



Pool or Spa Submersion: Estimated Non-Fatal Drowning Injuries and Reported Drownings, 2015 Report



May 2015

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

CPSA 6(b)(1) CLEARED for PUBLIC

NO MFRS/PRVTLBLS OR PRODUCTS IDENTIFIED

EXCEPTED BY: PETITION
RULEMAKING ADMIN. PRCDG

WITH PORTIONS REMOVED: _____

AM
5/19/15

This analysis was prepared by CPSC staff and has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

Executive Summary

This report presents annual estimates of the number of emergency department-treated pool- or spa¹-related non-fatal drownings (submersion injuries²) between 2012 and 2014, and it presents counts of reported pool- or spa-related drownings (submersion fatalities³) between 2010 and 2012 for children younger than 15 years of age. 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.⁴ It is also 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. The time period 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 5,400 pool- or spa-related hospital emergency department (“ED”)-treated non-fatal drowning injuries each year for 2012 through 2014, and 382 pool or spa-related drownings reported per year for 2010 through 2012, involving children younger than 15 years of age.
- The majority of the estimated ED-treated non-fatal drowning injuries for 2012 through 2014, and the reported drownings for 2010 through 2012, were associated with pools (versus spas).
- Annual estimates of the number of children who were treated in hospital emergency departments for pool- or spa-related non-fatal drowning injuries in 2014 were not statistically different from those in 2013.
- Seventy-six percent of the reported drownings from 2010 through 2012 and an annual average of 77 percent of the ED-treated non-fatal drowning injuries from 2012 through 2014 involved children younger than 5 years of age.
- For children under 15 years of age, there were approximately twice as many reported drownings involving male victims than reported drownings involving female victims.
- Children between the ages of 1 and 3 (12 months through 47 months) represented 64 percent of estimated non-fatal drowning injuries for 2012 through 2014 and 65 percent of the reported drownings for 2010 through 2012 involving children younger than 15 years.
- For children younger than 15 years old, 54 percent of the victims of estimated ED-treated pool or spa submersion injuries for 2012 through 2014 were admitted to the hospital or

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

² The term “submersion injury” is used in lieu of the term “non-fatal drowning” when comparing or referring to injuries resulting from incidents involving other products or hazards.

³ The term “submersion fatality” is used in lieu of the term “drowning” when comparing or referring to fatalities resulting from incidents involving other products or hazards.

⁴ 2009–2013 “Reported Circulation/Suction Entrapment Incidents Associated with Pools, Spas, and Whirlpool Bathtubs, 2014 Report,” March 2014.

treated and transferred to another hospital, compared to 4 percent for ED-treated injuries to children younger than 15 years old involving all consumer products in the CPSC's jurisdiction during the same time period.

- Approximately 49 percent of the estimated non-fatal drowning injuries for 2012 through 2014 and 75 percent of the reported drownings for 2010 through 2012 involving children younger than 15 years old occurred at a residence.
- Residential locations dominated reported incidents involving victims younger than 5 years of age (54 percent for non-fatal drowning injuries from 2012 through 2014 and 87 percent for drownings from 2010 through 2012).
- Most reported fatalities from drowning occurred on the day of (68 percent) or within a week of (additional 25 percent) the submersion incident. Only 7 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 before death.
- Approximately 55 percent of reported drownings (annual average of 212) occurred in in-ground pools. Above-ground pools accounted for 18 percent of the reported drownings (annual average of 69) with portable pools accounting for 7 percent of the reported drownings (annual average of 25) 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 2012 through 2014, an estimated annual average of 5,400 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.⁵ Injury estimates came from CPSC’s 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 2011 through 2013 are 4,900 children younger than 15 and 3,800 children younger than 5 years of age treated in hospital emergency departments for non-fatal drowning injuries related to pools or spas.

Table 1
Estimated Number of Emergency Department-Treated Pool or Spa Non-Fatal Drowning Injuries
Children Younger than 5 and 15 Years of Age, 2012–2014

Year	Estimated Emergency Department-Treated Injuries ⁶	
	Younger than 5 Years	Younger than 15 Years
Average	4,100	5,400
2014	4,400	5,800
2013	3,800	4,800
2012	4,200	5,400

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

The 2014 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 non-fatal drownings are not statistically different from the 2013 estimates. On average, during 2012 through 2014, 77 percent of children treated in emergency departments for pool- or spa-related non-fatal drowning injuries were younger than 5 years of age. Children younger than 5 years of age comprised an estimated 77, 80, and 76 percent of the childhood pool- or spa- related treated injuries in 2012, 2013, and 2014, respectively.

⁵ Estimates less than 1,200 are not routinely reported.

⁶ The estimates are rounded to the nearest hundred.

Table 2 shows the percent of estimates for 2012 through 2014 associated with pool or spa submersions by type of product. Spa-related submersions constitute 3 percent of the estimated number of the pool or spa submersion treated non-fatal drowning injuries for children younger than 15 years of age, and for children younger than 5 years of age.

Table 2
Percent of Estimated Emergency Department-Treated Pool or Spa Non-Fatal Drowning Injuries
Children Younger than 5 and 15 Years of Age by Product Type, 2012–2014

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 non-fatal drowning injuries by victim gender. Male children are more frequently treated for pool- or spa-related non-fatal drowning 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.

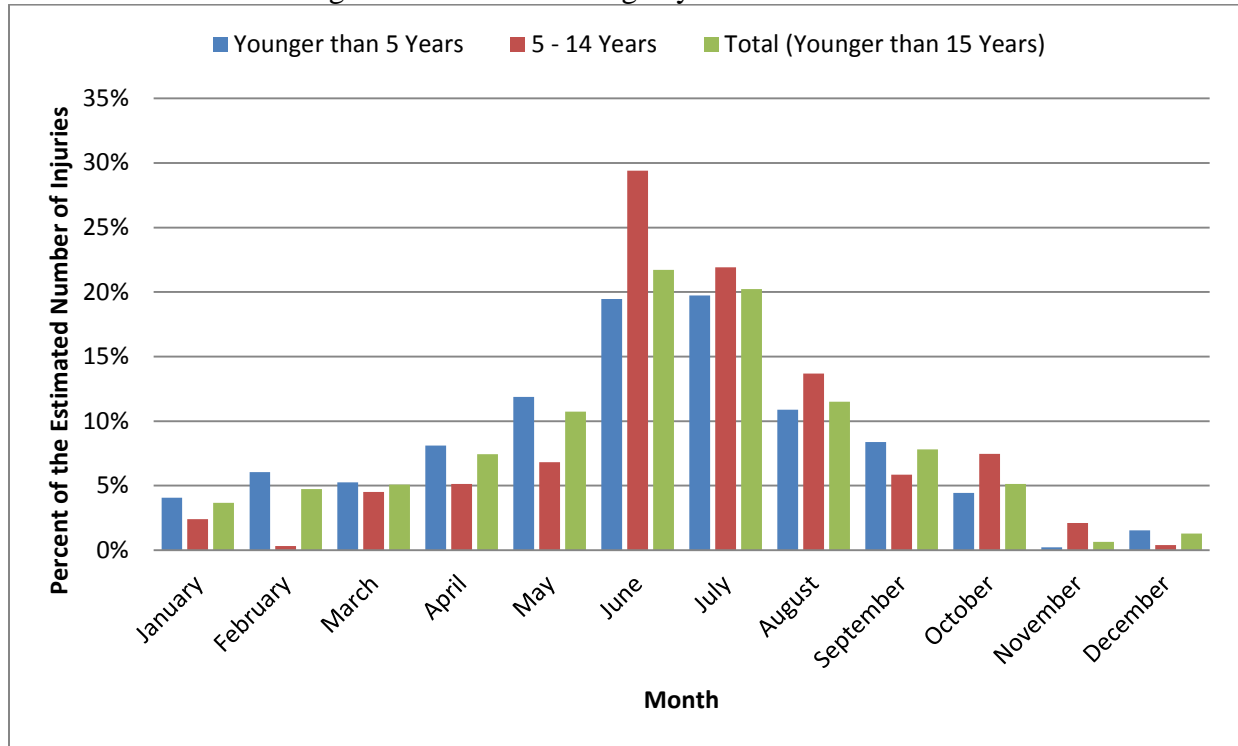
Table 3
Percent of Estimated Emergency Department-Treated Pool or Spa Non-Fatal Drowning Injuries
Children Younger than 5 and 15 Years of Age by Gender, 2012–2014

Gender	Estimated Emergency Department-Treated Injury Percentages	
	Younger than 5 Years	Younger than 15 Years
Male	59	61
Female	41	39

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 monthly distribution of the percentages of the estimated emergency department-treated non-fatal drowning injuries for each age group. The months of May, June, July, and August had the largest percentages.

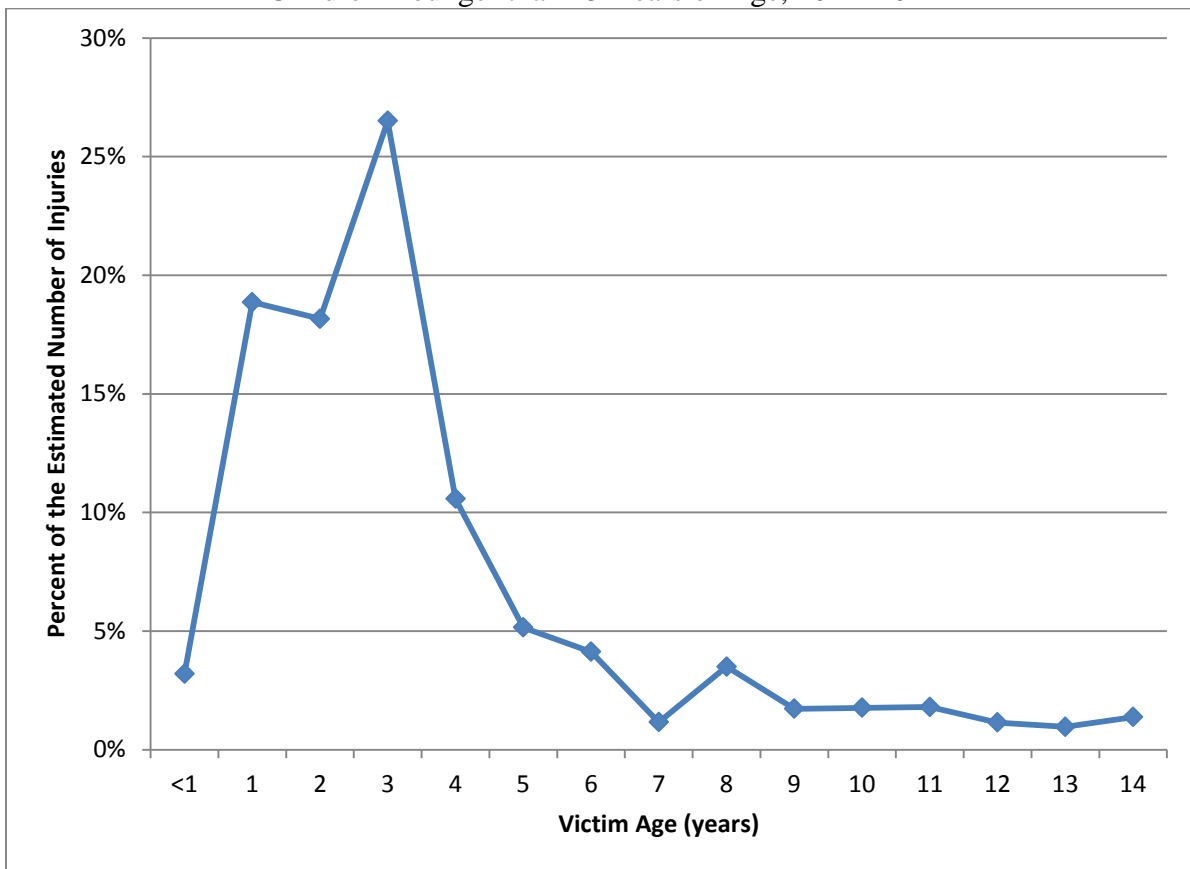
Figure 1
 Percent of Estimated Emergency Department-Treated Pool or Spa Non-Fatal Drowning Injuries
 Children Younger than 15 Years of Age by Month of Treatment 2012–2014



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 non-fatal drowning injuries as a function of the victim’s age. Children younger than 1 year of age accounted for 3 percent of the estimated pool- or spa-related non-fatal drowning 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 non-fatal drowning injuries. An additional 11 percent of the estimated childhood pool- or spa-related non-fatal drowning injuries occurred in children 4 years of age (48 to 59 months). Children ages 5 to 9 and 10 to 14 accounted for 16 and 7 percent, respectively, of the estimated ED-treated pool or spa related non-fatal drowning injuries.

Figure 2
Percent of Estimated Emergency Department-Treated Non-Fatal Drowning Injuries by Age
Children Younger than 15 Years of Age, 2012–2014



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

Table 4 gives a breakdown of estimated submersion injuries by disposition. Children younger than 15 years of age were admitted to the hospital or treated and transferred to another hospital 54 percent of the time. For *DOA or died in the emergency department* percentages, drowning victims younger than 5 years comprised all child drownings. 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, 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.

Table 4
Percent of Estimated Emergency Department-Treated Pool or Spa Submersion Injuries
Children Younger than 15 Years of Age by Disposition, 2012–2014

Disposition	Estimated Emergency Department-Treated Injury Percentages ⁷		
	Younger than 5 Years	5–14 Years	Younger than 15 Years
Examined or Treated and Released	38	45	40
Admitted to Hospital	46	43	46
Treated and Transferred	8	8	8
DOA or Died in Emergency Department	4	-	3
Held for Observation	3	3	3
Left Without Being Seen	-	-	-

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, approximately half (49%) of the incidents involving injuries that led to emergency department visits occurred at a residence. Injured children younger than 5 years of age had the largest percentage (54%) in a residential location. Children 5 to 14 years of age had a plurality in public locations (39%).

Table 5
Percent of Estimated Emergency Department-Treated Pool or Spa Non-Fatal Drowning Injuries
Children Younger than 15 Years of Age by Location, 2012–2014

Location	Estimated Emergency Department-Treated Injury Percentages		
	Younger than 5 Years	5–14 Years	Younger than 15 Years
Residential	54	34	49
Undisclosed Location	24	27	25
Public	22	39	26

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, 382 fatalities associated with pool or spa submersions involving children younger than 15 years of age were reported to CPSC staff annually from 2010 through 2012. 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. As noted previously, victims in this age category also accounted for an average of 77 percent of the childhood submersion injuries related to pools or spas between 2012 and 2014. 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 1,145 reported drowning incidents from 2010 through 2012, there were 1,118 fatalities or 98 percent of the incidents which involved 1 victim; 18 incidents which involved 2 victims; and 8 incidents which 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 drownings 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
Drownings Deaths Reported to CPSC Staff Associated with Pools or Spas
Children Younger than 15 Years of Age, 2010–2012

Year ⁸	Reported Fatality Frequencies			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years ⁹
Average	290	64	26	382
2012	279	63	20	364
2011	289	66	26	384
2010	302	64	31	397
Totals 2010-2012	870	193	77	1145

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 2011 and 2012. The number of reported fatalities may change in the future.

⁹ This category includes 3 cases in 2011 and 2 cases in 2012 where the victim's age is unknown, but the victim is inferred to be under 15 years of age.

Table 7 provides information on the interval between the submersion incident and the time of death for pool- or spa-related drownings. For most of the fatalities (78 percent), the date of death was either the same as the date of the incident or one day later. However, 22 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 Drownings Deaths Reported to CPSC Staff Associated with Pools or Spas
Children Younger than 15 Years of Age by Interval Between Injury and Death,¹⁰ 2010–2012

Days Between Incident & Death	Percentage of Reported Fatalities¹¹			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
0 days	68	72	65	68
1 day	10	10	8	10
2–7 days	15	12	21	15
8–31 days	5	4	3	5
> 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.

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 22 fatalities where the difference was more than 31 days.

¹¹ Percentages may not add up to 100 due to rounding.

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

Table 8
Percentage of Drownings Deaths Reported to CPSC Staff Associated with Pools or Spas
Children Younger than 15 Years of Age by Product Type, 2010–2012

Product	Percentage of Reported Fatalities			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
Pool	95	99	100	96
Spa	5	1	-	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 percentages of pool or spa drownings 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.

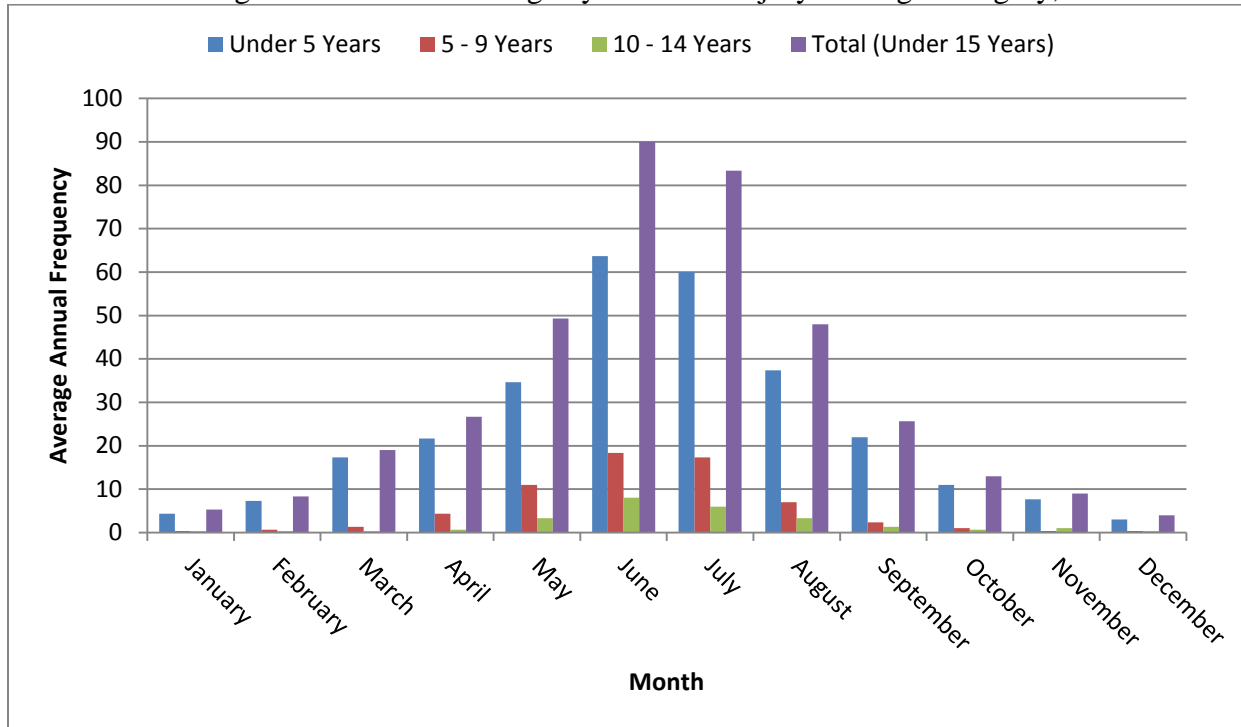
Table 9
Percentage of Drowning Deaths Reported to CPSC Staff Associated with Pools or Spas Children
Younger than 15 Years of Age by Gender, 2010–2012

Gender	Percentage of Reported Fatalities			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
Male	66	72	78	68
Female	34	28	22	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 monthly distribution of reported pool- or spa-related childhood drownings as a function of victim age. As expected, the summer months of May, June, July, and August had the largest annual frequencies for all age groups.

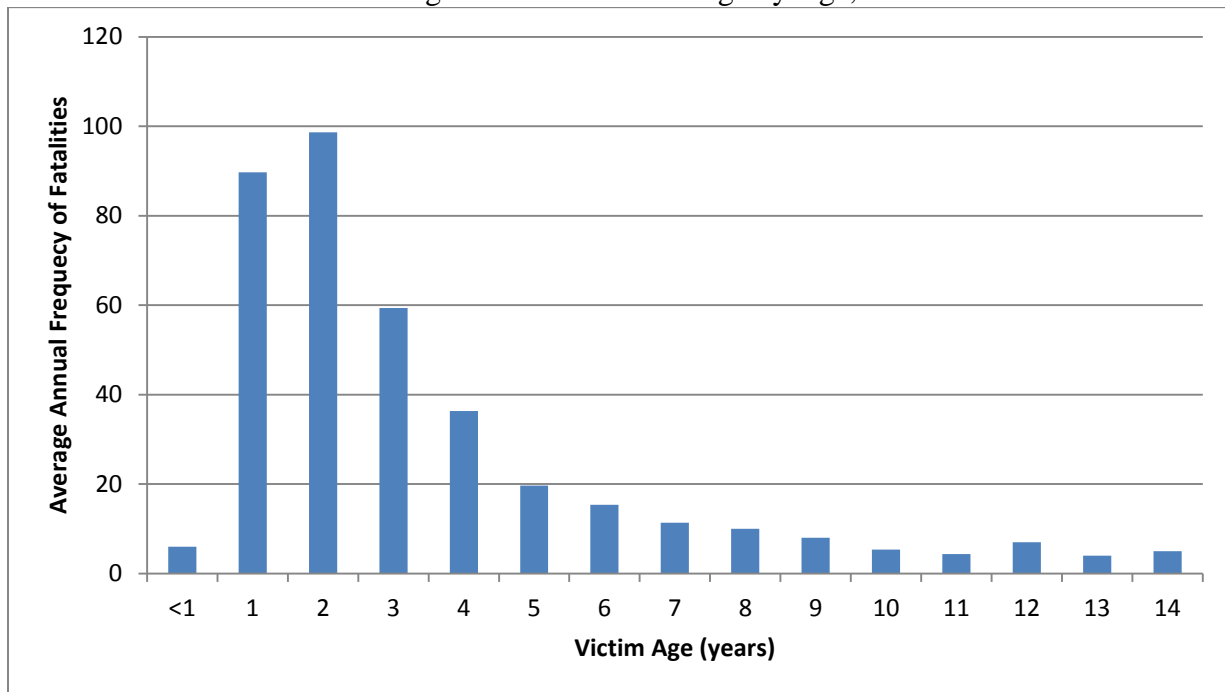
Figure 3
Average Annual Drownings Deaths Reported to CPSC Staff Associated with Pools or Spas Children Younger than 15 Years of Age by Month of Injury and Age Category, 2010–2012



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 drownings 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 65 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 Drownings Deaths Reported to CPSC Staff Associated with Pools or Spas
Children Younger than 15 Years of Age by Age, 2010–2012



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 drownings 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 (46 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 drownings.

Table 10
Percentage of Drownings Deaths Reported to CPSC Staff Associated with Pools or Spas
Children Younger than 15 Years of Age by Incident Location, 2010–2012

Location	Percentage of Reported Fatalities ¹²			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
Home	54	13	27	46
Family/ Friend	25	14	12	22
Public/ Community/ Business¹³	10	43	43	17
Undisclosed Location	4	19	14	7
Neighbor	7	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.

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

¹³ Condominium and apartment complex pools are included in this category.

Table 11 presents the percentages of reported drownings by pool/spa type. The in-ground product type accounted for the largest percentage of known pool/spa types (55 percent for victims younger than 15). This was followed by the above-ground pool category and portable pool category for cases where pool/spa type was known.

Table 11
Percentage of Drownings Deaths Reported to CPSC Staff Associated with Pools or Spas
Children Younger than 15 Years of Age by Specific Pool/Spa Type Product Category,
2010–2012

Location	Percentage of Reported Fatalities ¹⁴			
	Younger than 5 Years	5–9 Years	10–14 Years	Younger than 15 Years
In-Ground	56	55	55	55
Undisclosed Pool/Spa Type	9	37	38	16
Above-Ground (Pools Only)	22	6	6	18
Portable ¹⁵ (Pool Only)	8	2	1	7
Inside Home (Spa Only)	1	1	-	1
Outside Home (Spa Only)	4	-	-	3

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.

Since the majority of reported drowning victims were younger than 5 years of age, the incident reports from 2010 through 2012 were evaluated, and common scenarios for children younger than 5 years of age for pools or spas (870 reported drownings) were classified. The highest percentage of the reports (63 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). Eight 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 12 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 drownings involving this age group.

Table 12
Percentage of Drownings Deaths Reported to CPSC Staff Associated with Pools or Spas
Children Younger than 5 Years of Age by Scenario, 2010–2012

Scenario	Percentage of Reported Fatalities for Pools and Spas
Lost Contact or Knowledge of Whereabouts	63
Not Enough Information to Determine Scenario	12
Barrier Integrity or Circumvented Barrier	8
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 Non-Fatal Drowning Injuries and Reported Drownings (2015)

“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 “non-fatal 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

Injury estimates came from NEISS data extracted on April 13, 2015, for calendar year 2014. 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 2012 and 2013 were also used from last year’s report to cover the 2012 through 2014 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 March 11, 2015, from NEISS, IPII, DTHS and INDP for pool- or spa-related submersion deaths involving children younger than 15 years of age for the years 2010 to 2012. These data were merged with data from last year’s report for 2010 and 2011, to cover the 2010 through 2012 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), 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 (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.

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