2020-ALLDATA: Monthly Population Estimates by Age, Sex, Race, and Hispanic Origin for the United States: April 1, 2010, to July 1, 2020 (with short-term projections to December 2021) Release Date: June 2021); Census 2021 estimates were not available at the time of this report.*

Table 2

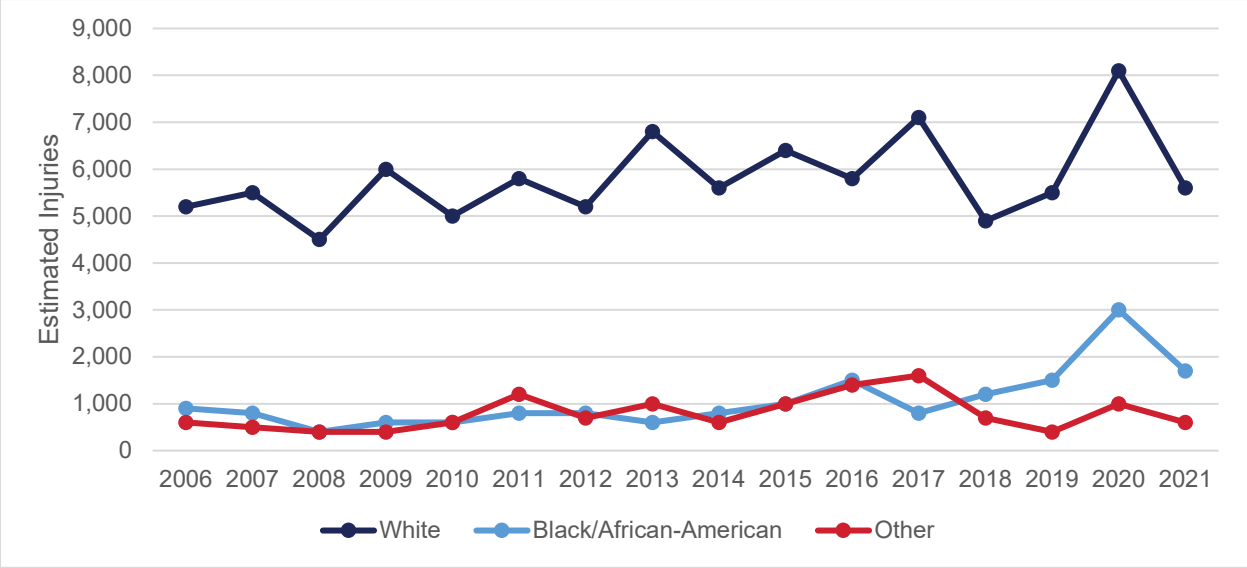
Estimated Fireworks-Related, Emergency Department-Treated Injuries by Race: 2006-2021

Year	White		Black/African-American		Other		Unknown		Total
	N	%	N	%	N	%	N	%	N
2006	5,200	56.0	900	9.3	600	6.7	2,600	28.1	9,200
2007	5,500	56.8	800	8.6	500	5.6	3,000	29.0	9,800
2008	4,500	63.8	400	6.4	400	5.9	1,700	23.9	7,000
2009	6,000	68.6	600	7.4	400	4.9	1,700	19.1	8,800
2010	5,000	58.4	600	7.1	600	6.6	2,400	27.9	8,500
2011	5,800	60.8	800	8.7	1,200	12.6	1,700	17.9	9,600
2012	5,200	59.6	800	8.8	700	10.0	1,900	21.6	8,700
2013	6,800	60.0	600	5.4	1,000	9.2	2,900	25.4	11,400
2014	5,600	52.9	800	7.8	600	5.5	3,600	33.8	10,500
2015	6,400	53.7	1,000	8.3	1,000	8.5	3,500	29.5	11,900
2016	5,800	51.9	1,500	13.3	1,400	12.4	2,500	22.4	11,100
2017	7,100	54.9	800	6.3	1,600	12.5	3,400	26.4	12,900
2018	4,900	53.7	1,200	12.7	700	8.0	2,400	25.7	9,000
2019	5,500	54.7	1,500	14.9	400	3.8	2,700	26.6	10,000
2020	8,100	51.5	3,000	18.7	1,000	6.7	3,600	23.1	15,600
2021	5,600	49.1	1,700	14.7	600	5.2	3,600	31.0	11,500

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

Race percentages do not match the previous paragraph's values, as incidents with unknown race values are included in the calculations for Table 2.

Figure 2: Estimated Fireworks-Related, Emergency Department-Treated Injuries by Race: 2006-2021



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

4. Injury Estimates for the 2021 Special Study: Detailed Analysis of Injury Patterns

The injury analysis in this section presents the results of the 2021 special study of fireworks-related injuries treated in hospital emergency departments between June 18, 2021, and July 18, 2021. During this period, there were an estimated 8,500 fireworks-related injuries (sample size=255, 95 percent confidence interval 5,600 – 11,300) accounting for 74 percent of the total estimated fireworks-related injuries for the year, which is statistically lower than the estimated 10,300 fireworks-related injuries in the 2020 special study period (p-value = 0.0193).

The remainder of this section provides the estimated fireworks-related, emergency department-treated 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 3 shows the estimated number and percent of emergency department-treated injuries by type of fireworks device during the special study period of June 18, 2021, to July 18, 2021.

Table 3

Estimated Fireworks-Related, Emergency Department-Treated Injuries by Device Type: June 18–July 18, 2021

Fireworks Device Type	Estimated Injuries	Percent
Total	8,500	100%
All Firecrackers	1,500	18%
Small	200	2%
Illegal	200	2%
Unspecified	1,000	12%
All Rockets	500	6%
Other Rockets	300	4%
Bottle Rockets	200	2%
Other Devices	1,900	22%
Multiple Tube	*	*
Reloadable	400	5%
Roman Candles	200	2%
Novelties	200	2%
Sparklers	1,100	13%
Fountains	*	*
Homemade/Altered	100	1%
Unknown	4,500	53%

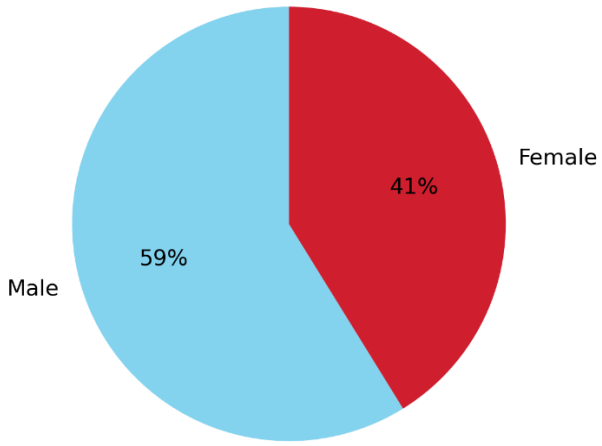
Source: NEISS, U.S. Consumer Product Safety Commission. Based on 255 NEISS emergency department-reported injuries between June 18, 2021, and July 18, 2021, and supplemented by 11 completed In-Depth Investigations. Firework types are obtained from the in-depth investigation, when available; otherwise, firework 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 CPSC's FHSA regulations (16 C.F.R. § 1500.17 (Banned hazardous substances)). Fireworks that may be illegal under state and local regulations are not listed as illegal unless they violate the CPSC's FHSA regulations. 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.

There were no injuries identified due to public firework displays during 2021. Unknown fireworks devices were associated with the most injuries during the 2021 special study period. Multiple tube devices and fountains were involved in less than 1 percent of the total estimated injuries during the 2021 special study period.

Gender and Age of Injured Persons

Males experienced an estimated 3.1 fireworks-related, emergency department-treated injuries per 100,000 individuals during the special study period. Females had 2.1 injuries per 100,000 people. Figure 3 shows the distribution of estimated fireworks-related injuries by gender.

Figure 3: Estimated Injuries by Gender: June 18 – July 18, 2021

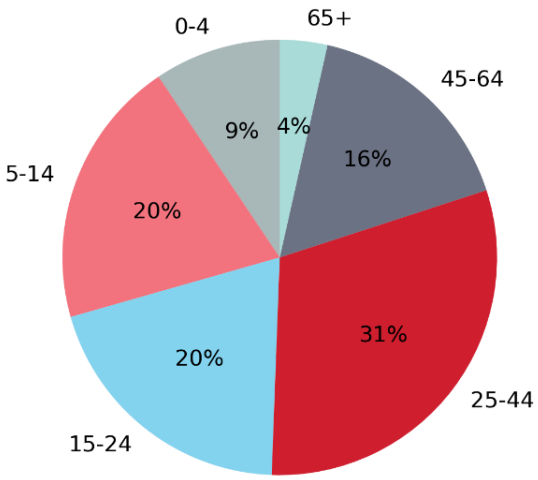


Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 18, 2021, and July 18, 2021.

Children under 5 years of age experienced an estimated 800 injuries (9 percent of all fireworks-related injuries during the special study period), as shown in Figure 4 and Table 4. Children in the 5- to 14-year-old age group experienced an estimated 1,700 injuries. Breaking down that age group further, children 5 to 9 years of age had an estimated 900 injuries and children 10 to 14 years of age accounted for 900 injuries.[10]

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

Figure 4: Percentage of Injuries by Age Group: June 18 – July 18, 2021



Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between July 18, 2021, and July 18, 2021.

The detailed breakdown by age and gender is shown in Table 4. The concentration of injuries among males and people under 25 years of age has been typical of fireworks-related injuries for many years. However, 2021 saw a decrease in the emergency department visits related to fireworks injuries among males in the 15 – 24 years age group (from 1,700 incidents in the 2020 special study period to approximately 900 incidents in 2021).

Table 4

Estimated Fireworks-Related, Emergency Department-Treated Injuries by Age and Gender: June 18–July 18, 2021

Age Group	Total	Per 100,000 People	Male	Female
Total	8,500	2.6	5,000	3,500
0-4	800	4.1	400	400
5-14	1,700	4.2	1,200	500
5-9	900	4.5	600	300
10-14	900	4.3	700	200
15-24	1,700	4.0	900	800
15-19	600	2.9	400	200
20-24	1,100	5.1	600	500
25-44	2,700	3.1	1,700	1,000
45-64	1,400	1.7	700	700
65+	300	0.5	100	200

Sources: NEISS, U.S. Consumer Product Safety Commission. NC-EST2020-AGESEX-SEL: Annual Resident Population Estimates by Selected Age Groups and Sex for the United States: April 1, 2010, to July 1, 2019; April 1, 2020; and July 1, 2020. Release date: August 2021. Census 2021 estimates were not available at the time of this report. Based on the special study between June 18, 2021, and July 18, 2021. The oldest victim was 81 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 2021 special study period. Young adults aged 20 to 24 years had the highest estimated injury rate at 5.1 per 100,000 population. This was followed by 4.5 injuries per 100,000 people for children 5 to 9 years of age and 4.3 injuries per 100,000 people for children ages 10 to 14 years. A general decrease is noted when comparing the 2021 rates to the 2020 rates, except for children 5 to 14 years of age which saw an increase from 3.3 injuries to 4.2 injuries per 100,000 people.

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

Table 5 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 63 percent of the total estimated injuries for that specific age group.[11] Unknown fireworks devices accounted for 53 percent of all injuries during the special study period.

No clear relationship between age and known fireworks type is suggested by the data in Table 5. 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.,* multiple tube and reloadable devices), which can injure people located some distance away from where the fireworks are launched.

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

Table 5

Estimated Fireworks-Related, Emergency Department-Treated Injuries by Device Type and Age Group: June 18–July 18, 2021

	Age Group						
Fireworks Type	Total	0-4	5-14	15-24	25-44	45-64	65+
Total	8,500	800	1,700	1,700	2,600	1,400	300
All Firecrackers	1,500	100	400	200	500	200	100
Small	200	*	*	*	100	100	*
Illegal	200	*	*	*	100	100	*
Unspecified	1000	100	300	200	300	100	100
All Rockets	500	*	100	100	300	*	*
Other Rockets	300	*	100	100	100	*	*
Bottle Rockets	200	*	*	*	100	*	*
Other Devices	1,900	500	400	400	400	100	*
Multiple Tube	*	*	*	*	*	*	*
Reloadable	400	*	*	200	100	100	*
Roman Candles	200	*	100	*	100	*	*
Novelties	200	*	200	*	*	*	*
Sparklers	1,100	500	100	200	200	*	*
Fountains	*	*	*	*	*	*	*
Homemade/Altered	100	*	*	*	100	*	*
Unknown	4,500	100	800	1,000	1,300	1,000	200

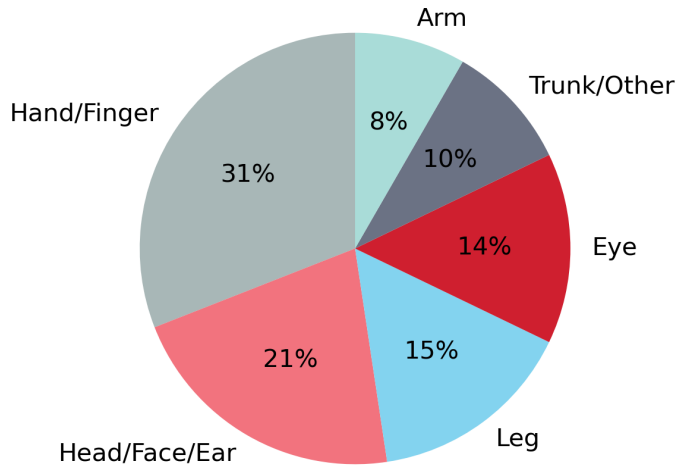
Sources: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 18, 2021, and July 18, 2021. Estimates are rounded to the nearest 100 injuries. Estimates of fewer than 50 injuries are denoted with an asterisk (*). Age subcategory estimates may not sum to the category total due to rounding.

As shown previously in Figure 3, males accounted for 59 percent of the estimated fireworks-related injuries, and females comprised 41 percent. Males and females were injured at approximately the same rate by fireworks device. Both males and females were most often injured by an unknown fireworks device (48 percent for males, 60 percent for females).

Body Region Injured and Injury Diagnosis

Figure 5 presents the distribution of estimated emergency department-treated injuries by the specific parts of the body injured. Hands and fingers were associated with an estimated 2,600 injuries. These were followed by an estimated 1,800 head/face/ear region injuries; 1,300 leg injuries; 1,200 eye injuries; 800 trunk/other injuries; and 700 arm injuries.

Figure 5: Body Regions Injured: June 18 – July 18, 2021

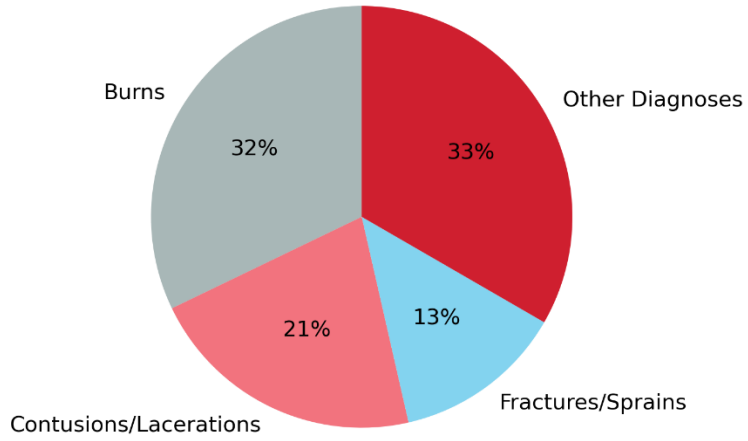


Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 18, 2021, and July 18, 2021. Arm includes NEISS codes for upper arm, elbow, lower arm, shoulder, and wrist. Head/Face/Ear regions include eyelid, eye area, nose, neck, and mouth but not the eyeball. Leg includes upper leg, knee, lower leg, ankle, foot, and toe. Trunk/other regions includes chest, abdomen, pubic region, "all parts of body," internal, and "25-50 percent of body."

Figure 6 shows the diagnoses of the estimated injuries associated with fireworks devices. "Other" diagnoses accounted for 2,800 estimated injuries and were the most frequent diagnosis. Burns were associated with 2,700 estimated injuries, contusions and lacerations were associated with 1,800 estimated injuries, and fractures and sprains accounted for the remaining 1,100 estimated injuries.[12]

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

Figure 6: Types of Injuries: June 18 – July 18, 2021



Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 18, 2021, and July 18, 2021. 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 6, burns accounted for over half (54 percent) of the injuries to hands/fingers. As a single-diagnosis category, burns caused the most injuries to trunk/other regions. Contusions and lacerations were the most frequent injuries to the head/face/ear regions, while fractures were the most common diagnoses to both the arm and leg regions. Other diagnoses were most associated with injuries in the eye region.

Table 6

Estimated Fireworks-Related, Emergency Department-Treated Injuries by Body Region and Diagnosis: June 18–July 18, 2021

		Diagnosis			
Body Region	Total	Burns	Contusions/ Lacerations	Fractures/ Sprains	Other Diagnoses
Total	8,500	2,700	1,800	1,100	2,800
Arm	700	200	200	300	*
Eye	1,200	100	400	*	700
Head/Face/Ear	1,800	300	800	100	700
Hand/Finger	2,600	1,400	400	100	700
Leg	1,300	400	100	500	300
Trunk/Other	800	300	*	100	400

Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 18, 2021, and July 18, 2021. Fractures and sprains also include dislocations. "Other diagnoses" include all other injury categories. 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.

Types of Fireworks Devices and Body Regions Injured

Table 7 presents estimated injuries by the type of fireworks device and body region injured.

Table 7

Estimated Fireworks-Related, Emergency Department-Treated Injuries by Type of Fireworks Device and Body Region Injured: June 18–July 18, 2021

		Region of the Body Injured					
Fireworks Type	Total	Arm	Eye	Head/Face/ Ear	Hand/Finger	Leg	Trunk/ Other
Total	8,500	700	1,200	1,800	2,600	1,300	800
All Firecrackers	1,500	300	200	400	600	100	*
Small	200	100	100	*	100	*	*
Illegal	200	*	*	100	200	*	*
Unspecified	1,000	200	100	300	400	100	*
All Rockets	500	100	300	100	*	*	*
Other Rockets	300	100	100	100	*	*	*
Bottle Rockets	200	*	200	*	*	*	*
Other Devices	1,900	*	200	300	1,000	300	100
Multiple Tube	*	*	*	*	*	*	*
Reloadable	400	*	*	300	100	*	*
Roman Candles	200	*	100	*	*	100	100
Novelties	200	*	*	*	200	*	*
Sparklers	1,100	*	100	*	800	200	*
Fountains	*	*	*	*	*	*	*
Homemade/ Altered	100	100	*	*	100	*	*
Unknown	4,500	300	600	1,000	900	900	700

Source: NEISS, U.S. Consumer Product Safety Commission. Based on the special study between June 18, 2021, and July 18, 2021. 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.

Most injuries resulted from fireworks devices of an unknown type; this uncertainty results from victims' (or parent/guardians') inability to identify the firework device that injured them, when asked.

Hospital Treatment

An estimated 83 percent of the victims of fireworks-related injuries in the special study period were treated at the emergency department and then released; about 9 percent of the victims were admitted to the hospital. Approximately 6 percent of the victims were treated and then transferred to another hospital. The remaining 3 percent of victims had other dispositions (*i.e.*, left the hospital without being seen or were held for observation).[13] The percentage of victims that were treated-and-released, treated, and admitted, or held for observation for fireworks-related injuries was lower than for all consumer products in 2021. The percentages of those treated and transferred and those that left before being seen were higher for the fireworks-related injuries in the special study period than those for all consumer products. This trend is relatively similar compared to prior years.

For all injuries associated with consumer products in 2021, 85 percent of patients were treated and released; 11 percent were admitted to the hospital; 2 percent of patients were transferred to other hospitals; and 3 percent had other dispositions, including left hospital without being seen, held for observation, or dead on arrival.[14]

5. Telephone Investigations of Fireworks-Related Injuries

CPSC staff conducted in-depth telephone investigations of a sample of fireworks incidents that occurred during the 1-month special study period surrounding the 4th of July holiday (June 18, 2021, to July 18, 2021). 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.

[13] *The percentages are calculated from actual injury estimates and may not sum to 100 due to rounding.*

[14] *Comparisons are calculated using actual injury estimates and differences may not appear due to rounding.*

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 111 emergency department-treated, fireworks-related injuries during the special study period, staff selected 60 cases for telephone investigations, of which 11 were completed and determined to be in scope, and 49 were incomplete. Table 8 shows the final status of these investigations, including the reasons why some investigations were incomplete.

Table 8

Final Status of Telephone Investigations

Final Case Status	Number of Cases	Percent
Total Assigned	60	100
Completed Investigation	11	18
In Scope	11	18
Incomplete Investigation	49	82
Failed to Reach Patient	21	35
Victim Name Not Provided by Hospital	15	25
Victim Refused to Cooperate	13	22

Short descriptions of the 11 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

Of the 11 completed in-scope cases, 6 involved males, and 5 involved females. There were two victim aged 0 to 4 years old; three victims aged 5 to 14 years old; four victims aged 15 to 33 years old; and two victims aged 34 to 59. Four victims were admitted to the hospital and seven victims were treated and released.

The fireworks devices consisted of eight reloadable aerial shells,[15] two roman candles, and one unspecified device.

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 investigations on more serious injuries and incomplete NEISS records. Eighteen percent of the victims selected for the telephone interviews completed the survey.

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 had two or more hazard patterns, staff selected the hazard pattern most likely to have caused the injury. Hazard patterns are presented in Table 9 below, and a detailed description of the incidents follows Table 9. Case numbers refer to the case numbers shown in Appendix B.

Table 9

Hazard Patterns as Described in Telephone Investigations for Fireworks-Related Injuries

Hazard Pattern	Number of Cases	Percent of Total
Total Cases	**11**	**100%**
Malfunction	**6**	**55%**
Errant Flightpath	3	27%
Early Detonation	2	18%
Tip Over	1	9%
Misuse	**5**	**45%**
Improper Preparation	5	45%

[15] *The category "aerial shells" includes multiple tube, reloadable mortars and rockets, but excludes bottle rockets.*

Malfunction (6 Victims, 55 percent of total)

Errant Flight Path

Case 2: A 15-year-old female victim was sitting with their parent approximately 40 to 50 feet away from the device watching fireworks be shot off. One of the devices shot from the side landing on the victim's lap. The device then exploded which lit the victims shorts on fire. The parent quickly ripped the pants off. After applying a cold compress, the parent decided to take the victim to the hospital. The victim was admitted to the hospital with third degree burns from the victim's inner thigh to the intergluteal cleft. The victim recovered fully after three weeks the only long-term consequence being a large amount of scarring.

Case 6: A 6-year-old female victim was with her family watching another family member set off fireworks. After one device was detonated, the victim turned to their mother with a bleeding mouth. The grandmother took the victim to the garage to assess the damage. Due to the amount of blood, it was difficult to see the injury, so it was decided to take the victim to the hospital. At the hospital the victim was sedated and given seven stitches to sew the bottom of her lip back as well as close a hole in her cheek. The victim recovered after one month with scarring to the face and difficulties chewing.

Case 5: A 3-year-old female victim was being held by their mother when a family friend was lighting fireworks in the yard. After the first firework ignited with no incident, the second device then began shooting in random directions. The mother tried to leave the scene, but the firework flew over the mother's shoulder and struck the victim in the face. The victim was taken to the hospital and was given an ointment and bandages to cover the wound. The victim fully recovered after one week with no long-term consequences.

Early Detonation

Case 10: A 30-year-old female victim was watching her neighbors light store-bought fireworks when a mortar-style firework device exploded from the bottom of the tube. The victim was hit underneath her left arm and debris entered her left eye. The victim felt fine after the incident noting only singed hair on her arm and eye pain. A few days later the victim developed an infection in her eye. The victim visited the emergency department where she was treated with IV antibiotics as well as antibiotics to take after her release. The victim is unsure of any long-term consequences due to the incident but notes having a "knot" on her eye from the infection.

Case 11: A 45-year-old male victim was supervising teenagers who were lighting reloadable mortar fireworks. One mortar was ignited and never launched, eventually exploding on the ground. The victim was struck by debris in his right eye and was taken to the emergency department by a witness. The victim was given eye drops, pain medication, as well as steroid

for his eye. The victim made a full recovery after three weeks and does not suspect any long-term consequences.

Tip Over

Case 7: A 7-year old male victim was outside his home in a field setting off fireworks with his father and cousin. After lighting a firework, the device fell over and launched towards the victim. The victim attempted to run but tripped and the firework struck him in the head. The firework then exploded hitting the victims face, head, and both arms. The victim was taken to the hospital and given antibiotic ointment and was wrapped with bandages. The victim recovered after one week with no long-term physical consequences.

Misuse (5 Victims, 45 percent of total)

Improper Preparation

Case 1: A 4-year-old male victim was outside in a field near their home with his father watching others light fireworks. One of the participants lit a multiple tube device and burned themselves, causing them to drop the device. The device shot into the crowd after it was dropped. The firework hit the victim in the left eye and exploded. Due to the nature of the victim's injuries, they were taken via ambulance to a nearby field to be airlifted. At the hospital the victim was given stitches for the laceration under his eye, as well as bandages for the burns. The victim recovered with no suspected long-term consequences although hemorrhaging of the eye is still present.

Case 3: A 33-year-old female victim was sitting on a lawn chair at a park when she noticed a group standing nearby. She heard a member of the group shout "Oh man I kicked it over". The victim then turned around and a firework landed on her lap and exploded. The victims dress and underwear caught on fire, severely burning her inner thighs and part of her genital area. The victim underwent skin grafting surgery, was given staples, and then attended physical therapy. The victim now must wear compression shorts daily to prevent the scars on her leg from chafing. The victim also mentioned that they experience numbness in the area as well. Doctors believe it could take up to two years for the injury to be fully healed.

Case 4: A 59-year-old male victim was purchasing fireworks. While the victim was looking around, someone launched a reloadable device. The firework struck the victim in his left arm and chest area and then exploded. The victim mentioned having "the wind knocked out" of him, causing him to collapse. The victim caught on fire due to the explosion. A nearby police officer along with the victim's wife helped to extinguish the fire. At the hospital the wound was bandaged and dressed. There does not appear to be any long-term consequences from the incident aside from scarring.

Case 8: A 12-year-old male victim was with his friends lighting fireworks in the yard outside of his house. Someone lit a rocket nearby that struck the victim in the left eye. The victim went

inside to tell his mother of the incident. The mother then called 911 for emergency medical transport. At the hospital the victim was given an antibiotic ointment as well as a laser eye treatment. The victim was also referred to an eye specialist because surgery would be required to fix the victim's eye. The victim is currently scheduled for surgery to remove a cataract on the injured eye. A second surgery will be needed to repair the lens, as well. Doctors believe that after both surgeries, the victim should have his sight fully restored.

Case 9: A 17-year old male watched as his brother lit a rocket type firework and proceeded to point it at the victim. The rocket hit the victim in his right eye. The victim ran his eye under cold water, which did not help, so then travelled to the emergency department. The victim was given an ointment for the burn. The victim fully recovered after three days with only a small scar.

Long Term Consequences of Fireworks-Related Injuries

Respondents were asked if there were any long-term consequences of their injuries. Seven of the 11 victims (64 percent of the total) experienced or expected complete recovery, with no long-term consequences. However, four victims described their expected long-term adverse consequences:

Case 3: A multiple tube device exploded in the victim's lap. The victim has extreme scarring after the incident along with the results of skin grafting surgery. The victim is also experiencing numbness in the groin area. The victim also experiences severe chafing when walking due to the scarring rubbing together. Doctors believe it will take up to two years for the injuries to be fully healed.

Case 6: A unknown device exploded and hit the victim in the mouth. The victim still experiences difficulties chewing which they plan to visit a dentist in hopes of correcting the issue.

Case 8: The victim was struck by a rocket in the eye. The victim has a scheduled surgery to remove a cataract as well as a second surgery to repair the lens of the eye. Doctors hope that with both surgeries the victim will have their sight restored.

Case 10: A reloadable device struck the victim under her left arm with debris entering her eye. The victim is unsure of any long-term consequences but states that she still has a knot in her eye from the infection.

Where Fireworks Were Obtained

Of the 11 telephone survey respondents, five knew where the fireworks were obtained. All five respondents stated that the fireworks were purchased from a store.

Six of the 11 respondents did not know the source of the fireworks. This is typically the case when the respondent did not purchase the firework that caused injury.

6. Enforcement Activities

During fiscal year 2021, CPSC's Office of Compliance and Field Operations continued to work closely with federal agencies to conduct surveillance on consumer fireworks and to enforce the provisions of the Federal Hazardous Substances Act.

Approximately 31 percent of the selected and tested products were found to contain noncompliant fireworks. The noncompliant fireworks devices had a combined estimated import value of $326,000. The violations consisted of fuse violations, presence of prohibited chemicals, and pyrotechnic materials overload.

7. Summary

In calendar year 2021, there were 9 reported non-occupational fireworks-related deaths. However, reporting for 2021 may not be complete at this time. There were an estimated 11,500 fireworks-related emergency department-treated injuries for calendar year 2021.

During the 1-month special study period from June 18, 2021, to July 18, 2021, there were an estimated 8,500 emergency department-treated fireworks-related injuries. Adults aged 25 to 44 years of age experienced about 32 percent of the estimated injuries, and males of all ages experienced 59 percent of the estimated injuries, down from 71 percent in 2020.

Additionally, 33 percent of the estimated injuries during the special study period involved an injury diagnosis of "Other" which included debris landing in the eye, the device striking the eye, potential hearing loss, etc. The estimated injuries were somewhat evenly distributed with regards to the body part that was affected. Thirty-two percent of the estimated injuries during the special study period involved burns. Burns were the most common injury to hands/fingers as well as the trunk/other region. The parts of the body most often injured were hands and fingers (an estimated 31 percent of the injuries); followed by head, face, and ears (21 percent); eyes (14 percent); legs (15 percent); trunk/unspecified (9 percent); and arms (8 percent). Most of the estimated injuries (83 percent) were treated-and-released. An estimated 14 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 involved in 13 percent of the estimated injuries during the special study period; this is an increase from 9 percent in 2020. Firecrackers were involved in 18 percent, rocket-type devices accounted for 6 percent of injuries, reloadable tube devices were associated with 5 percent of injuries, and novelties and roman candles were both associated with 2 percent of injuries. Fountains and multiple tube devices were each associated with less than 50 estimated injuries which at a maximum equates to about one-half of 1 percent of injuries. Most fireworks-related injuries, 53 percent, were associated with unknown firework device types.

A review of data from telephone follow-up investigations showed that the typical causes of injuries were due to both the malfunction and misuse of fireworks. 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 11 respondents interviewed reported that the injury will be long term, while one reported that they were unsure if they would face long term consequences.

Finally, in fiscal year 2021, CPSC staff continued to actively monitor import shipments of fireworks and products in the marketplace. CPSC staff worked with the U.S. Customs and Border Protection agency 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 Imported Fireworks

Table 10 reports the total estimated number of injuries per 100,000 pounds of imported fireworks. Table 10 shows an average of 247.7 million pounds of fireworks were imported each year between 2006 and 2021, with a standard deviation of 53.2 million pounds. Between 2006 and 2010, the number of imports declined from a peak of 272.1 million pounds in 2006 to a low of 199.6 million pounds in 2010. From 2011 to 2014, the number of imports were relatively steady with modest changes for some years. In 2015, fireworks imports reached their highest level since 2005, with an estimated 279.5 million pounds. Since 2015, the imports have remained relatively high compared to the 2008 to 2014 period. The year 2021 had the largest number of imports within the 15-year window with a total of 415.9 million pounds. This 2021 value surpassed the previous high of 277.5 million pounds in 2018 by 138.4 million pounds.

As for the number of estimated emergency department-treated fireworks-related injuries, 2018, with 9,100 injuries, had the lowest since 2013. The highest three annual estimated fireworks-related injuries were 15,600 in 2020, 12,900 in 2017, and 11,900 in 2015.The 2021 total of 11,500 fireworks-related injuries was the fourth highest number of injuries in the 2006-2021 timeframe.

As shown in Table 10 below, the estimated number of injuries per 100,000 pounds of fireworks imported was 2.8 in 2021.The 2021 value is the smallest estimated number of injuries per 100,000 pounds of fireworks in the 15-year period. The highest three estimated number of injuries per 100,000 pounds of fireworks were 6.3 injuries in 2013, 6.1 in 2020, and 5.2 injuries in 2017. The large decrease in injuries per 100,000 pounds of fireworks for 2021 stemmed from the large increase in overall imports. 2021 experienced the largest number of fireworks imports in the 15-year timeframe with 136.4 million pounds more than the second largest (2015) which had 279.5 million pounds of imports.

Table 10

Estimated Fireworks-Related Injuries and Estimated Fireworks Imported into the United States: 2006-2021

Year	Estimated Injuries	Estimated Fireworks Imports (millions of pounds)[¥]	Injuries Per 100,000 Pounds of Fireworks Imported
2021	11,500	415.9	2.8
2020	15,600	255.0	6.1
2019	10,000	256.5	3.9
2018	9,100	277.5	3.3
2017	12,900	247.0	5.2
2016	11,100	262.4	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

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 codes 3604.10.90.10 and 3604.10.90.50) and display fireworks (1.3G HTS code 3604.10.10.00). Display fireworks were about 1.4 percent of the total imports in 2021. In addition to imported fireworks used in the United States, there is also a small number of fireworks manufactured in the United States for domestic consumption; the data for these fireworks is not available from ITC and is not shown in this table.

[¥]Fireworks imports data were downloaded from the ITC website in February 2022. Fireworks imports data subject to change by ITC. These changes have typically been minor.

Table 10 should be interpreted with caution. First, while there may be a relationship between the number of fireworks devices and estimated injuries resulting from fireworks, the number of imported fireworks is not available. Table 10 uses the total import weight as an approximation for the number of fireworks devices.

Second, the total import weight over-represents heavy devices and under-represents light devices. A heavy device may not be more dangerous than a light device because a firework's weight includes things other than just the amount of explosive material.

In addition, international trade statistics do not provide weight by fireworks device types. It is not possible to associate injuries with the weight of different types of imported fireworks. As shown in Table 2 earlier in this report, different fireworks devices are associated with different numbers of injuries. Thus, the decrease in injuries per 100,000 pounds between 2014 and 2016 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

Telephone Investigations

Case	Age	Sex	Diagnosis	Body Part	Disposition	Fireworks Type	Narrative	Medical Treatment and Prognosis	Long Term Consequences	Hazard	Source
1	4	M	Laceration	Face	Treated and admitted for hospitalization	Multiple tube device	On an evening in July 2021, the victim was outside in an open field near their home with his father, friend, and friends' father watching "Older boys" light off fireworks. One of the participants lit a multiple tube device and burned themselves causing them to drop the device. The device then shot off into the crowd. The firework hit the victim in the left eye and exploded. Due to the nature of the victim's injuries, they were taken via ambulance to a nearby field to be airlifted.	The victim was given stitches for the laceration under his eye, as well as a bandage/dressing for the burns.	No long-term consequences although still a possibility due to the eye still hemorrhaging.	Misuse, improper preparation	Unknown
2	15	F	Burns, Thermal	Upper Leg	Treated and admitted for hospitalization	Multiple tube device	On an evening in July 2021, the victim was watching fireworks being shot off and was sitting with their parent 40-50 feet away. One device shot out from the side landing on the	The victim was admitted into the hospital overnight and was discharged after 24 hours; the victim took three weeks to recover	No long-term consequences other than scarring	Malfunction, errant flightpath	Store

							victim's lap and exploding. The explosion lit the victims shorts on fire which the parent promptly removed. After applying a cold compress, the parent decided to take the victim to the hospital. The victim was admitted to the hospital with 3rd degree burns from the victim's inner thigh to the intergluteal cleft.	fully with bad scarring.			
3	33	F	Burns, thermal	Upper leg	Treated and admitted for hospitalization	Roman candle	On an evening in July 2021, the victim was sitting in a lawn chair at a park, when she noticed a group standing nearby. She then heard the group shout "Oh man I kicked it over". The victim turned around and the firework landed on her lap and exploded. The victims dress and underwear caught on fire, burning the victim's inner thighs and part of her genital area.	The victim was required to undergo skin grafting surgery, given staples after surgery, and attended physical therapy	Doctor mentioned it may take up to two years for the injured area to be fully healed. The victim must wear compression shorts to prevent the scars on their leg from becoming "raw". The victim also experiences numbness in the area.	Misuse, improper preparation	Unknown

4	59	M	Burns, thermal	Lower arm	Treated and admitted for hospitalization	Reloadable	On an evening in July 2021, the victim was purchasing fireworks from a stand. While the victim was looking around someone shot off a reloadable device. The fireworks flew at the victim striking him on the left arm and chest area, then exploded. The firework "Knocked the wind out" of the victim causing him to collapse. The victim also caught on fire due to the explosion. A nearby police officer as well as the victim's wife were able to extinguish the fire.	The wound was bandaged and dressed.	No long-term consequences aside from scarring.	Misuse, improper preparation	Store
5	3	F	Burns, Thermal	Face	Treated and released	Roman candle	On an evening in July 2021, the victim was being held by their mother when a family friend was lighting off fireworks in the yard. After the first firework went off with no incident the device then began shooting off in random directions. The mother tried to run away but the firework flew over her	The victim was given an ointment and bandages to cover the wound; the victim fully recovered after one week.	No long-term consequences	Malfunction, Errant flightpath	Unknown

							shoulder striking the victim in the face.				
6	6	F	Laceration	Mouth	Treated and released	Unknown	On an evening in July 2021, the victim and her family were watching a firework show being ran by a family member in their yard. After one firework detonated the victim turned around to their mother with a bleeding mouth. The grandmother took the victim to the garage to see the extent of the injuries. The grandmother could not see the specific injury due to the amount of blood and decided to rush the victim to the hospital.	The victim was sedated and given seven stitches to sew the bottom of her lip back as well as close a hole in her cheek; After one month the victim recovered with scarring as well as problem chewing which they plan to visit the dentist to address.	Difficulties chewing, significant scarring to the face	Malfunction, errant flightpath	Unknown
7	7	M	Burns, thermal	Lower arm	Treated and released	Rocket	On an evening in July 2021, the victim was outside his home in a field lighting off fireworks with his father and cousin. After his cousin lit a firework, the device fell over and shot towards the victim.	The victim was cleaned up, given antibiotic ointment, and was wrapped up with bandages; the victim made a full recovery after one week.	No long-term consequences beyond a fear of fireworks/ sparkler devices.	Malfunction, tip over	Store

							The victim attempted to run but tripped and the firework struck him in the head. The firework then exploded hitting the victims face, head, and both arms.				
8	12	M	Traumatic cataract	Eyeball	Treated and released	Rocket	Mid-day in July 2021, the victim was with his friends lighting off fireworks in the yard outside of his home. Someone lit a rocket nearby which struck the victim in the left eye. The victim went inside to tell his mother what had happened who then called 911 for emergency room transport.	The victim was given an antibiotic ointment for his eye as well as a laser treatment. He was also referred to a specialist as surgery would be required to fix the victim's eye.	The victim is scheduled for a surgery to remove the cataract as well as a second surgery to repair the lens. After both surgeries the victim should have his sight restored.	Misuse, improper preparation	Unknown
9	17	M	Burns, Thermal	Face	Treated and released	Rocket	Just after midnight in June 2021, the victim's brother lit a rocket type firework and proceeded to aim it at the victim. The sparks from the device hit the victim in his right eye. The victim then ran his eye under cold water then travelled to the emergency department.	The victim was given an ointment to put on the burn; the victim fully recovered after three days with only a small scar.	No long-term consequences	Misuse, improper preparation	Unknown

10	30	F	Cellulitis	Eye	Treated and released	Reloadable	On an evening in July 2021, the victim was watching her neighbors light off fireworks with her family. As the neighbor lit a mortar style firework the device exploded from the bottom of the tube, never taking flight. The victim was hit from underneath her left arm and bits of fireworks debris got into the victims left eye. The victim felt fine after the incident only having singed hair on her left arm and pain in her eye. A few days later the victim noticed an infection in her eye. The victim removed her contacts thinking they could be the cause, but the infection continued to get worse. Eight days after the incident the victim visited the emergency department.	The victim was given IV antibiotics as well as antibiotics to take after her release. The victim was told to follow up with an eye specialist.	Unsure of long-term consequences, but the victim states that she still has a knot on their eye from the infection.	Malfunction, early detonation	Store

11	45	M	Traumatic hyphema	Eyeball	Treated and released	Reloadable	On an evening in July 2021, the victim was at a friend's house supervising teenagers in lighting reloadable mortar fireworks. After one mortar was lit it detonated on the ground never taking off. The victim was struck by the debris on his right eye and taken to the emergency department by someone who was with him.	The victim was seen by an eye specialist at the emergency department and given eye drops, pain medication, and steroids for his eye; the victim made a full recovery after three weeks.	No long-term consequences	Malfunction, early detonation	Store