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Pool or Spa Submersion: Estimated Injuries and Reported Fatalities, 2014 Report

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Ted Yang
Directorate for Epidemiology
Division of Hazard Analysis
U.S. Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

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Executive Summary

This report presents estimates of the number of pool- or spa¹-related submersion² injuries that occurred between 2011 and 2013, and presents counts of reported pool- or spa-related submersion fatalities involving children younger than 15 years of age that occurred between 2009 and 2011. In addition, the report provides the subset of submersion injuries and fatalities involving children younger than 5 years of age. Please note that injuries and fatalities associated with circulation/suction entrapments in pools or spas are presented in a separate document.³ Importantly, incidents covered by this report were associated with a pool or spa, but a pool or a spa product was not necessarily the primary cause of the incident.

The report presents annual estimates for 2011 through 2013, and an average annual estimate of the number of emergency department-treated submersion injuries. Included is a count of fatal submersions reported to CPSC staff for 2009 through 2011. The years for reported injury and fatality statistics differ because of the lag in fatality reporting.

Key findings include:

- There were, on average, an estimated 4,900 pool- or spa-related hospital emergency department (ED)-treated submersion injuries each year for 2011 through 2013, and 390 pool or spa-related fatalities reported per year for 2009 through 2011, involving children younger than 15 years of age.
- Seventy-six percent of the reported fatalities and an annual average of 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 2011 through 2013, and the reported fatalities for 2009 through 2011, were associated with pools (versus spas).
- Children between the ages of 1 and 3 (12 months through 47 months) represented 64 percent of estimated ED-treated injuries for 2011 through 2013, and 67 percent of the reported fatalities for 2009 through 2011 involving children younger than 15 years old.
- For children younger than 15 years old, 51 percent of the victims of ED-treated pool or spa submersion injuries for 2011 through 2013 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.
- Approximately 47 percent of the estimated ED-treated injuries for 2011 through 2013 and 75 percent of the fatalities for 2009 through 2011 involving children younger than 15 years old occurred at a residence.

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

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

³ 2009–2013 “Reported Circulation/Suction Entrapment Incidents Associated with Pools, Spas, and Whirlpool Bathtubs, 2014 Report,” March 2014.

- Residential locations dominated incidents involving victims younger than 5 years of age (50 percent for injuries and 85 percent for fatalities).
- Most reported fatalities occurred on the day of (69 percent), or within a week of (additional 25 percent), the submersion incident. Only 6 percent of fatal victims younger than 15 survived beyond a week of the submersion, and these victims had severe injuries and required intensive medical care.
- For children under 15 years of age, there were approximately twice as many reported submersion fatalities involving male victims than reported submersion fatalities involving female victims.
- Approximately 58 percent of fatalities (annual average of 226) occurred in in-ground pools. Above-ground pools accounted for 17 percent of the reported fatalities, with portable pools accounting for 9 percent of the reported fatalities (annual average of 35) 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 Injury Estimates

For 2011 through 2013, an estimated annual average of 4,900 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 are derived from National Electronic Injury Surveillance System (NEISS) data, where sampling weights are used to project the number of cases reported by NEISS hospitals to national estimates. The corresponding annual average estimates for the years 2010 through 2012 are 5,100 children younger than 15 and 4,000 children younger than 5 years of age treated in hospital emergency departments for submersion injuries related to pools or spas.⁵

Table 1
Estimated Number of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years of Age, 2011–2013

Year	Estimated Emergency Department-Treated Injuries ⁶	
	Younger than 5 Years	Younger than 15 Years
Average	3,800	4,900
2013	3,800	4,800
2012	4,200	5,400
2011	3,400	4,400

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

The 2013 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 2012 estimates. On average, during 2011 through 2013, 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, 77, and 80 percent of all childhood pool- or spa- related treated submersion injuries in 2011, 2012, and 2013, respectively.

⁴ Estimates less than 1,200 are not routinely reported according to NEISS publication standards.

⁵ <http://www.cpsc.gov/Global/Research-and-Statistics/Injury-Statistics/Sports-and-Recreation/Pools/PoolSubmersions2013.pdf>.

⁶ The estimates are rounded to the nearest hundred.

Table 2 shows the percent of estimates for 2011 through 2013 associated with pool or spa submersions by type of product. Spa-related submersions constitute 3 percent of the estimated number of treated pool or spa related submersion injuries for children younger than 15 years of age, and 3 percent of the treated pool or spa related submersion 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, 2011–2013

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

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. The data indicate that this occurs for submersion injured children younger than 15 and for the subset of children younger than 5 years of age.

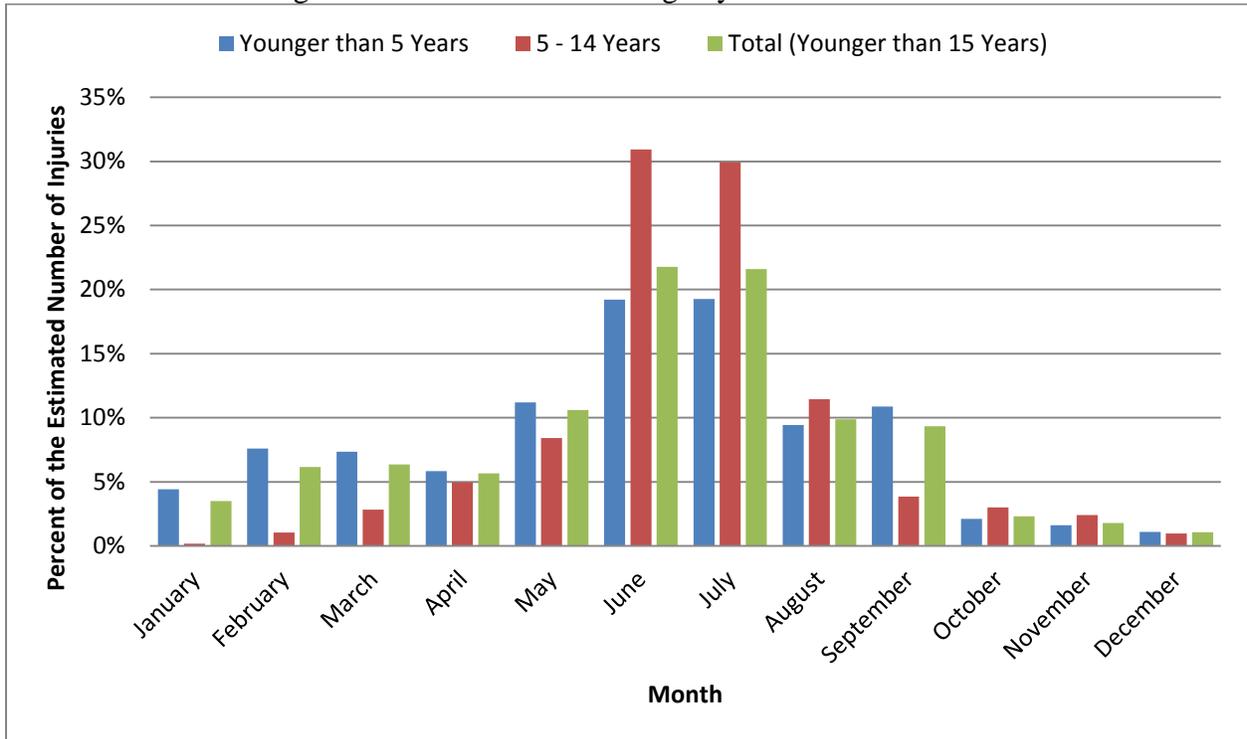
Table 3
Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years of Age by Gender, 2011–2013

Gender	Estimated Emergency Department-Treated Injury Percentages	
	Younger than 5 Years	Younger than 15 Years
Male	59	60
Female	41	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.

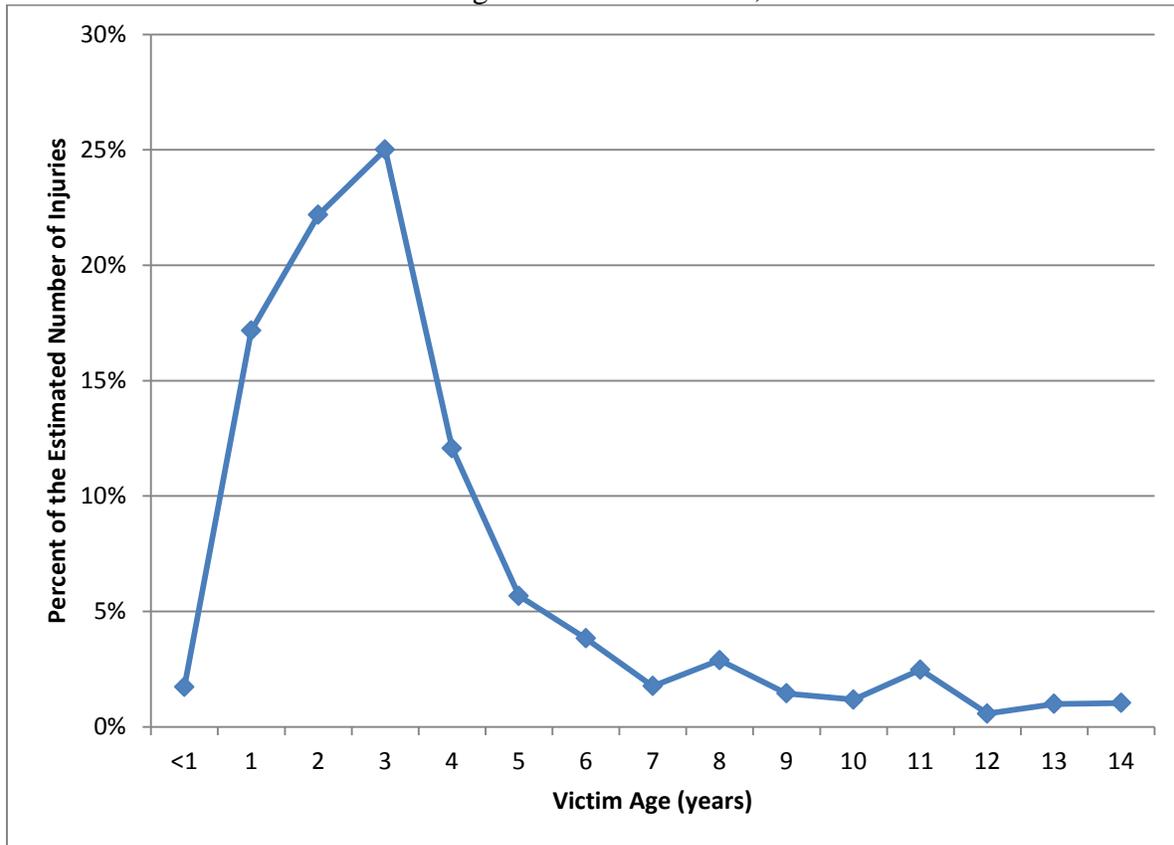
Figure 1
 Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
 Children Younger than 5 and 15 Years of Age by Month of Treatment 2011–2013



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 old 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 12 percent of the estimated childhood pool- or spa-related submersion injuries occurred to children 4 years old (48 to 59 months). Children ages 5 to 9 and 10 to 14 accounted for 16 and 6 percent, respectively, of the estimated ED-treated pool or spa related submersion injuries.

Figure 2
Percent of Emergency Department-Treated Submersion Injuries by Age
Children Younger than 15 Years Old, 2011–2013



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

Table 4 gives a breakdown of submersion injuries by disposition. Children younger than 15 years of age were admitted to the hospital or treated and transferred to another hospital 51 percent of the time. In contrast, for all consumer products in the CPSC’s jurisdiction, of those treated or examined in an emergency department for a product-related injury, only 4 percent of children in the younger than 15 years of age category were either admitted to the hospital or treated and transferred to another hospital. For *DOA or died in the emergency department* percentages, drowning victims younger than 5 years had a higher percentage (6%) compared to victims 5 to 14 years of age (2%). The deaths recorded in NEISS are also included in the fatality count in the section on reported fatalities.

Table 4
Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years Old by Disposition, 2011–2013

Disposition	Estimated Emergency Department-Treated Injury Percentages ⁷		
	Younger than 5 Years	5–14 Years	Younger than 15 Years
Examined or Treated and Released	42	39	41
Admitted to Hospital	40	41	40
Treated and Transferred	10	15	11
DOA or Died in Emergency Department	6	2	5
Held for Observation	3	4	3
Left Without Being Seen	< 1	0	< 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 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 old had the largest percentage (50%) in a residential location. Children 5 to 14 years of age had a plurality in public locations (44%).

Table 5
Percent of Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 5 and 15 Years Old by Location, 2011–2013

Location	Estimated Emergency Department-Treated Injury Percentages		
	Younger than 5 Years	5–14 Years	Younger than 15 Years
Residential	50	36	47
Undisclosed Location	27	20	26
Public	23	44	27

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

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 from 2009 through 2011. The years for reported injury statistics differ from those for fatalities because of a 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. As stated previously, victims in this age category also accounted for an average of 78 percent of the childhood submersion injuries related to pools or spas between 2011 and 2013. Cases in NEISS that were classified as “DOA” or “died in the ED” (see Table 4) are also included in fatality case counts for their respective years.

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.

For the 1,171 reported submersion fatalities from 2009 through 2011, there were 1,144 fatalities or 98 percent of the incidents that involved 1 victim; 18 incidents that involved 2 victims; and 9 incidents that 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.

Table 6
Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 15 Years of Age, 2009–2011

Year ⁸	Reported Fatality Frequencies			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years ⁹
Average	298	64	27	390
2011	289	66	26	384
2010	302	64	31	397
2009	304	61	25	390
Totals 2009-2011	895	191	82	1171

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.

⁸ Reporting is not considered complete for 2010 and 2011. The number of reported fatalities may change in the future.

⁹ This category includes three cases in 2011, where the victim’s age is unknown, but the victim is inferred to be under 15 years old.

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, 21 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,¹⁰ 2009–2011

Days Between Incident & Death	Percentage of Reported Fatalities¹¹			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
0 days	69	70	63	69
1 day	10	11	9	10
2–7 days	14	13	21	14
8–31 days	5	4	2	4
> 31 days	2	2	4	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.

¹⁰ 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 24 fatalities where the difference was more than 31 days.

¹¹ 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, 2009–2011

Product	Percentage of Reported Fatalities			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
Pool	96	99	100	96
Spa	4	1	0	4

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 under 15, there were more reported male submersion victims than reported female submersion victims. 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.

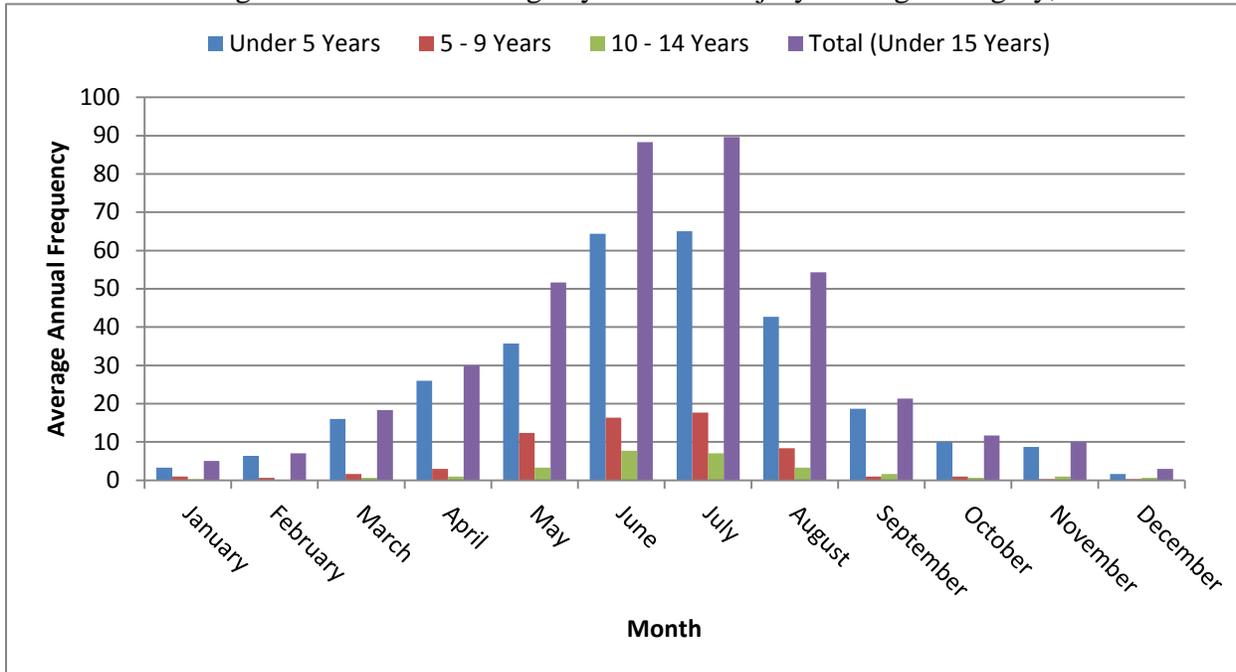
Table 9
Percentage of Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersions
Children Younger than 15 Years of Age by Gender, 2009–2011

Gender	Percentage of Reported Fatalities			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
Male	67	72	76	68
Female	33	28	24	32

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.

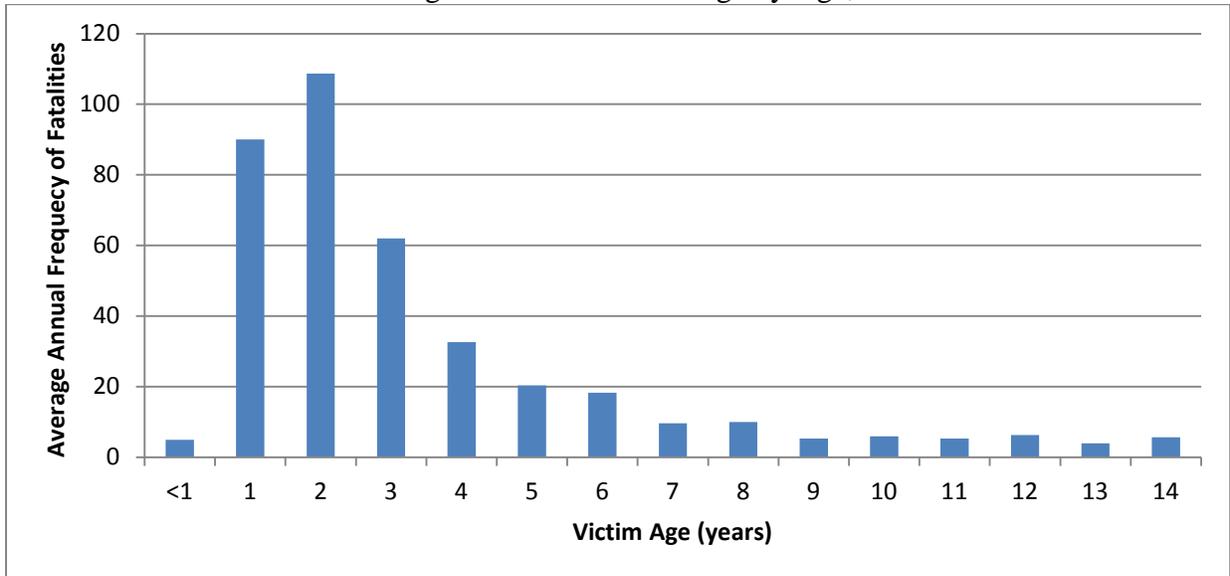
Figure 3
Average Annual Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion Children Younger than 15 Years of Age by Month of Injury and Age Category, 2009–2011



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

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, 2009–2011



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 (75 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 (44 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, 2009–2011

Location	Percentage of Reported Fatalities ¹²			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
Home	53	10	22	44
Family/ Friend	26	19	10	24
Public/ Community/ Business ¹³	9	44	50	18
Undisclosed Location	5	16	13	7
Neighbor	6	10	5	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.

¹² Percentages may not add to 100 due to rounding.

¹³ 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 (58 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,
2009–2011

Location	Percentage of Reported Fatalities ¹⁴			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
In-Ground	58	59	57	58
Undisclosed Pool/Spa Type	8	34	33	14
Above-Ground (Pools Only)	20	6	4	17
Portable ¹⁵ (Pool Only)	11	1	4	9
Inside Home (Spa Only)	< 1	0	2	1
Outside Home (Spa Only)	2	0	0	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.

¹⁴ Percentages may not add up to 100 due to rounding.

¹⁵ A “portable pool” is defined as any pool that can be set up/taken down or moved to another location with relative ease.

Because the majority of reported fatal submersion victims were younger than 5 years old, the incident reports from 2009 through 2011 were evaluated, and common scenarios for children younger than 5 years old for pools or spas (895 reported submersion fatalities) were classified. The highest percentage of the reports (59 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 13 percent of the reports, there was too little information available to determine the scenario. The scenarios are categorized in Table 12.

Table 12
Percentage of Fatalities Reported to CPSC Staff Associated with Pool or Spa Submersion
Children Younger than 5 Years Old by Scenario, 2009–2011

Scenario	Percentage of Reported Fatalities for Pools and Spas
Lost Contact or Knowledge of Whereabouts	59
Not Enough Information to Determine Scenario	13
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.

Appendix A

Methodology for Pool or Spa Submersion—Estimated Injuries and Reported Fatalities (2014)

“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.¹⁶ For this reason, and because incidents occur where 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 the NEISS data extracted on April 16, 2014, for calendar year 2013. The NEISS product codes used for the data were 3251 (Built-in pools), 3221 (Above-ground pools), 5043 (Portable 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 2011 and 2012 were also used from last year’s report to cover the 2011 through 2013 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 11, 2014, from NEISS, IPII, DTSH and INDP for pool- or spa-related submersion deaths involving children younger than 15 years of age for the years 2009 to 2011. These data were merged with data from last year’s report for 2009 and 2010, to cover the 2009 through 2011 reporting period. It should be noted that for a given year, incidents are included on an ongoing basis for IPII and DTSH. 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), 5043 (Portable 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 (DTSH), 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.

¹⁶ *Dorland’s Illustrated Medical Dictionary*, 30th Edition, Saunders, 2003.