IAAPA WATER SLIDE SAFETY REPORT—UNITED STATES—2019

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To gain perspective on water slide-related injuries occurring at IAAPA-member parks in the United States, a survey of all member facilities with water slides was undertaken to collect and analyze ridership, attendance, and patron injury data for 2019. The goal of the project was to develop injury and injury rate estimates of water slide-related injuries occurring in U.S. member parks. The survey included seasonal and year-around dedicated water parks as well as fixed site amusement parks that also have water slides.

A total of 245 U.S. member water parks and fixed-site amusement parks were invited to participate in the 2019 survey of water slide-related injuries. This sampling attempts to represent 100% of U.S. member parks with water slides. In addition to surveying all of the IAAPA park members listed as water parks, industry experts reviewed the IAAPA fixed site amusement park member list to identify any other facilities not listed as dedicated water parks that were likely to have one or more water slides. All facilities received an initial survey packet via U.S. postal service mail prior to the start of the operating season that included a cover memo with a link to the online survey, a paper version of the survey instrument, reporting instructions, a sample water park exit survey, and a frequently asked questions (FAQ) document. All facilities received an initial follow-up email at the end of the summer operating season, and year-round operators received another follow-up at the end of year. Non-respondents received up to five additional follow-up messages inviting their participation. Water park operators were asked to report attendance, number of water slides, and water slide ridership, as well as the number of patron injuries. Because ridership is an important measure of exposure, water park operators were encouraged to provide an estimate of water slide ridership through exit surveys, sample counts, or other methods. Operators were also asked to provide a summary of their estimating procedures.

Eighty-two IAAPA-member parks provided some or all of the data requested, with 82 parks providing attendance-based data and 61 parks providing ridership-based data. Overall, the National Safety Council estimates that approximately 33% of IAAPA-member parks with water slides in the United States provided usable data for the 2019 estimate, an increase of 23% from 2018. Assuming the size of the responding parks are representative of all member parks with slides, the parks included in the current study represent 32% of the total estimated attendance and 25% of the total estimated number of rides on slides taken at IAAPA-member parks in the United States; these figures represent 5% and 3% increases from 2018, respectively. Although participation levels improved substantially in 2019, because the percentage of participating parks is still relatively low (below 50%), the injury estimates made from the sample data should be interpreted with caution.

Separate attendance-based and ridership-based analyses were performed. 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 1 presents the attendance and ridership-based estimates of water slide-related injuries for all member parks in the United States. In 2019, the attendance-based injury estimate of 1,273 was 61 less than the ridership-based estimate of 1,334 injuries.

When comparing results across years, injury rates are a better indicator of change than the number of injuries. The number of member parks identified with water slides decreased from 254 in 2018 to 245 in 2019. Because of this 3.5% decrease in the number of member parks with

water slides, the number of total injuries increased less in 2019 than they would have if the estimated number of member parks remained the same.

Table 1. Attendance-Based vs. Ridership-Based Injury Estimates, 2016-2019

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	
2016	784	9.59	900	2.68	-116
2017	998	8.81	1,162	3.37	-164
2018	1,079	8.57	1,133	2.97	-54
2019	1,273	10.32	1,334	3.60	-61

Source: National Safety Council estimates based on water slide injury survey.

Confidence intervals were developed for the estimated 2019 water slide injury rates for parks in the United States. The confidence intervals, along with exposure estimates, were then used to estimate the likely range of injuries experienced in 2019. The confidence intervals provided in Table 2 assume a Poisson distribution of the data instead of the normal bell-shaped curve often used in statistics. The Poisson distribution is used in the medical and epidemiological fields to model events, particularly uncommon events like injuries and illnesses. This distribution is not symmetric about its mean and so the associated confidence intervals are not symmetric (the upper limit is slightly farther from the estimate than is the lower limit). The relatively wide confidence interval is a reflection of a small heterogeneous sample of parks reporting a wide range of ridership, attendance, and injury counts. The 2016, 2017, and 2018 attendance and ridership-based injury rates and counts are all outside the confidence intervals of the 2019 results and thus are statistically different.

Table 2. 95% Confidence Intervals of Injury Rates and Counts Assuming a Poisson Distribution

	Attendance Based Estimates		Ridership Based Estimates	
	Injuries per Million Attendance	Injury Count	Injuries per Million Patron-Rides	Injury Count
Upper Confidence Limit	11.36	1,402	4.01	1,485
Estimated Value	10.32	1,273	3.60	1,334
Lower Confidence Limit	9.34	1,153	3.23	1,196

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 water slides provided. The results provided in Table 3 are based on the ridership analysis.

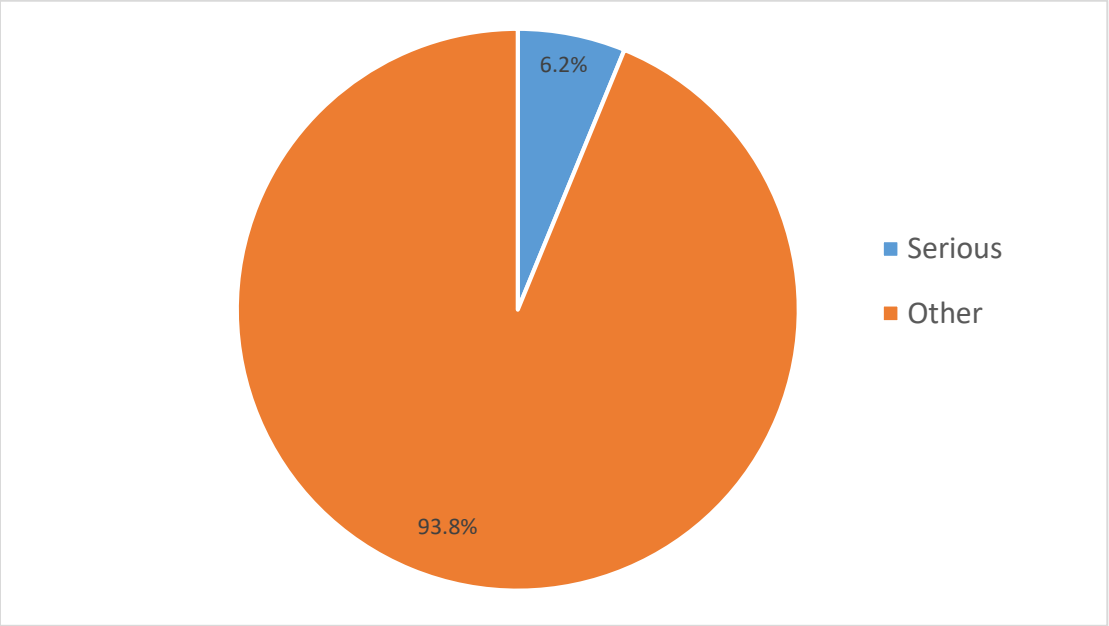
Table 3. Summary of Water Slide Injuries by Severity, United States, 2016-2019 (based on ridership)

		Injuries by Severity		
Year	**Characteristic**	**Total**	**Serious Injuries**	**Other Reportable Injuries**
2016	Estimated Number of Injuries	900	53	846
	Percent	100.0%	5.9%	94.1%
	Injuries per Million Patron-rides	2.68	0.16	2.52
2017	Estimated Number of Injuries	1,162	65	1,097
	Percent	100.0%	5.6%	94.4%
	Injuries per Million Patron-rides	3.37	0.19	3.19
2018	Estimated Number of Injuries	1,133	34	1,098
	Percent	100.0%	3.0%	97.0%
	Injuries per Million Patron-rides	2.97	0.09	2.88
2019	Estimated Number of Injuries	1,334	83	1,251
	Percent	100.0%	6.2%	93.8%
	Injuries per Million Patron-rides	3.61	0.23	3.38

Source: National Safety Council estimates based on water slide injury survey. Note: Totals may not equal sum of parts due to rounding.

As shown in Figure 1, about 6.2% 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 93.8% were reportable injuries that were other than serious incidents that involved medical treatment beyond ordinary first aid. Although the percentage of serious injuries is substantially higher than in 2018, the percentage is in line with 2016 and 2017 results.

Figure 1. Proportion of Injuries by Severity, United States, 2019



Source: National Safety Council estimates based on water slide-related Injury survey.

Survey Response

Of the approximately 245 IAAPA-member parks in the United States with water slides in 2019, a total of 82 provided some or all of the data requested (82 provided attendance data, 61 provided ridership data). The respondents used in the analyses represented about 32% of the total estimated attendance and 25% of the total estimated number of rides on water slides taken at IAAPA-member parks in the United States.

Attendance and Ridership Estimates

Based on IAAPA membership data, it is estimated that 245 member parks with water slides were in operation in the United States at the end of 2019 (see Table 4). Total U.S. attendance and ridership is estimated by extrapolating the average reported attendance and ridership figures by the ratio of the total number of U.S. member facilities to the number reporting data. Using this method, it is estimated that 123.4 million people visited U.S. facilities with water slides and approximately 370.1 million water slide rides were taken in 2019. This estimating method relies on the assumption that the parks that participated in this survey are representative of all IAAPA- member parks with water slides regarding attendance, number of water slides, and number of water slide rides taken. Because a relatively small sample of parks participated, it is likely that the estimated attendance and ridership estimates will show large variations from year to year until the sample of participating parks increases to over 50%.

Table 4. Estimated Number of IAAPA-Members in the United States with Water Slides, Attendance, and Ridership, 2016-2019

Year	Estimated Number of Member Facilities with Water Slides in the United States	Estimated Annual Attendance (millions)	Estimated Annual Ridership (millions)
2016	229	81.7	335.6
2017	239	113.2	344.5
2018	254	125.9	381.5
2019	245	123.4	370.1

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

While most water park operators have procedures in place to count the number of visitors to the park, many parks do not have similar procedures to count every time a visitor rides down a slide. Because ridership is an important measure of exposure, water park operators were encouraged to provide an estimate of water slide ridership through exit surveys, sample counts, or other methods. Operators were also asked to provide a summary of their estimating procedures. Results showed that a wide variety of estimating procedures are being used by water park operators. A summary of water slide ridership estimating procedures is provided below:

- 24 parks: Directly count using turnstiles, laser counters, or other devices.
- 11 parks: Estimate from a sampling of on-location counts using hand-held counters or other devices.
- 8 parks: Estimate from average water slide rides per guest figures obtained using an exit survey or similar method.
- 18 parks: Estimate using their own alternative method. These methods varied widely but tended to be based on number of rides per guest estimates multiplied by the number of guests. Many estimating procedures included corrections for poor weather and peak hours when long wait times result in fewer rides per guest.

2019 Methodology

The National Safety Council conducted the survey using a master list of IAAPA-member water parks and amusement parks. The sampling attempts to represent 100% of U.S. member parks with water slides. In addition to surveying all of the IAAPA members listed as water parks, industry experts reviewed the IAAPA fixed site amusement park member list to identify any other facility not listed as a dedicated water park that were likely to have one or more water slides. The industry experts also identified the seasonal and year-round facilities from among those identified to have water slides. The initial survey packet mailed prior to the start of the operating season consisted of a notification letter that included a link to the online survey, a paper copy of the survey instrument, the reporting instructions, a sample water park exit survey, and a frequently asked questions (FAQ) document. At the end of the summer operating season, all facilities received an email reminder including the response periods for the seasonal and year round facilities. Year round facilities received another email message in December reminding them of the response period and requesting their participation. Seasonal facilities received up to five follow-up messages via email, while year round facilities received up to two follow-up messages. Injury rates based on the data supplied by reporting facilities were used to estimate national totals (see also “Survey Response” above).