



Pool or Spa Submersion: Estimated Injuries and Reported Fatalities, 2013 Report



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Executive Summary

This report presents estimates of the number of pool- or spa¹-related submersion² injuries between 2010 and 2012, and it presents counts of reported pool- or spa-related submersion fatalities involving children younger than 15 years of age between 2008 and 2010. The subset of submersion injuries and fatalities involving children younger than 5 years of age is also provided. Please note that injuries and fatalities associated with circulation/suction entrapments in pools or spas are presented in a separate document.³ It is important to note that incidents covered by this report were associated with a pool or spa, but the primary cause of the incident was not necessarily the pool or spa product.

Annual estimates for 2010 through 2012, and an average annual estimate of the number of emergency department-treated submersion injuries are presented. This is followed by a count of fatal submersions reported to CPSC staff for 2008 through 2010. The years for reported injury and fatality statistics differ as a result of the lag in fatality reporting.

Key findings include:

- There were, on average, an estimated 5,100 pool- or spa-related hospital emergency department (ED)-treated submersion injuries each year for 2010 through 2012, and 390 pool- or spa-related fatalities reported per year for 2008 through 2010, involving children younger than 15 years of age.
- Seventy-six percent of the reported fatalities and 78 percent of the ED-treated injuries involved children younger than 5 years of age.
- The majority of the estimated ED-treated submersion injuries for 2010 through 2012, and the reported fatalities for 2008 through 2010, were associated with pools (versus spas).
- Children between the ages of 1 and 3 (12 months through 47 months) represented 64 percent of estimated injuries for 2010 through 2012 and 67 percent of the reported fatalities for 2008 through 2010 involving children younger than 15 years.
- For children younger than 15 years old, 51 percent of the victims of ED-treated pool or spa submersion injuries for 2010 through 2012 were admitted to the hospital or treated and transferred to another hospital, compared to 4 percent for ED-treated injuries to children younger than 15 years old involving all types of consumer products during the same time period.
- Injured children younger than 5 years old were treated and transferred less frequently (12 percent) than injured children between the ages of 5 and 14 years old (23 percent). Thirty-four percent of children between the ages of 5 and 14 were treated and released, compared to 45 percent of children younger than age 5.

¹ The term “spa” is used to refer to spas and hot tubs.

² The term “submersion” is used in lieu of the term “drowning” to encompass a broader scope of incidents.

³ 1999–2011 “Reported Circulation/Suction Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs, 2012 Report,” May 2012.

- Approximately 48 percent of the estimated injuries for 2010 through 2012 and 73 percent of the fatalities for 2008 through 2010 involving children younger than 15 years old occurred at a residence.
- Residential locations dominated incidents involving victims younger than 5 years of age (53 percent for injuries and 85 percent for fatalities).
- Most reported fatalities occurred on the day of (68 percent) or within a week of (additional 25 percent) the submersion incident. Only 6 percent of fatal victims survived beyond a week of the submersion, and these victims had severe injuries and required intensive medical care.
- Approximately 59 percent of fatalities (annual average of 231) occurred in in-ground pools. Above-ground pools accounted for 15 percent of the reported fatalities with portable pools accounting for 9 percent of the reported fatalities (annual average of 37) for children younger than 15 years of age.
- Parents, caregivers, and the media are encouraged to visit www.PoolSafely.gov for vital safety information regarding the prevention of child submersions in and around pools and spas.

Emergency Department-Treated Injuries

For 2010 through 2012, an estimated annual average of 5,100 children younger than 15 years of age were treated in U.S. hospital emergency departments (EDs) for injuries associated with pool or spa submersions. Estimates are shown in Table 1. Estimates are also provided for injured children younger than 5 years of age but are not provided for injured children 5 to 14 years of age due to the estimate being very small.⁴ Injury estimates came from National Electronic Injury Surveillance System (NEISS) data, where sampling weights are used to project the cases from NEISS hospitals to national estimates. The corresponding annual average estimates for the years 2009 through 2011 are 5,200 children younger than 15 and 4,100 children younger than 5 years of age treated in hospital emergency departments for submersion injuries related to pools or spas.

Table 1
Estimated Number of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years of Age, 2010–2012

Year	Estimated Emergency Department-Treated Injuries ⁵	
	Younger than 5 Years	Younger than 15 Years
Average	4,000	5,100
2012	4,200	5,400
2011	3,400	4,400
2010	4,400	5,600

Source: U. S. Consumer Product Safety Commission: National Electronic Injury Surveillance System (NEISS). Appendix A details the methodology for data extraction.

The 2012 estimates of children younger than 15 years of age and children younger than 5 years of age who were treated in U.S. hospital emergency departments for pool- or spa-related submersion injuries are not statistically different from the 2011 estimates. On average, during 2010 through 2012, 78 percent of children treated in emergency departments for pool- or spa-related submersion injuries were younger than 5 years of age. Children younger than 5 years of age comprised an estimated 78, 78, and 77 percent of the childhood pool- or spa- related treated injuries in 2010, 2011, and 2012, respectively.

⁴ Estimates less than 1,200 are not routinely reported.

⁵ The estimates are rounded to the nearest hundred.

Table 2 shows the percent of estimates for 2010 through 2012 associated with pool or spa submersions by type of product. Spa-related submersions constitute 2 percent of the estimated number of treated injuries for children younger than 15 years of age, and 3 percent of the pool or spa submersion treated injuries for children younger than 5 years of age.

Table 2
Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years of Age by Product Type, 2010–2012

Product Type	Emergency Department-Treated Injury Percentages	
	Younger than 5 Years	Younger than 15 Years
Pool	97	98
Spa	3	2

Source: U. S. Consumer Product Safety Commission: National Electronic Injury Surveillance System (NEISS). Appendix A details the methodology for data extraction.

Table 3 shows the percentage of the estimated number of pool- or spa-related submersion injuries by victim gender. Male children are more frequently treated for pool- or spa-related submersion injuries than female children. This is true of all injured children younger than 15 and the subset of children younger than 5 years of age.

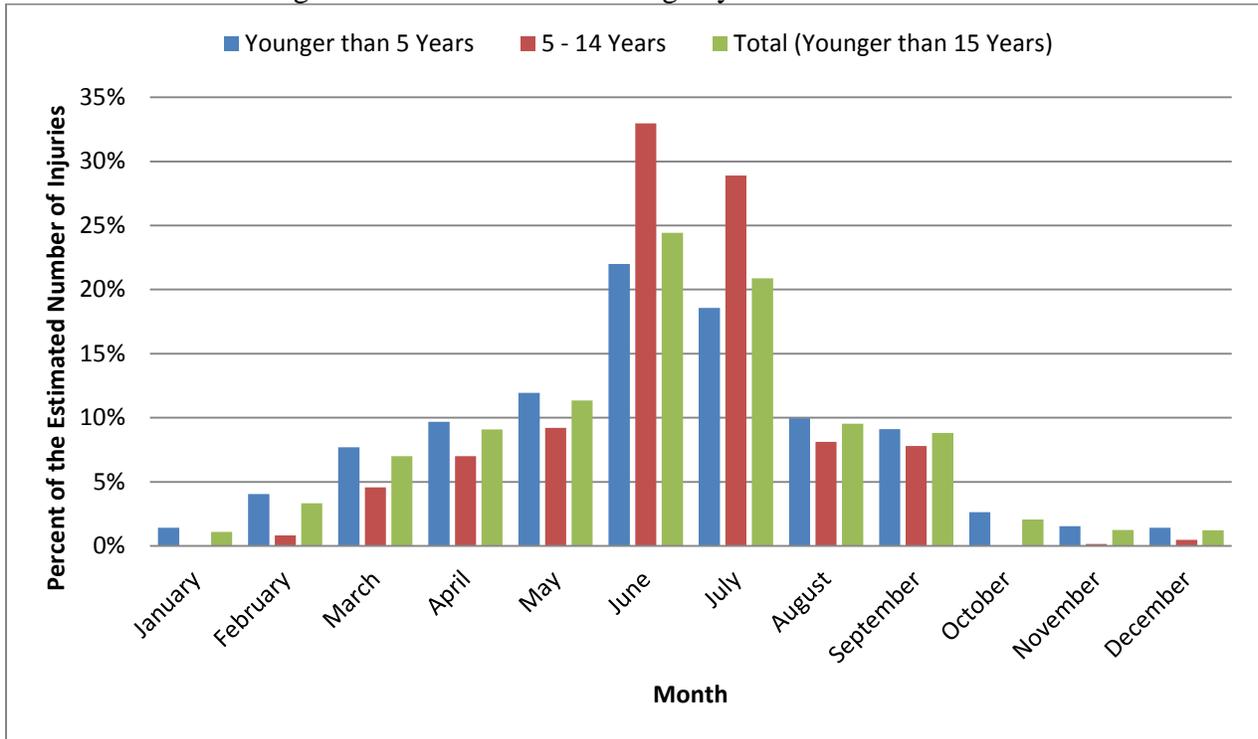
Table 3
Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years of Age by Gender, 2010–2012

Gender	Estimated Emergency Department-Treated Injury Percentages	
	Younger than 5 Years	Younger than 15 Years
Male	58	60
Female	42	40

Source: U. S. Consumer Product Safety Commission: National Electronic Injury Surveillance System (NEISS). Appendix A details the methodology for data extraction.

Figure 1 illustrates the seasonal distribution of the percentages of the estimated emergency department-treated submersion injuries for each age group. The months of May, June, July, and August had the largest percentages.

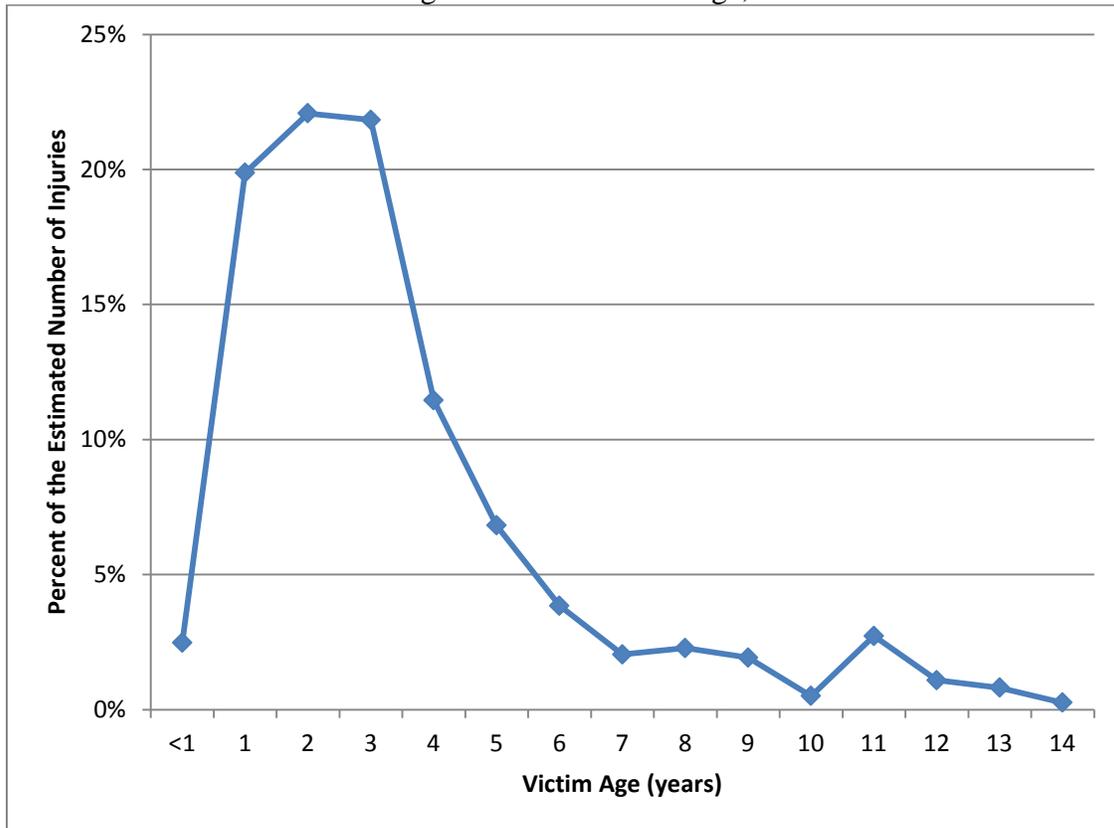
Figure 1
 Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
 Children Younger than 5 and 15 Years of Age by Month of Treatment 2010–2012



Source: U. S. Consumer Product Safety Commission: National Electronic Injury Surveillance System (NEISS).

Figure 2 plots the percent of the estimated number of ED-treated submersion injuries as a function of the victim's age. Children younger than 1 year of age accounted for 2 percent of the estimated pool- or spa-related submersion injuries. Children between the ages of 1 and 3 years (12 to 47 months) comprised approximately 64 percent of the estimated number of children treated for pool- or spa-related submersion injuries. An additional 11 percent of the estimated childhood pool- or spa-related submersion injuries occurred in children 4 years of age (48 to 59 months). Children ages 5 to 9 and 10 to 14 accounted for 17 and 5 percent, respectively, of the estimated ED-treated pool or spa related submersion injuries.⁶

Figure 2
Percent of Emergency Department-Treated Submersion Injuries by Age
Children Younger than 15 Years of Age, 2010–2012



Source: U. S. Consumer Product Safety Commission: National Electronic Injury Surveillance System (NEISS).

⁶ Percentages may not add up to 100 due to rounding.

Table 4 gives a breakdown of submersion injuries by disposition. Injured children younger than 5 years had a higher percentage (45%) of the *examined/treated and released* disposition compared to children 5 to 14 years of age (34%). For *admitted to hospital and treated and transferred* dispositions, injured children younger than 5 years had a lower percentage (49%) compared to the percentage (60%) for children 5 to 14 years of age. *DOA or died in the emergency department* percentages are close for the two age groups. The deaths recorded in NEISS are also included in the fatality count in the section on reported fatalities. In contrast, for all consumer products in the CPSC’s jurisdiction, only 4 percent of children in the younger than 5 and younger than 15 years of age categories treated or examined in an emergency department for a product-related injury were either admitted to the hospital or treated and transferred.

Table 4
Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years of Age by Disposition, 2010–2012

Disposition	Estimated Emergency Department-Treated Injury Percentages ⁷		
	Younger than 5 Years	5–14 Years	Total (Younger than 15 Years)
Examined or Treated and Released	45	34	43
Admitted to Hospital	36	36	36
Treated and Transferred	12	24	15
DOA or Died in Emergency Department	5	2	4
Held for Observation	1	4	2
Left Without Being Seen	1	-	-

Source: U. S. Consumer Product Safety Commission: National Electronic Injury Surveillance System (NEISS). Appendix A details the methodology for data extraction.

⁷ Percentages may not add up to 100 due to rounding.

Table 5 shows the percentages of the estimated number of injuries for each age group by the type of location of the submersion incident. Overall, the majority of the incidents that led to these emergency department visits occurred at a residence. Injured children younger than 5 years of age had the largest percentage (53%) in a residential location. Children 5 to 14 years of age had a plurality in public locations (40%).

Table 5
Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years of Age by Location, 2010–2012

Location	Estimated Emergency Department-Treated Injury Percentages⁸		
	Younger than 5 Years	5–14 Years	Total (Younger than 15 Years)
Residential	53	32	48
Undisclosed Location	29	28	29
Public	19	40	24

Source: U. S. Consumer Product Safety Commission; National Electronic Injury Surveillance System (NEISS). Appendix A details the methodology for data extraction.

⁸ Percentages may not add up to 100 due to rounding.

Reported Fatalities

On average, 390 fatalities associated with pool or spa submersions involving children younger than 15 years of age were reported to CPSC staff annually during the period from 2008 through 2010. The years for reported injury and fatality statistics differ as a result of the lag in fatality reporting. Reported fatality frequencies by year and age category are shown in Table 6. Seventy-six percent of the victims of the reported pool- or spa-related childhood submersion fatalities were younger than 5 years of age. Victims in this age category also accounted for 78 percent of the childhood submersion injuries related to pools or spas between 2010 and 2012. Cases in NEISS that were classified as DOA or died in the ED are also included in fatality case counts for their respective years.

For the 1,170 reported submersion fatalities from 2008 through 2010, 1,144 or 98 percent of the incidents involved 1 victim; 18 incidents involved 2 victims; and 8 incidents involved 1 victim who was included in the count, plus additional victims who were older than 14 years of age, and therefore, excluded from the counts.

The numbers of fatal submersions related to pools or spas that are presented in the following section are based on all incidents reported to CPSC staff. These numbers are considered to be minimum counts only and cannot be used as generalized estimates for the U.S. population because they are derived from anecdotal data.

Table 6
Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 15 Years of Age, 2008–2010

Year ⁹	Reported Fatality Frequencies			Total (Younger than 15 Years)
	Younger than 5 Years ¹⁰	5–9 Years	10–14 Years	
Average	295	65	31	390
2010	299	60	30	389
2009	300	61	25	386
2008	285	73	37	395
Totals 2008-2010	884	194	92	1170

Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations). Appendix A details the methodology for data extraction.

⁹ Reporting is not considered complete for 2009 and 2010. The number of reported fatalities may change in the future.

¹⁰ One case is included in this category where the age is unknown, but the term “toddler” was used to describe the victim.

Table 7 provides information on the interval between the submersion incident and the time of death for pool- or spa-related submersion fatalities. For most of the fatalities (79 percent), the date of death was either the same as the date of the incident or one day later. However, 20 percent of the victims younger than 15 years of age succumbed days, weeks, and even years after the submersion, often after extensive medical treatment.

Table 7
Percentage of Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 15 Years of Age by Interval Between Injury and Death,¹¹ 2008–2010

Days Between Incident & Death	Percentage of Reported Fatalities¹²			Percentage (Younger than 15 Years)
	Younger than 5 Years	5–9 Years	10–14 Years	
0 days	69	72	57	68
1 day	10	12	12	11
2–7 days	14	12	26	15
8–31 days	4	3	2	4
> 31 days	2	1	3	2

Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations). Appendix A details the methodology for data extraction.

¹¹ Note that the age at time of death is used to determine the appropriate age category. In most cases, the difference between the date of incident and date of death is not sufficient to change the age category. There were 25 fatalities where the difference was more than 31 days.

¹² Percentages may not add up to 100 due to rounding.

Reported fatalities occurred predominantly in pools. A small number of fatalities were associated with spas. Children younger than 5 years of age comprised the largest percentage of reported spa-related submersion fatalities compared to the other age subcategories. Table 8 records these percentages by product type.

Table 8
Percentage of Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 15 Years of Age by Product Type, 2008–2010

Product	Percentage of Reported Fatalities			Total (Younger than 15 Years)
	Younger than 5 Years	5–9 Years	10–14 Years	
Pool	98	100	97	98
Spa	2	-	3	2

Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths) and INDP (In Depth Investigations). Appendix A details the methodology for data extraction.

Table 9 gives the estimated percentages of pool or spa submersion fatalities by victim age and gender. For all age groups, roughly two-thirds of victims were males. This is consistent with the injury data, which show that more male children were treated in emergency departments for pool- or spa-related submersion injuries.

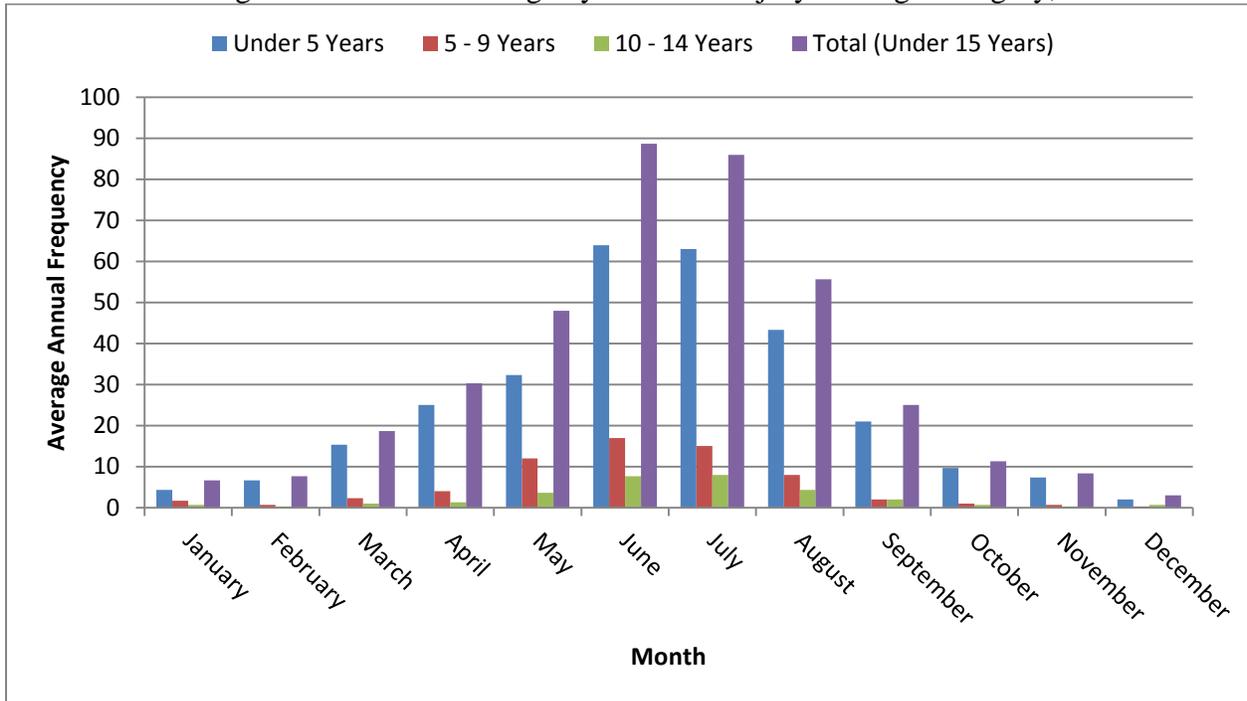
Table 9
Percentage of Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersions
Children Younger than 15 Years of Age by Gender, 2008–2010

Gender	Percentage of Reported Fatalities			Total (Younger than 15 Years)
	Younger than 5 Years	5–9 Years	10–14 Years	
Male	67	69	67	67
Female	33	31	33	33

Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations). Appendix A details the methodology for data extraction.

Figure 3 illustrates the seasonal distribution of reported pool- or spa-related childhood submersion fatalities as a function of victim age. As expected, the summer months of June, July, and August had the largest annual frequencies for all age groups.

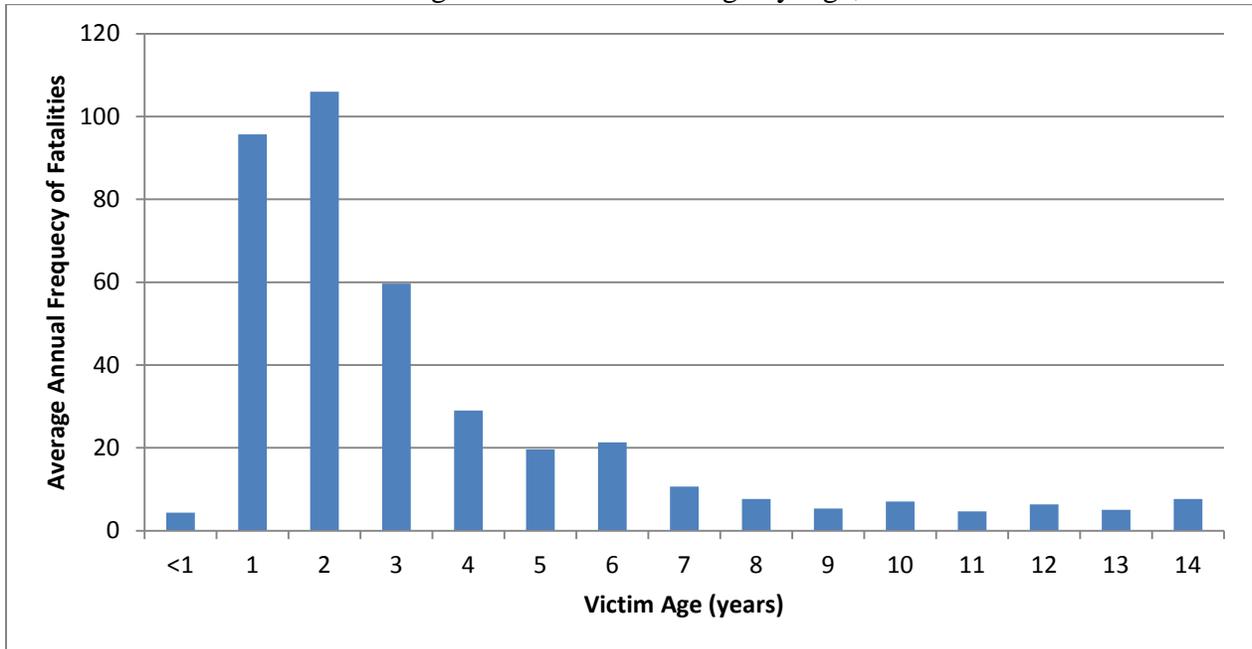
Figure 3
Average Annual Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion Children Younger than 15 Years of Age by Month of Injury and Age Category, 2008–2010



Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations). Appendix A details the methodology for data extraction.

Figure 4 shows the annual average of reported pool or spa submersion fatalities in children younger than 15 years old as a frequency distribution of the victim’s age. Children between the ages of 1 and 3 years (12 to 47 months) comprised approximately 67 percent of the reported pool or spa submersion fatalities. The graph shows a sharp decrease after age 2 (less than or equal to 35 months).

Figure 4
Average Annual Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 15 Years of Age by Age, 2008–2010



Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations).

Table 10 records the percentages of reported pool or spa fatalities by incident location. The majority of reported deaths (73 percent for pools or spas) occurred in residential settings, such as the victim’s home, a family or friend’s house, or a neighbor’s residence. The victim’s home accounts for the largest percentage (43 percent) for all location categories for victims younger than 15 years of age. For children 5 to 9 years of age and children 10 to 14 years of age, the public/community/business location accounted for the largest percentage of reported submersion fatalities.

Table 10
Percentage of Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 15 Years of Age by Incident Location, 2008–2010

Location	Percentage of Reported Fatalities ¹³			Total (Younger than 15 Years)
	Younger than 5 Years	5–9 Years	10–14 Years	
Home	53	10	13	43
Family/ Friend	26	17	13	23
Public/ Community/ Business¹⁴	9	45	57	19
Undisclosed Location	6	17	13	8
Neighbor	6	11	4	7

Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations). Appendix A details the methodology for data extraction.

¹³ Percentages may not add up to 100 due to rounding.

¹⁴ Condominium and apartment complex pools are included in this category.

Table 11 presents the percentages of reported fatalities by pool/spa type. The in-ground product type accounted for the largest percentage of known pool/spa types (59 percent for victims younger than 15). This was followed by the above-ground pool category and portable pool category.

Table 11
Percentage of Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 15 Years of Age by Specific Pool/Spa Type Product Category,
2008–2010

Location	Percentage of Reported Fatalities ¹⁵			Total (Younger than 15 Years)
	Younger than 5 Years	5–9 Years	10–14 Years	
In-Ground	59	59	62	59
Undisclosed Pool/Spa Type	9	34	32	15
Above- Ground (Pools Only)	18	5	1	15
Portable ¹⁶ (Pool Only)	12	2	2	9
Inside Home (Spa Only)	-	-	2	-
Outside Home (Spa Only)	2	0	1	2

Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations). Appendix A details the methodology for data extraction.

¹⁵ Percentages may not add up to 100 due to rounding.

¹⁶ A “portable pool” is defined as any pool that can be set up/taken down or moved to another location with relative ease.

Since the majority of reported fatal submersion victims were younger than 5 years of age, the incident reports from 2008 through 2010 were evaluated, and common scenarios for children younger than 5 years of age for pools or spas (881 reported submersion fatalities) were classified. The highest percentage of the reports (55 percent) attributed the incident to a lapse in adult supervision (an adult losing contact or knowledge of the whereabouts of the child and, during this time period, the child managed to access the pool/spa). Eleven percent of the reports indicated barrier compromise or circumvention. Another common scenario—17 percent of the reports—involved close proximity to the pool/spa, with the victim last seen in the pool/spa, or near the pool/spa, before the incident occurred. In 16 percent of the reports, there was too little information available to determine the scenario. The scenarios are categorized in Table 12. Hazard scenarios for older children are not characterized because CPSC staff receives fewer reports of fatal submersions involving this age group.

Table 12
Percentage of Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 5 Years of Age by Scenario, 2008–2010

Scenario	Percentage of Reported Fatalities for Pools and Spas ¹⁷
Lost Contact or Knowledge of Whereabouts	55
Not Enough Information to Determine Scenario	16
Barrier Integrity or Circumvented Barrier	11
Near Pool/Spa or In Pool/Spa	17

Source: CPSC databases including NEISS, IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations). Appendix A details the methodology for data extraction.

¹⁷ Percentages do not add up to 100 due to rounding.

Appendix A

Methodology for Pool or Spa Submersion—Estimated Injuries and Reported Fatalities (2013)

“Drowning” is defined as suffocation and death resulting from filling of the lungs with water or other substances or fluid, so that gas exchange becomes impossible. A “near drowning” is defined as survival for any length of time after submersion in water and temporary suffocation. “Submersion” is defined as the act of placing or the condition of being under the surface of a liquid.¹⁸ For this reason and because a considerable number of children are injured or do not die immediately, the term “submersion,” rather than the term “drowning,” encompasses more accurately the various events that occur.

Injury estimates came from National Electronic Injury Surveillance System (NEISS) data extracted on April 4, 2013, for calendar year 2012. The NEISS product codes used for the data were 3251 (Built-in pools), 3221 (Above-ground pools), 1246 (Wading pools), 1284 (Pools, not specified), 3274 (Swimming, activity) and 698 (Hot tubs and Spas). Diagnoses codes of 69 (Submersions), 65 (Anoxia), and 42 (Aspirated on) were also used, along with the age constraint of “children younger than 15 years of age,” to restrict the extracted data. Cases involving the activity of swimming were reviewed for potential inclusion in the data set. NEISS data from 2010 and 2011 were also used from last year’s report to cover the 2010 through 2012 timeframe. NEISS data is from a probability-based sample. Sampling weights are used to project the cases from NEISS hospitals to national estimates. Because incidents in NEISS are unique, there were no duplicates.

The estimated numbers of emergency department-treated injuries are rounded to the nearest hundred. Percentages in this report are rounded to the nearest integer. Because NEISS is a weighted sample, injury category percentages were based on the category weighted estimate (not rounded), divided by the total weighted estimate (not rounded).

Data were extracted on February 4, 2013, from NEISS, IPII, DTHS and INDP for pool- or spa-related submersion deaths involving children younger than 15 years of age for the years 2008 to 2010. These data were merged with data from last year’s report for 2008 and 2009, to cover the 2008 through 2010 reporting period. It should be noted that for a given year, incidents are included on an ongoing basis for IPII and DTHS. In particular, additional reports for prior reported years are generally received for the most recent years. Fatal incidents associated with product codes 3251 (Built-in pools), 3221 (Above-ground pools), 1246 (Wading pools), 1284 (Pools, not specified), 3274 (Swimming, activity), and 698 (Hot tubs and Spas) were examined for inclusion in counts. Information from these cases was extracted into an Excel spreadsheet and sorted by date and incident location. As pool submersion incidents are notable events in the community where they occur, there were often multiple news reports (IPII), a medical examiner’s report (IPII), a death certificate (DTHS), an in-depth investigation (INDP), and less frequently, a hospital emergency department report (NEISS) for a single incident. IPII is a mixture of various types of information, including newspaper clippings, consumer complaints, and reports from other government agencies, such as medical examiners/coroners. Information is submitted voluntarily to IPII, so staff cannot be sure that information on all the deaths has been received. Source documents were checked to eliminate duplicate incident reports.

¹⁸ *Dorland’s Illustrated Medical Dictionary*, 30th Edition, Saunders, 2003.