



## Date: July 10, 2009

## I. Overview

From 2003 through 2007 there were an estimated 31,069 emergency department-treated injuries associated with inflatable amusements. The 95% confidence interval (C.I.) for this estimate is 13,732 – 48,406, based on a coefficient of variance (C.V.) of 0.2847. The average annual estimated number of emergency department-treated injuries associated with inflatable amusements from 2005 through 2007 is 6,552. Of the estimated 31,069 emergency department-treated injuries, an estimated 28,338 (or 91%) were associated with moon bounces. The 95% confidence interval for this estimate is 11,328 – 45,448, based on a C.V. of 0.3066. The average annual estimated number of emergency department-treated injuries associated with moon bounces from 2005 through 2007 is 5,968.

This analysis was prepared by CPSC staff, has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.  
CPSC Hotline: 1-800-638-CPSC (2772) CPSC's Web Site: <http://www.cpsc.gov>

CCPSA 608(1) CLEARED for PUBLIC  
NO MFERS/PRIVILERS OR  
PRODUCTS IDENTIFIED  
EXCEPTED BY: PETITION  
RULEMAKING ADMIN. PRCDG

## II. Annual Injury Estimates

Yearly estimates of emergency department-treated injuries associated with inflatable amusements were generated for 2003 through 2007. Yearly estimates for all inflatable amusements are shown in Table 1, and yearly estimates for moon bounces are shown in Table 2.

**Table 1: Estimated Emergency Department-Treated Injuries for Inflatable Amusements, 2003 – 2007**

Year	Observations	Estimate	95% C.I.	C.V.
2003	163	5,311	1,711 – 8,911	0.3458
2004	202	6,101	2,250 – 9,952	0.3220
2005	209	5,371	1,971 – 8,771	0.3229
2006	246	5,938	2,661 – 9,215	0.2815
2007	319	8,348	4,488 – 12,208	0.2359
Total	1,139	31,069	13,732 – 48,406	0.2847

*Source: National Electronic Injury Surveillance System, September 2008*  
*The estimates may not sum to the totals due to rounding.*

**Table 2: Estimated Emergency Department-Treated Injuries for Moon Bounces, 2003 – 2007**

Year	Observations	Estimate	95% C.I.	C.V.
2003	150	5,022	1,418 – 8,626	0.3661
2004	184	5,412	1,608 – 9,216	0.3586
2005	197	5,133	1,721 – 8,545	0.3391
2006	227	5,474	2,253 – 8,695	0.3002
2007	290	7,297	3,681 – 10,913	0.2528
Total	1,048	28,338	11,308 – 45,368	0.3066

*Source: National Electronic Injury Surveillance System, April 2008*  
*The estimates may not sum to the totals due to rounding.*

The estimated coefficients of variation for these estimates are high. Based on the generalized relative sampling errors for the National Electronic Injury Surveillance System (NEISS)<sup>2</sup>, an estimate of 5,000 would generally give a C.V. of 0.1504. The high variance appears to be due to the clustering of incidents. One of the hospitals in the sample is near an amusement park comprised completely of inflatable amusements. Other hospitals are near fair grounds, and clusters of cases will appear during the operation of a state or country fair. Even with residential use through rentals there are often multiple injuries associated with a single event, resulting in a cluster at the local hospital.

Both the estimates for all inflatables and for moon bounces were analyzed for the existence of a trend. Neither set of estimates showed a statistically significant trend. The p-value for all inflatable amusements was 0.1795. The p-value for moon bounces was 0.2634.

---

<sup>2</sup> Schroeder T. *National Electronic Injury Surveillance Systems (NEISS) Estimated Generalized Relative Sampling Errors*. U.S. Consumer Product Safety Commission. October, 2000.

### III. Injury Estimates By Category

The incidents involving inflatable amusements were categorized by age of the victim, body part injured, injury diagnosis, and disposition. The estimated number of emergency department-treated injuries was calculated for each category for 2005 – 2007, and is presented in Tables 3 – 6. Table 4 provides estimated average annual injury rates per million population for each age category.

**Table 3: Estimated Emergency Department-Treated Injuries for Inflatable Amusements by Age Category, 2005 – 2007**

Age	Moon Bounce		All Inflatables	
	Estimate	% Total	Estimate	% Total
0 to 4	4,114	23%	4,478	23%
5 to 14	11,163	62%	12,212	62%
15 and up	2,628	15%	2,967	15%
Total	17,904	100%	19,657	100%

*Source: National Electronic Injury Surveillance System, April 2008*

*The estimates may not sum to the totals due to rounding.*

The estimated emergency department-treated injuries for inflatable amusements by age category are shown in Table 3. Most of the estimated injuries (62%) were in the 5 to 14 age group, and almost all the estimated injuries (85%) involved children under the age of 15.

**Table 4: Estimated Annual Average Emergency Department-Treated Injury Rates per Million Population for Inflatable Amusements by Age Category, 2005 – 2007**

Age	Moon Bounce	All Inflatables
0 to 4	67	73
5 to 14	92	101
15 and up	4	4
Total	20	22

*Sources: National Electronic Injury Surveillance System, April 2008; U.S. Census Bureau*

*The estimates may not sum to the totals due to rounding.*

The estimated annual average emergency department-treated injury rates per million population for inflatable amusements by age category are shown in Table 4. While 15% of the injuries were in the 15 and older age category, Table 4 shows that the injury rate is much lower relative to the other age categories due to the large population of the open-ended 15 and up age category.

**Table 5: Estimated Emergency Department-Treated Injuries for Inflatable Amusements by Body Part Injured, 2005 – 2007**

	<b>Moon Bounce</b>		<b>All Inflatables</b>	
<b>Body Part</b>	<b>Estimate</b>	<b>% Total</b>	<b>Estimate</b>	<b>% Total</b>
Leg/Foot	5,973	33%	6,686	34%
Arm/Hand	5,451	30%	5,877	30%
Head/Face	2,679	15%	2,983	15%
Other	2,252	13%	2,404	12%
Torso	1,550	9%	1,707	9%
Total	17,904	100%	19,657	100%

*Source: National Electronic Injury Surveillance System, April 2008*  
*The estimates may not sum to the totals due to rounding.*

The estimated emergency department-treated injuries for inflatable amusement by body part injured are shown in Table 5. Most of the injuries were to the limbs, with leg and arm injuries together accounting for approximately 60% of the estimated injuries for both the moon bounce and all inflatable amusements.

**Table 6: Estimated Emergency Department-Treated Injuries for Inflatable Amusements by Injury Diagnosis, 2005 – 2007**

	<b>Moon Bounce</b>		<b>All Inflatables</b>	
<b>Diagnosis</b>	<b>Estimate</b>	<b>% Total</b>	<b>Estimate</b>	<b>% Total</b>
Fracture	5,120	29%	5,795	29%
Strain/Sprain/Dislocation	5,055	28%	5,375	27%
Contusion/Abrasion/Laceration	4,267	24%	4,690	24%
Other/Not Stated	3,462	19%	3,797	19%
Total	17,904	100%	19,657	100%

*Source: National Electronic Injury Surveillance System, April 2008*  
*The estimates may not sum to the totals due to rounding.*

The estimated emergency department-treated injuries for inflatable amusements by injury diagnosis are shown in Table 6. The most common injuries were fractures (29%), although strains, sprains, contusions, and abrasions were also common.

The estimated emergency department-treated injuries for inflatable amusements cannot be provided by disposition due to small sample sizes in some categories. For both moon bounce and all inflatable associated injuries, 95% of the estimated emergency department-treated injuries were treated and released, 4% were hospitalized, and 1% left against medical advice or did not state a disposition.

## **IV. Deaths**

CPSC staff is aware of four deaths involving inflatable amusements from 2003 through 2007. None of the four involved a moon bounce style inflatable amusement, and all four involved the decedent striking their head on a hard surface.

Two of the deaths involved falls from inflatable slides. In 2003, a 15 year old male fell from an inflatable slide at a high school wellness event. The slide was part of a larger obstacle course inflatable amusement. In 2004, an 18 year old male fell from an inflatable slide at a high school prom party. There was no indication that the slide was part of a larger inflatable amusement.

One of the deaths involved an inflatable rock climbing wall. In 2005, a 24 year old female fell 15 to 20 feet from an inflatable rock climbing wall at a music festival. Her legs and backside reportedly hit the inflatable base of the inflatable amusement, but then her upper body fell back and her head hit the surrounding pavement.

The fourth death involved an inflatable “king of the hill” amusement. The amusement consisted of a rounded, inflated hill, surrounded by an inflated fence. Two adults who were playing in the amusement fell out of it through a gap in the surrounding inflated fence. They struck a 3 year old male who was standing near the amusement, knocking him down. The child’s head struck the floor, and he died as a result of his injuries.

## V. Methodology

The NEISS is a probability sample of approximately 100 U.S. hospitals having 24-hour emergency departments (EDs) and more than six beds. NEISS collects injury data from these hospitals. Coders in each hospital code the data from the ED record and the data is then transmitted electronically to CPSC. Because NEISS is a probability sample, each case collected represents a number of cases (the case’s *weight*) of the total estimate of injuries in the U.S. Different hospitals carry different weights, based on stratification by their annual number of emergency department visits (Schroeder and Ault, 2001).

A coefficient of variation is the ratio of the standard error of the estimate (i.e., variability) to the estimate itself. This is generally expressed as a percent. A C.V. of 10% means the standard error of the estimate equals 0.1 times the estimate. Large C.V.’s alert the reader that the estimate has considerable variability. This is often due to a small sample size.<sup>3</sup> Estimates and confidence intervals are usually not reported unless the number of cases is 20 or more, the estimate is greater than 1,200, and the C.V. is less than 33%.

Injury rates per million population are based on U.S. Census Bureau intercensal population estimates for the resident U.S. population. These were downloaded from <http://www.census.gov/popest/national/>.

CPSC staff did a broad survey of the NEISS data, and found potential inflatable amusement related incidents in ten different product codes. These ten codes are listed in Table 6 (next page). These ten product codes were searched for incidents containing one of the following keywords: air, balloon, blow, bounce, inflate, jump, or space. The words were shortened for the actual search to include different forms of words (such as inflated vs. inflatable) and observed misspellings of the words (such as “bouce house” or “mook walk”). Individual product code

---

<sup>3</sup> Schroeder T, Ault K. *The NEISS Sample (Design and Implementation)*. U.S. Consumer Product Safety Commission. 2001.

searches did not use words directly related to the product code (such as “balloon” for product code 1347: Balloons). The keywords excluded for each product code are also shown in Table 6.

This report is focused on amusements requiring continuous air pressure to maintain their form. However, there are similar, but smaller versions of these inflatable amusements that are inflated once and maintain their form by retaining the air from the initial inflation. These smaller versions were excluded as out of scope for the purposes of this report. Often there was not enough information in the data to determine whether the product involved used continuous air pressure. In general, indications of a larger product were assumed to be indicators of continuous air pressure. When there was no information about size, home use of the product *for certain product codes* was assumed to be an indicator of smaller size, and thus lack of continuous air pressure. Whether or not home use was included for cases with no clear indication on size or inflation method is also included on Table 7.

**Table 7: Product Codes with Possible Inflated Amusement Related Incidents**

<b>Product Code</b>	<b>Description</b>	<b>Home Use Included</b>	<b>Keywords Excluded</b>
1233	Trampolines	No	jump
1242	Slides or sliding boards (excluding swimming pool slides)	No	
1244	Monkey bars, playground gyms, or other playground climbing apparatus	No	
1258	Mountain climbing (activity, apparel, or equipment)	Yes	
1293	Amusement attractions	Yes	
1325	Inflatable toys	No	air, blow, inflate
1347	Balloons (toy)	No	air, balloon, blow, inflate
3219	Other playground equipment	Yes	
3277	Exercise equipment	Yes	jump
5004	Toys, other or not specified	No	

The definition of inflatable amusement and the methodology described in this section were developed by CPSC’s Hazard Analysis staff, in conjunction with subject matter experts from Engineering Sciences, Health Sciences, Compliance, and the General Counsel’s office.