

**FIXED-SITE AMUSEMENT RIDE INJURY SURVEY, 2011 UPDATE**

**Prepared for  
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## Preface

This report presents the results of work done by the National Safety Council, Research and Statistical Services Group, under contract to the International Association of Amusement Parks and Attractions. It includes estimates by the Council for calendar years 2003 through 2011. The Council's work is an extension of, but independent of, the estimates made for 2001-2002 by Heiden Associates, which are included here for reference and reported more fully in the June/July 2003 issue of *Injury Insights* (Heiden & McGonegal, 2003).

## **FIXED-SITE AMUSEMENT RIDE INJURY SURVEY, 2011 UPDATE**

Since 2001 the International Association of Amusement Parks and Attractions (IAAPA) has sponsored an annual survey to collect and analyze ride, attendance, and patron injury data from facilities that operate fixed-site amusement rides. The IAAPA survey was undertaken to gain perspective on fixed-site amusement ride injuries in the United States. The surveys include amusement and theme parks, tourist attractions, and family entertainment centers. The results of these surveys are presented below.

Facilities were asked to report attendance and ridership as well as the number of patron injuries. Separate attendance-based and ridership-based analyses were performed and are shown in Table 2. To be consistent with the estimates previously reported for 2001-2002, the summary of results is shown in Table 1. Estimated attendance in 2011 was up 2.5% from 2010 and estimated ridership was down 0.3%.

**Table 1. Summary of Results**

<b>Year</b>	<b>Estimated Number of Facilities w/Rides in the U.S.</b>	<b>Estimated Annual Attendance (millions)</b>	<b>Estimated Annual Ridership (billions)</b>	<b>Estimated Annual Number of Ride-Related Injuries</b>	<b>Injuries per Million Attendance</b>
2001-2002	459	302.9	---	2,486	8.2
2003*	403	300.4	1.95	2,044	7.0
2004	403	300.0	1.81	1,637	5.2
2005	398	300.4	1.82	1,783	5.2
2006	395	291.7	1.76	1,797	6.6
2007	395	292.1	1.78	1,664	4.6
2008	422	291.2	1.70	1,523	4.7
2009	398	278.4	1.69	1,181	4.4
2010	386	290.1	1.70	1,299	4.4
2011	383	297.4	1.69	1,204	4.3

Source: 2001-2002, Heiden & McGonegal (2003). 2003-2011, National Safety Council estimates based on fixed-site amusement ride injury surveys.

\*Changes in the estimating method beginning with 2003 affect comparability with the 2001-2002 survey.

Not all facilities were able to report both attendance and ridership and therefore there were differences in the selection of facilities used in each analysis. Table 2 presents the attendance-based estimates of ride related injuries compared to ridership-based estimates of ride related injuries for the period 2003-2011. The difference between the two injury estimates has varied from as little as 11 in 2004 to as much as 355 in 2007. In 2011, the ridership-based injury estimate of 1,415 exceeded the attendance-based estimate by 211 injuries.

The distributions of injuries by ride type and injury severity for 2011 obtained from the ridership-based estimates were similar to the distributions obtained from the attendance-based estimates for total injuries, serious injuries, and other injuries. The largest portion of injuries for both sets of estimates took place on family and adult rides, followed by roller coasters and children's rides. However, the portion of injuries by injury severity for family and adult rides were uniformly higher in the ridership-based analysis than in the attendance-based analysis, while the portion of injuries by injury severity for children's rides showed virtually no difference. The portion of injuries by injury severity for roller coasters was consistently lower in the ridership-based analysis than in the attendance-based analysis.

**Table 2. Attendance-Based vs. Ridership-Based Injury Estimates, 2003-2011**

Year	Attendance-Based		Ridership-Based		Difference between attendance-based and ridership-based injury count
	Estimated Annual Number of Ride-Related Injuries	Injuries per Million Attendance	Estimated Annual Number of Ride-Related Injuries	Injuries per Million Patron-Rides	
2003	2,044	7.0	1,954	1.0	+90
2004	1,637	5.2	1,648	0.9	-11
2005	1,783	5.2	1,713	0.9	+70
2006	1,797	6.6	1,546	0.9	+251
2007	1,664	4.6	1,309	0.7	+355
2008	1,523	4.7	1,343	0.8	+180
2009	1,181	4.4	1,086	0.6	+95
2010	1,299	4.4	1,207	0.7	+92
2011	1,204	4.3	1,415	0.8	-211

Source: National Safety Council estimates based on annual fixed-site amusement ride injury surveys.

Ridership and attendance-based injury estimates show divergent trends in 2011:

Attendance-based:

- The estimated injury total and the injury rate per million attendees were each down in 2011 compared to 2010 (1,204 vs. 1,299 injuries and 4.35 vs. 4.25 injuries per million attendees, respectively).
- Compared to 2003, both the estimated number of injuries and the injury rate per million attendees in 2011 were down—by 41% and 38%, respectively.

Ridership-based:

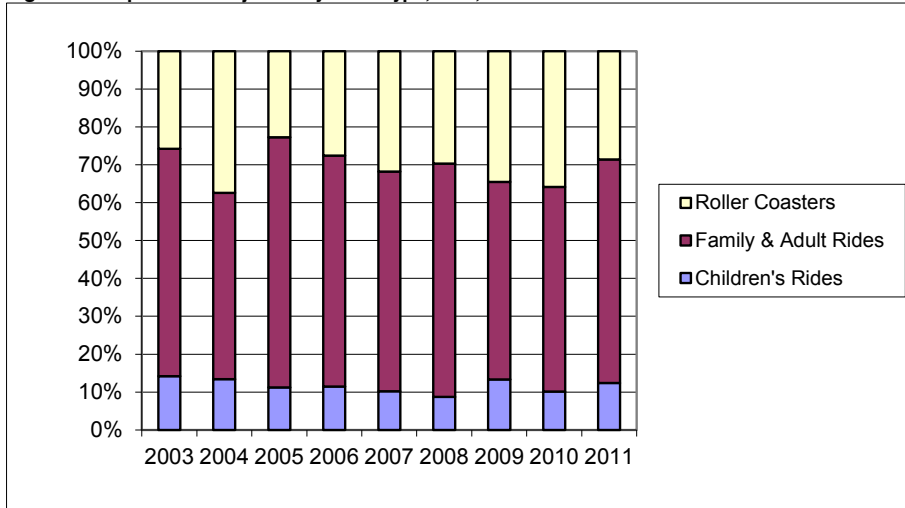
- The estimated injury total and the injury rate per million patron-rides were each up 18% in 2011 compared to 2010 (1,415 vs. 1,204 injuries and 0.84 vs. 0.71 injuries per million patron-rides, respectively).
- Compared to 2003, both the estimated number of injuries and the injury rate per million patron-rides in 2011 were down—by 28% and 20%, respectively.

The primary factor underlying the difference between the attendance and ridership-based estimates was differences in the data reported by small parks. In the attendance-based analysis, small parks reported a 10% higher attendance figure than for the previous year while reporting similar injury totals. This increase in attendance resulted in lower injury rates and therefore lower estimates for total, serious injury, and other reportable injuries for small parks. Conversely, in the ridership-based analysis, small parks reported a 25% lower ridership and reported higher injury totals, resulting in higher injury rates and therefore higher estimates for total and other reportable injuries for small parks compared to 2010.

Ridership-based rates are perhaps a more appropriate measure of exposure to risk than attendance-based rates because injuries on rides are the outcome of interest. Parks with similar attendance may have much different ridership numbers because of differences in the number and kinds of amusement rides provided. **The results discussed in the remainder of the report are based on the ridership analysis, which is shown in Table 3.**

As shown in Figure 1, about 59% of the injuries in 2011 occurred on family and adult rides compared to 54% in 2010, 52% in 2009, and 61% in 2008. The overall number of injuries on family and adult rides in 2011 was up 28% compared to 2010. The number of injuries on children’s rides increased from 122 in 2010 to 175 in 2011, with the overall proportion of injuries on children’s rides increasing 22% -- from 10.1% to 12.3%. Roller coasters accounted for 28.6% of the injuries in 2011, down from 35.9% in 2010. Unlike the increases observed for children’s and family and adult rides, the overall number of injuries on roller coasters decreased 6.5% from 2010 to 2011.

**Figure 1. Proportion of Injuries By Ride Type, U.S., 2003-2011**



Source: National Safety Council estimates based on annual fixed-site amusement ride injury surveys.

In 2011, the injury rate per million patron-rides was 0.8 for family and adult rides, 1.0 for roller coasters, and 1.0 for children's rides. The difference between the injury rate for children's rides and family and adult rides is statistically significant, as is the difference between the injury rate for family and adult rides and roller coasters. The difference between the injury rate for children's rides and roller coasters was not significant.

About 4.3% of the injuries were reported to be "serious," meaning an injury resulting in immediate admission and hospitalization in excess of 24 hours for purposes other than medical observation. The remaining 95.7% were reportable injuries that were other than serious. The proportion of injuries that were serious in 2011 was down 12% from the proportion in 2010 and was lower than for every other year reported except for 2007. The rate of serious injuries per million patron-rides was 0.04 in 2011—up from 0.03 in 2010, the same as in 2009, and lower than for every other year reported with the exception of 2007.

**Table 3. Summary of Estimated Fixed-Site Amusement Ride-Related Injuries, U.S., 2003-2011 (based on ridership)**

Year	Characteristic	Injuries by Ride Type				Injuries by Severity		
		Total	Children's Rides	Family and Adult Rides	Roller Coasters	Total	Serious Injuries	Other Reportable Injuries
2003	Estimated Number of Injuries	1,954	277	1,173	504	1,954	106	1,848
	Percent	100.0%	14.2	60.1	25.8	100.0%	5.4	94.6
	Injuries per Million Patron-rides	1.0	1.2	1.0	1.0	1.0	0.1	1.0
2004	Estimated Number of Injuries	1,648	219	806	613	1,648	132	1,516
	Percent	100.0%	13.3	49.5	37.2	100.0%	8.0	92.0
	Injuries per Million Patron-rides	0.9	1.0	0.8	1.2	0.9	0.1	0.8
2005	Estimated Number of Injuries	1,713	192	1,131	390	1,713	132	1,582
	Percent	100.0%	11.2	66.0	22.8	100.0%	7.7	92.3
	Injuries per Million Patron-rides	0.9	0.8	1.0	0.9	0.9	0.1	0.9
2006	Estimated Number of Injuries	1,546	177	943	426	1,546	135	1,411
	Percent	100.0%	11.4	61.0	27.6	100.0%	8.7	91.3
	Injuries per Million Patron-rides	0.9	0.7	0.9	1.0	0.9	0.1	0.8
2007	Estimated Number of Injuries	1,309	134	759	416	1,309	35	1,274
	Percent	100.0%	10.2	58.0	31.8	100.0%	2.7	97.3
	Injuries per Million Patron-rides	0.7	0.5	0.7	0.9	0.7	0.02	0.7
2008	Estimated Number of Injuries	1,343	117	827	399	1,343	80	1,264
	Percent	100.0%	8.7	61.5	29.7	100.0%	5.9	94.1
	Injuries per Million Patron-rides	0.8	0.6	0.8	1.0	0.8	0.05	0.7
2009	Estimated Number of Injuries	1,086	145	565	375	1,086	65	1,021
	Percent	100.0%	13.4	52.1	34.5	100.0%	6.0	94.0
	Injuries per Million Patron-rides	0.6	0.6	0.5	0.9	0.6	0.04	0.6
2010	Estimated Number of Injuries	1,207	122	652	433	1,207	59	1,148
	Percent	100.0%	10.1	54.0	35.9	100.0%	4.9	95.1
	Injuries per Million Patron-rides	0.7	0.5	0.6	1.0	0.7	0.03	0.7
2011	Estimated Number of Injuries	1,415	175	836	405	1,415	61	1,355
	Percent	100.0%	12.3	59.0	28.6	100.0%	4.3	95.7
	Injuries per Million Patron-rides	0.8	1.0	0.8	1.0	0.8	0.04	0.8

Source: National Safety Council estimates based on annual fixed-site amusement ride injury surveys.

Note: Totals may not equal sum of parts due to rounding.

### Survey Response

Of the 383 eligible facilities with rides in 2011, a total of 144 provided some or all of the data requested (31 provided attendance data only, 16 provided ridership data only, 92 provided both attendance and ridership data, and 5 provided injury data only). The respondents used in the analyses represented about 66.6% of the estimated total annual attendance and 69.1% of the estimated total rides taken at all facilities.

The table below summarizes the number of facilities whose data were used for the attendance-based and ridership-based estimates from 2004-2011. It was impractical to find a single set of facilities that reported all data (attendance, ridership, and injuries) for all years as that would have reduced the reliability of the estimates.

Year	Number of facilities used for injury estimates	
	Attendance-based	Ridership-based
2004	124	99
2005	117	90
2006	124	97
2007	125	104
2008	153	134
2009	113	105
2010	104	96
2011	117	100

#### 2003-2011 Methodology

The National Safety Council conducted the survey using a master list of amusement/theme parks, family entertainment centers, and tourist attractions thought to have fixed-site rides. The master list was prepared in consultation with IAAPA and Amusement Industry Consulting, Inc. The survey consisted of a notification letter, a package of reporting information mailed one week later, and a follow-up postcard mailed one week after the reporting package. After the mailings, IAAPA volunteers made follow-up telephone calls and sent e-mails to IAAPA member facilities and some nonmember facilities. Injury rates based on the reporting facilities were used to estimate national totals. (See also “Survey Response” above.)

#### 2001-2002 Methodology

In 2001 and 2002 IAAPA mailed survey questionnaires to members previously identified as having fixed-site amusement rides. IAAPA retained Heiden Associates, Washington, DC, to analyze the survey results. Using the IAAPA survey results and other data, Heiden Associates estimated the number of U.S. facilities with one or more fixed-site amusement rides and the injury totals and rates.

#### References

Heiden, E.J., & McGonegal, S. (2003). 2001-2002 fixed-site amusement ride injury survey analysis. *Injury Insights*, June/July 2003.