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Executive Summary

This report provides the results of a U.S. Consumer Product Safety Commission (CPSC) staff analysis of 1997 data on fireworks-related injuries. The analysis is based on a one-month survey (June 23 to July 23, 1997) of fireworks-related injuries treated in hospital emergency rooms reporting to the CPSC's National Electronic Injury Surveillance System (NEISS). Highlights are as follows:

- ! Fireworks devices were involved in an estimated 8,300 injuries treated in U. S. hospital emergency rooms in 1997. This estimate is significantly lower than estimates for the years 1992 through 1994.
- ! An estimated 5,700 injuries, directly involving fireworks, were treated in U.S. hospital emergency rooms during the one-month period surrounding the Fourth of July 1997. The highest injury estimates were for firecrackers (1,800), rockets (900), and sparklers (580).
- ! Almost 40 percent of the injuries were to children under age 15. The estimated number of injuries to males (4,200) was 2.8 times the number of injuries to females (1,500).
- ! The parts of the body most often injured were the hands (2,020), head (1,250), eyes (1,015), and arms or legs (860 combined). Over half the injuries involved burns. Burns were the most frequent injury received by all parts of the body except the eye, for which contusions or lacerations were the most common injuries.

Although estimates of injuries by fireworks type are presented, evaluation of relative risk by type requires data on the number of products used, which are not available at this time.

I. Introduction

Each year, CPSC conducts a study of fireworks injuries that occur around the Fourth of July holiday to monitor the effectiveness of the CPSC fireworks regulations. This report presents the results of the 1997 study.

CPSC regulations include a 50 milligram powder limit on firecrackers, fuse burn time limits, requirements to prevent tip-over and blowout of devices, and requirements for specific cautionary labeling. Recent regulations include the October 1991 ban on reloadable tube aerial shell fireworks devices with shells larger than a 1.75-inch outer diameter and the March 1996 static stability requirement for multiple tube devices with tubes greater than or equal to an inner diameter of 1.5 inches.

II. Methodology

From June 23 to July 23, 1997, CPSC conducted a special study of fireworks-related injuries treated in hospital emergency rooms that report to its National Electronic Injury Surveillance System (NEISS). NEISS is a probability sample of U. S. hospitals with emergency room departments from which national estimates of emergency room-treated injuries can be made.

The 1997 study focused on the types of fireworks involved in injuries and the kinds of injuries associated with their use. Victims identified the fireworks type from illustrations shown to them at the hospital emergency room (see Appendix). Although estimates are provided for many data subsets, interpretation should be made with caution since estimates based on small sample sizes generally have large variances. These estimates are provided primarily to indicate the details involved.

NEISS data for 1997 are based on a revised sampling frame and are not directly comparable to previously published estimates for past years. Adjusted annual estimates for past years are presented in Table 1 (rounded to the nearest 100) and reflect the gradual changes that occurred in the U.S. hospital emergency room population since the initial use of the previous sampling frame.

III. Results

A. Annual Estimates

Table 1 presents the estimated number of fireworks-related injuries (1988-1997) treated in U.S. hospital emergency rooms both annually and during the one-month period surrounding the Fourth of July. In most years, about 70-75 percent of fireworks-related injuries occurred during the July 4 holiday period. Annual estimates were highest in the years 1992-1994, declining to lower levels in 1996 and 1997. Tests of year-to-year differences were conducted using estimated variances and taking into account the correlation between year-to-year estimates. These tests indicated that there were no significant differences between 1997, 1996, and 1995 (at a significance level of .05). However, there were significant differences between 1997 and each of the years 1992-1994. There were also significant differences between 1996 and the years 1992-1994.

Table 1
Estimated Fireworks-Related Injuries, by Year

Year	June 23-July 23	Entire Year
1997	6,200	8,300
1996	4,900*	7,300*
1995	7,900*	10,900*
1994	8,800*	12,500*
1993	9,100*	12,300*
1992	9,200*	12,600*
1991	7,900*	11,000*
1990	7,900*	12,000*
1989	6,200*	9,600*
1988	7,000*	10,100*

*Estimates were revised to adjust for a new sampling frame and do not match previously published estimates.

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

B. 1997 Special Study

The remainder of this report presents the results of the 1997 special study of hospital emergency room treated-injuries associated with fireworks that occurred during the July 4 holiday season. As indicated in Table 1, an estimated 6,200 injuries associated with fireworks occurred during the study period (n=155). However, an estimated 500 of those injuries (n=14) were marginally related to a fireworks device and are excluded from the remainder of this analysis, leaving a total of 5,700 injuries directly related to fireworks.

1. Injury Disposition by Fireworks Type

Firecrackers accounted for about 30 percent (1,800) of all estimated fireworks injuries that occurred during this period (Table 2). Within this category, large illegal firecrackers, such as M-80's, were involved in about 420 estimated injuries. Rockets (900 injuries), sparklers (580 injuries), and fountains (430 injuries) were the major contributors to injury among consumer devices. Bottle rockets accounted for 800 of the 900 rocket-related injuries.

Although most of these fireworks-related injuries were treated at the emergency room and then released, about 6 percent (320) were serious enough to require hospitalization. This was somewhat higher than the hospitalization rate of 3.4 percent for all consumer products. Among the eight injuries in the sample that were hospitalized, the type of device involved was not specified for three. The remaining five injuries involved a variety of devices: two firecrackers of unspecified size, one fountain, one mortar, and a bottle rocket.

**Table 2 Estimated Fireworks-Related Injuries,
by Fireworks Type, June 23-July 23, 1997
n=141**

Fireworks Type	Estimate¹
Total	5,700
Firecrackers	1,800
Small	230
Illegal	420
Unspecified	1,150
Rockets	900
Bottle	800
Other, Unspecified	100
Other Consumer Devices	1,750
Sparklers	580
Fountains	430
Novelties	300
Multiple Tube & Shell	240
Roman Candles	200
Homemade/Altered	70
Public Display²	180
Unknown	1,000

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

¹ Caution is recommended when using the relatively small estimates in Table 2 because of the small sample sizes from which some subsets were derived, e.g., the estimate for public display-related injuries was based on six reported injuries.

² Includes individuals injured from the use of a public display device, and injuries sustained at a public display of fireworks.

2. Age and Sex of the Injured Person

About seven percent (400) of all estimated fireworks injuries were to children younger than age five (Table 3). These children along with children in the 5 to 14 age group accounted for almost 40 percent (2,150) of all injuries. The age groups of 15 to 24 (1,500) and 25 to 44 (1,900) each comprised about 30 percent of the injuries.

Injury rates per 100,000 population were highest among those between the ages of 5 and 24 years (4.0 - 4.5) Rates were lowest among victims over age 45 who infrequently sustained fireworks-related injuries. No injuries occurred in the 65 and over age group.

In general, most (74%) fireworks injuries were to males. Overall, the estimated number of injuries to males (4,200) was 2.8 times the number of injuries to females (1,500).

Table 3
Estimated Fireworks-Related Injuries,
By Age, Sex, and Rate per 100,000 Population
June 23-July 23, 1997
n=141

Age Group (Years)	Sex		Total ³	Injuries per 100,000
	Male	Female		
Total	4,200	1,500	5,700	2.42
Less than 5	300	100	400	2.10
5 to 14	1,200	550	1,750	4.50
15 to 24	1,260	240	1,500	4.00
25 to 44	1,370	530	1,900	2.25
45 to 64	70	80	150	.80

Population rates were based on 1997 U.S. population estimates by age and sex, U.S. Bureau of the Census.

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

³ Caution is recommended when using the relatively small estimates in Table 3, because of the limited number of sample cases from which they were derived.

3. Age of the Injured Person by Fireworks Type

Table 4 presents the ages of those injured by the type of fireworks device involved in the injury. Among the 800 estimated bottle rocket-related injuries, one-half (400) were sustained by persons between the ages of 15 and 24 years. Children between the ages of 5 and 14 sustained an estimated 300 bottle rocket-related injuries. Children between the ages of 5 and 14 accounted for about one-third (610) of the firecracker-related injuries. Among sparkler-related injuries, about 60 percent (350) involved children under age 15. Sparklers were the primary source of injuries to children under age 5 (180).

Table 4
Estimated Fireworks-Related Injuries,
by Fireworks Type and Age Group
June 23-July 23, 1997
n=141

Fireworks Type	Total ⁴	Age Group (Years)				
		0-4	5-14	15-24	25-44	45-64
Total	5,700	400	1,750	1,500	1,900	150
Firecrackers	1,800	100	610	430	580	80
Small	230	--	90	70	70	--
Illegal	420	70	--	160	190	--
Unspec.	1,150	30	520	200	320	80
Rockets	900	10	370	400	120	--
Bottle	800	10	300	400	90	--
Unspec.	100	--	70	--	30	--
Sparklers	580	180	170	--	230	--
Other⁵	1,170	--	470	200	500	--
Homemade/Altered	70	--	--	--	70	--
Public Display	180	10	90	--	80	--

⁴ Caution is recommended when using the relatively small estimates in Table 4, because of the limited number of sample cases from which they were derived.

⁵ This group includes novelty items, roman candles, multiple tube devices, shells, and fountains.

Unspecified	1,000	100	40	470	320	70
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Source: NEISS, U.S. Consumer Product Safety Commission/EHHA

4. Injury Diagnosis and Body Part Injured

Table 5 presents the types of injuries sustained by specific parts of the body. Most injuries (75%) were to the hands, head, and eyes. Burns (58%) and contusions (26%) were the most common injuries. Burns were the most frequent injury to most parts of the body. However, contusions or lacerations were the most common injuries to the eye. Head injuries involved both burns and contusions or lacerations.

Table 5
Estimated Fireworks-Related Injuries,
By Body Part and Diagnosis
June 23-July 23, 1997
n=141

Body Part	Total ⁶	Diagnosis			
		Burns	Contusions/ Lacerations	Fractures/ Sprains	Other
Total	5,700	3,330	1,480	95	795
Hand (Inc. Finger)	2,020	1,460	270	95	195
Head (Inc. Face, Neck, Mouth, & Nose)	1,250	630	450	--	170
Eye	1,015	175	620	--	220
Leg (Inc. Knee & Ankle)	560	325	25	--	210
Up/Low Trunk	415	300	115	--	--
Arm (Inc. Elbow)	300	300	--	--	--
Foot (Inc. Toe)	120	120	--	--	--

⁶ Caution is recommended when using the relatively small estimates in Table 5, due to the limited number of sample cases from which they were derived.

Multiple Body Parts	20	20	--	--	--
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Source: NEISS, U.S. Consumer Product Safety Commission/EHHA

5. Fireworks Type and Body Part Injured-Brief Scenario Information

Table 6 presents estimated fireworks injuries by the device and body part involved. Firecracker injuries were most often to the hand (820), head (375), and arms or legs (325). Victims sustained injuries from firecrackers while holding the device, or attempting to release it after an ignition. Rocket injuries were primarily to the hand (360) and eye (240). Many of these victims sustained injuries from erratic rocket flight patterns, or burning debris from the rocket. Other scenarios involved rockets which were placed on the ground or thrown into the air. Sparkler-related injuries most frequently involved eyes (225) and hands (170). A typical sparkler injury occurred when the user touched the glowing end, or inadvertently poked himself or a bystander with the ignited device.

Table 6
Estimated Fireworks-Related Injuries,
By Fireworks Type and Body Part
June 23-July 23, 1997 Period
n=141

Fireworks Type	Total ⁷	Body Part				
		Hand	Head	Eye	Arms and Legs	Other Parts
Total	5,700	2,020	1,250	1,015	860	555
Firecrackers	1,800	820	375	180	325	100
Rockets	900	360	150	240	60	90
Sparklers	580	170	40	225	85	60
Other Devices	2,420	670	685	370	390	305

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

⁷ Caution is recommended when using the relatively small estimates in Table 6, because to the limited number of sample cases from which they were derived.

IV. Discussion

Estimated fireworks-related injuries for 1997 are significantly lower than estimates for the years 1992 through 1994. Whether this reduction is indicative of a downward trend remains to be seen.

As in previous years, injuries to children were a major component of fireworks-related injuries in 1997, with children under age 15 accounting for 40 percent of all fireworks-related injuries. The disproportionate involvement of children is further illustrated by the high rate of injury for the 5 to 14 age group, compared to the rate for the population as a whole (4.5 injuries per 100,000 population for ages 5 to 14 vs 2.42 for all ages).

It should be noted that while estimates are presented by type of fireworks device, evaluation of relative hazard by type requires data on the number of products on the market. These data are not available at this time.

Appendix