



2014–2018 Reported Circulation/Suction Entrapment Incidents Associated with Pools, Spas, and Whirlpool Bathtubs, 2019 Report

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Executive Summary

This report characterizes the information on circulation entrapment incidents associated with pools, spas,¹ and whirlpool bathtubs that were reported to U.S. Consumer Product Safety Commission (CPSC) staff. A “circulation entrapment” is defined as an entrapment involving the water circulation system of a product. A multidisciplinary team of CPSC staff developed this definition and determined the types of products that are of interest regarding circulation entrapments.

CPSC staff is aware of 11 victims of circulation entrapments in incidents that reportedly occurred from 2014 through 2018. The previous report that covered 2013–2017 and was published in April 2018 also reported 11 incidents. Highlighted findings in this report include:

- Victims
 - Fatality (2 victims, 18 percent)
 - Injury (9 victims, 82 percent)
 - All of the entrapment victims were individuals younger than 15 years of age
 - More females (6 victims, 55 percent) than males (5 victims, 45 percent) driven by hair entrapment.
- Product
 - 64 percent of the victims (7 victims) were associated with a spa incident
 - 36 percent (4 victims) were associated with a pool incident
- Location
 - 55 percent (6 victims) occurred in residential settings
 - 45 percent of the entrapments (5 victims) occurred in public settings
- Entrapment Type
 - 55 percent (6 victims) experienced hair entrapment
 - 36 percent (4 victims) experienced limb entrapment
 - 9 percent (1 victims) experienced body entrapment
- Hazard Scenario²
 - 55 percent (6 victims) were involved in incidents related to being caught on an outlet cover
 - 36 percent (4 victims) were involved in incidents related to missing or removed outlet covers
 - 9 percent (1 victim) were trapped in suction incidents

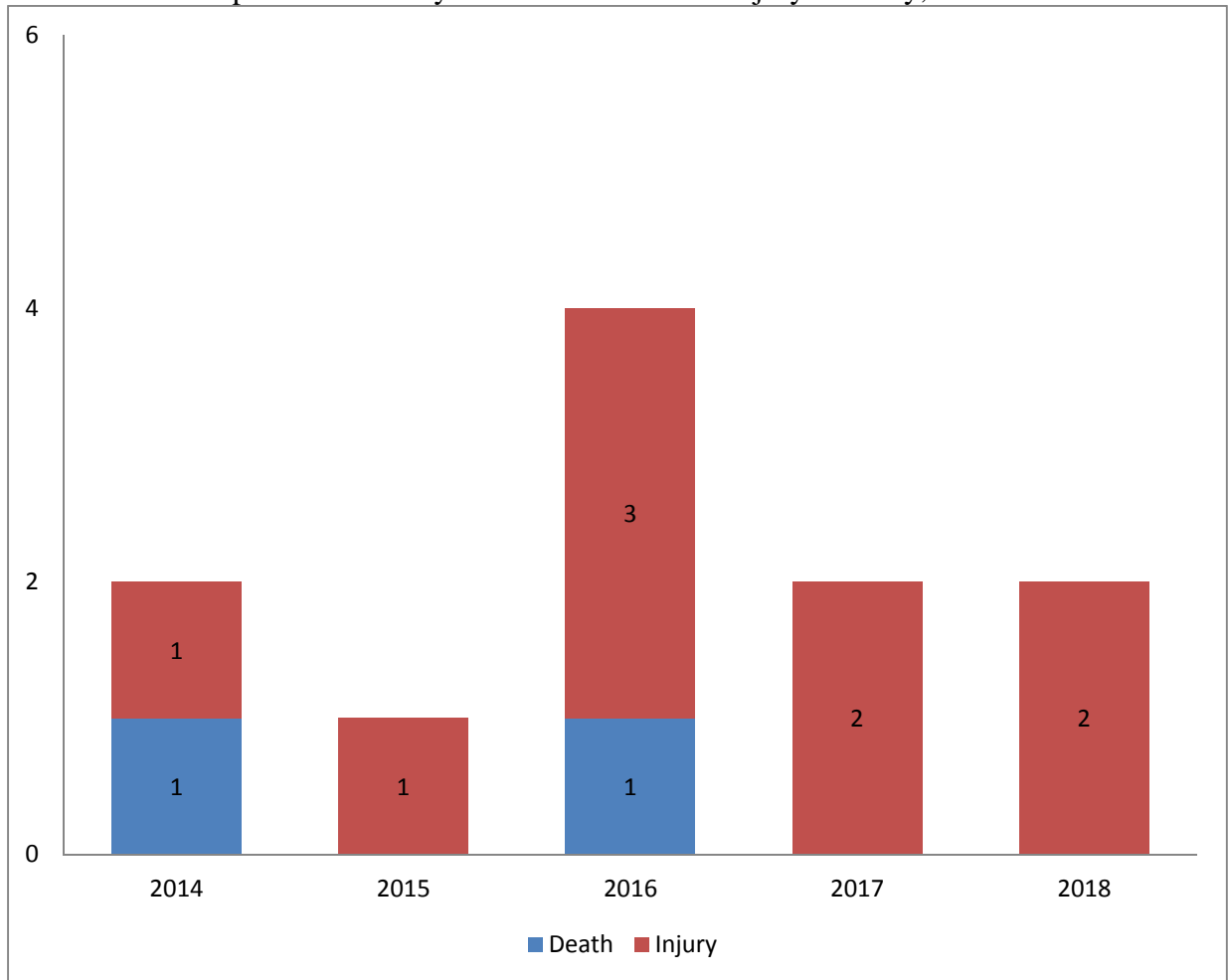
Circulation Entrapment

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

² Since the Virginia Graeme Baker Pool & Spa Safety Act went into effect in December 2008, there have been no reported fatalities involving a child being entrapped on a suction outlet cover in a public pool or spa.

CPSC staff received reports of 11 incidents involving 11 victims of circulation entrapments from 2014 through 2018. Appendix A provides the methodology for extracting the data and updating the database, and Appendix B provides the summary of the 11 reports. For this period, there were two fatalities (spa) and nine injuries (4 pool and 5 spa). Figure 1 displays the yearly counts of reported victims based on severity (fatality and injury). Reporting in CPSRMS is ongoing for the years 2016 through 2018.

Figure 1
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Year of Incident and Injury Severity, 2014–2018



Source: CPSC database, including the Consumer Product Safety Risk Management System (CPSRMS) and National Electronic Injury Surveillance System (NEISS). Reporting in CPSRMS is ongoing for 2016–2018.

Among the 11 victims, four (36 percent) were associated with incidents in pools, and seven (64 percent) were associated with spas. No circulation entrapment incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018. Table 1 shows these counts by year.

Table 1

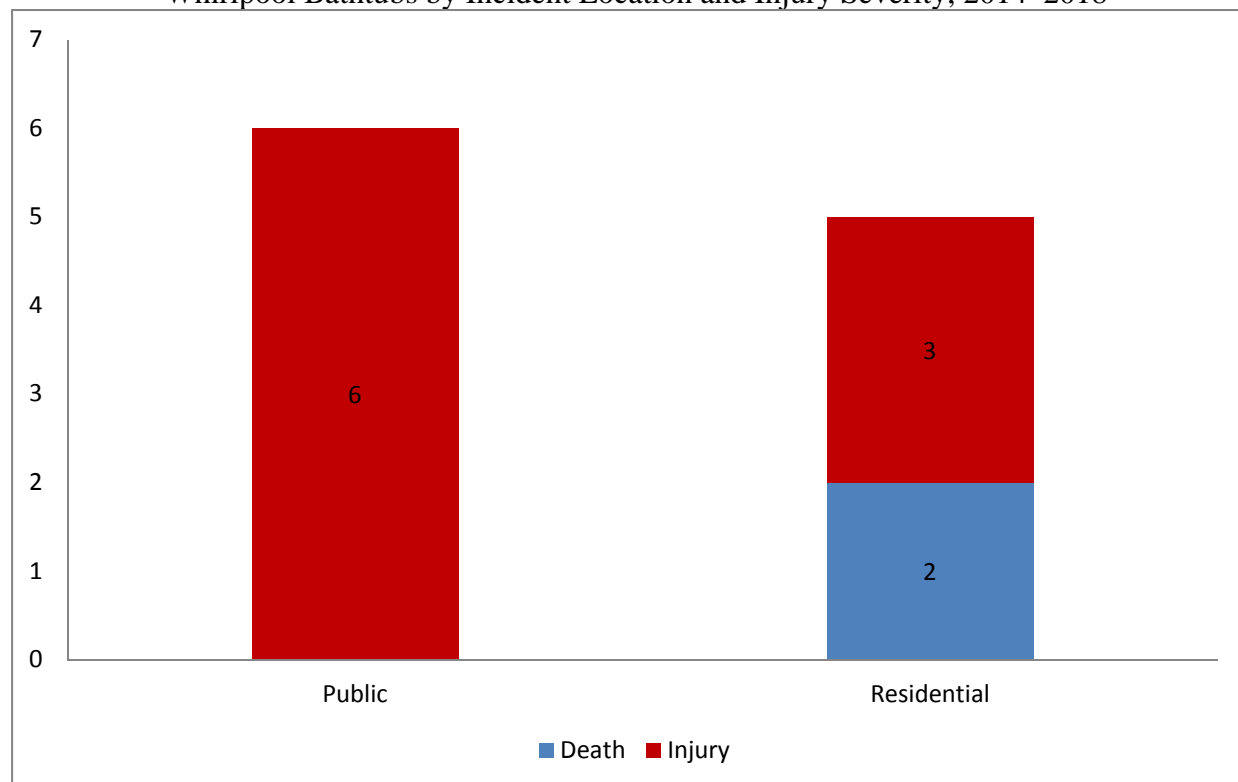
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Year of Incident and Product Category, 2014–2018

Year	Pool	Spa	Total
2018	2	-	2
2017	2	-	2
2016	-	4	4
2015	-	1	1
2014	-	2	2
Total	4	7	11

Source: CPSC databases, including CPRMS and NEISS. Reporting in CPRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

One more incident occurred in public locations (6 victims, 55 percent) than in residential locations (5 victims, 45 percent). Figure 2 presents the frequency of reported victims by location and severity.

Figure 2
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Incident Location and Injury Severity, 2014–2018



Source: CPSC databases, including CPRMS and NEISS. Reporting in CPRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

Among the four pool victims, 50 percent were in residential pools. Among the seven spa victims, 43 percent were in residential locations and 57 percent were at nonresidential locations, such as a hotel or motel. Table 2 shows the counts by incident location and product category.

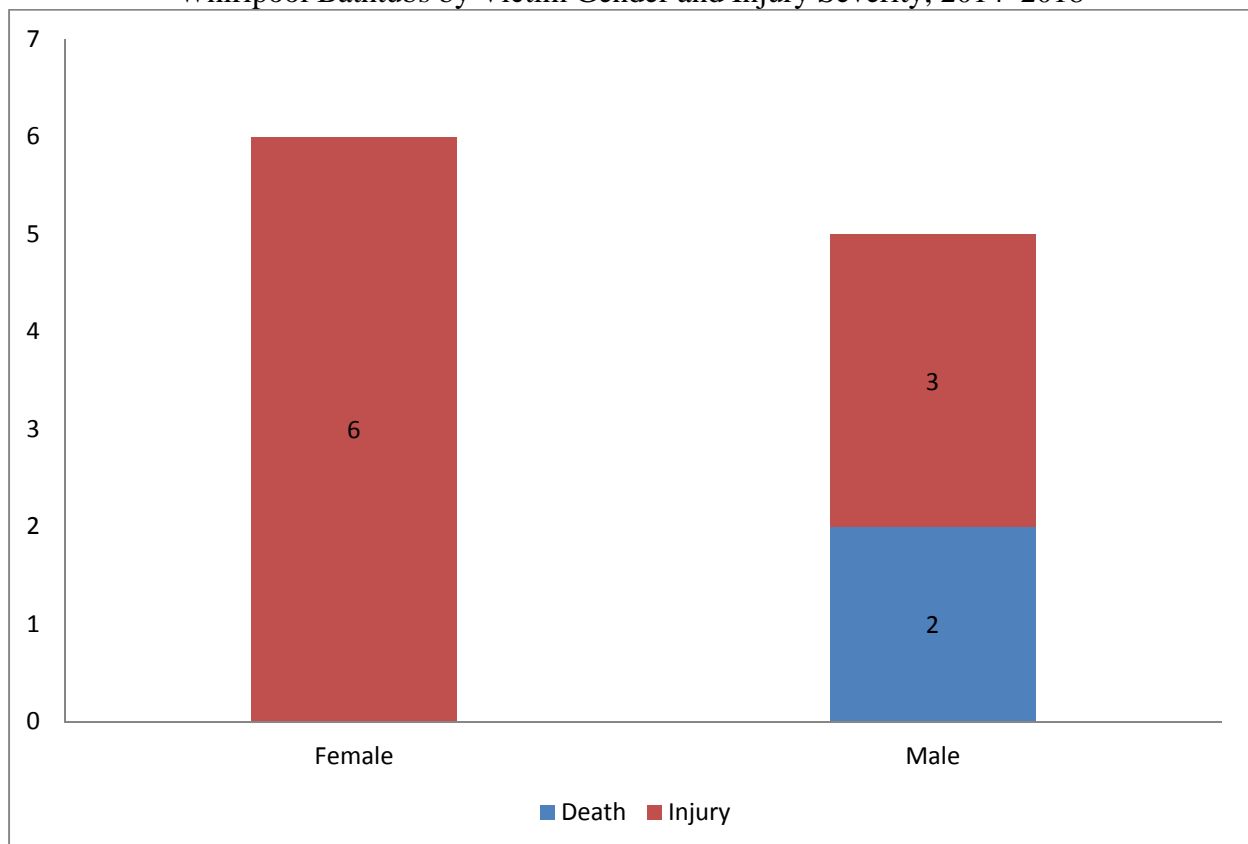
Table 2
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Incident Location and Product Category, 2014–2018

Location	Pool	Spa	Total
Public	2	4	6
Residential	2	3	5
Total	4	7	11

Source: CPSC databases, including CPRMS and NEISS. Reporting in CPRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

More females (6 victims, 55 percent) were involved in these incidents than males (5 victims, 45 percent). Figure 3 displays circulation entrapment counts for reported entrapments by gender and severity.

Figure 3
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Victim Gender and Injury Severity, 2014–2018



Source: CPSC databases, including CPRMS and NEISS. Reporting in CPRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

There were more female victims (57 percent of spa victims) than male in spas. Table 3 illustrates these counts.

Table 3

Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Victim Gender and Product Category, 2014–2018

Gender	Pool	Spa	Total
Female	2	4	6
Male	2	3	5
Total	4	7	11

Source: CPSC databases, including CPRMS and NEISS. Reporting in CPRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

Figure 4 shows the counts of reported victims by age category and injury severity. More than half of the victims (6 victims, 55 percent) were children in the 5 to 9 year age category; the rest were 10 to 14 year (4 victims, 36 percent) and the younger than 5 year (1 victim, 9 percent) age categories. All of the victims were children younger than 15 years of age.

Figure 4

Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Victim Age Category and Injury Severity, 2014–2018



Source: CPSC databases, including CPRMS and NEISS. Reporting in CPRMS is ongoing for 2016-2018. No victim falls in the 15- to 19- year age category or other age categories for 20 years and older.

Among the children 9 years of age or younger, three (75 percent of pool victims) were associated with pools, and four (57 percent of spa victims) were associated with spas. Table 4 lists these counts.

Table 4

Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Victim Age Category and Product Category, 2014–2018

Victim Age Category (years)	Pool	Spa	Total
Younger than 5	-	1	1
5–9	3	3	6
10–14	1	3	4
15–19	-	-	-
20–29	-	-	-
30–39	-	-	-
40–49	-	-	-
50 and Older	-	-	-
Total	4	7	11

Source: CPSC databases, including CPSRMS and NEISS. Reporting in CPSRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

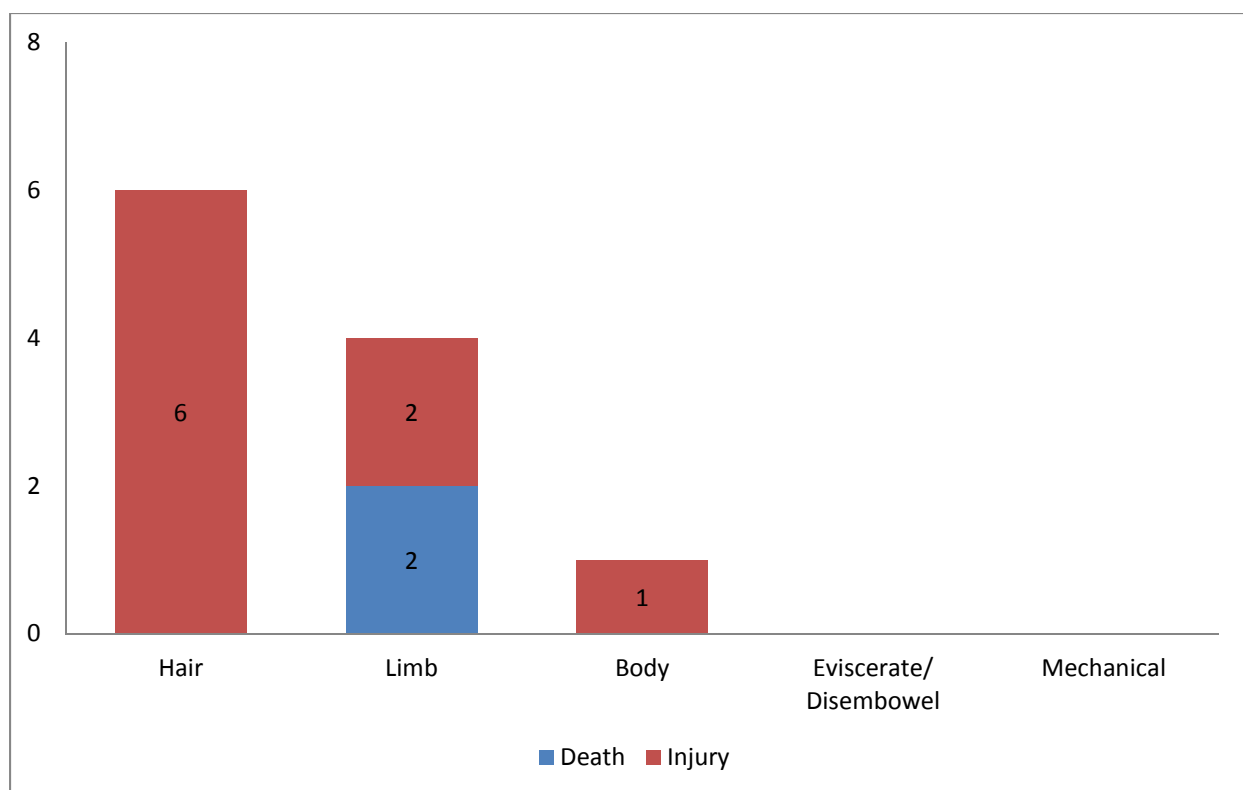
Using definitions developed by the Association of Pool and Spa Professionals (APSP), there are five types of circulation entrapment: (1) body, (2) limb, (3) evisceration/disembowelment, (4) hair, and (5) mechanical.³ “Limb entrapment” happens when a limb is sucked or inserted into an open sump or pipe. If only a limb was involved in the entrapment, then the incident was coded as “limb entrapment” (*i.e.*, arms, hands, legs, or feet). “Evisceration/disembowelment⁴” concerns suction applied directly to the intestines, such as when a child sits on an open sump. “Hair entrapment” occurs when hair becomes caught in an outlet cover. Incidents involving hair were coded as “hair entrapments.” “Mechanical entrapment” involves articles of clothing, jewelry, or appendages caught in an outlet cover. “Appendages” refer to digits (*i.e.*, fingers or toes). Incidents involving appendages only were coded as “mechanical entrapments.” Finally, “body entrapment” occurs when suction is applied to a large portion of the body or limbs. For this report, incidents were coded as a “body entrapment” if the entrapment involved a portion of the body not covered by the other types of entrapment. Examples of body entrapment include suction to areas such as: the shoulder and upper arm, abdomen, back, or hip.

The incidents reported to CPSC staff identified hair (6 victims, 55 percent) as the most frequent type of entrapments. This is followed by limb (4 victims, 36 percent) and body (1 victim, 9 percent). No incident was associated with eviscerations/disembowelments or mechanical entrapments. Figure 5 displays the circulation entrapment victim data by entrapment type and injury severity.

Figure 5
Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs
by Entrapment Type and Injury Severity, 2014–2018

³ ANSI/APSP-7 2006, *American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins*, p. viii.

⁴ Evisceration or disembowelment involves suction applied directly to the rectum with injuries ranging from prolapse of the rectum to small intestine removal. Incidents involving prolapsed rectums that retracted and required no further medical attention are now classified as eviscerations or disembowelments. They were previously counted as body entrapments.



Source: CPSC databases, including CPSRMS and NEISS. Reporting in CPSRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

Among the four pool entrapment victims, half of them experienced hair (2 victims, 50 percent) entrapments, and the other two experienced a limb (2 victim, 50 percent) entrapment, respectively. More than half of the seven spa victims experienced hair entrapments (4 victims, 57 percent); the rest experienced limb (2 victim, 29 percent) entrapments and body (1 victim, 14 percent) entrapments. No evisceration/disembowelment or mechanical entrapment was reported to have occurred from 2014 through 2018. Table 5 provides the counts by entrapment type and product category.

Table 5
Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs
by Entrapment Type and Product Category, 2014–2018

Circulation Entrapment Type	Pool	Spa	Total
Hair	2	4	6
Limb	2	2	4
Body	-	1	1
Eviscerate/Disembowel	-	-	-
Mechanical	-	-	-
Total	4	7	11

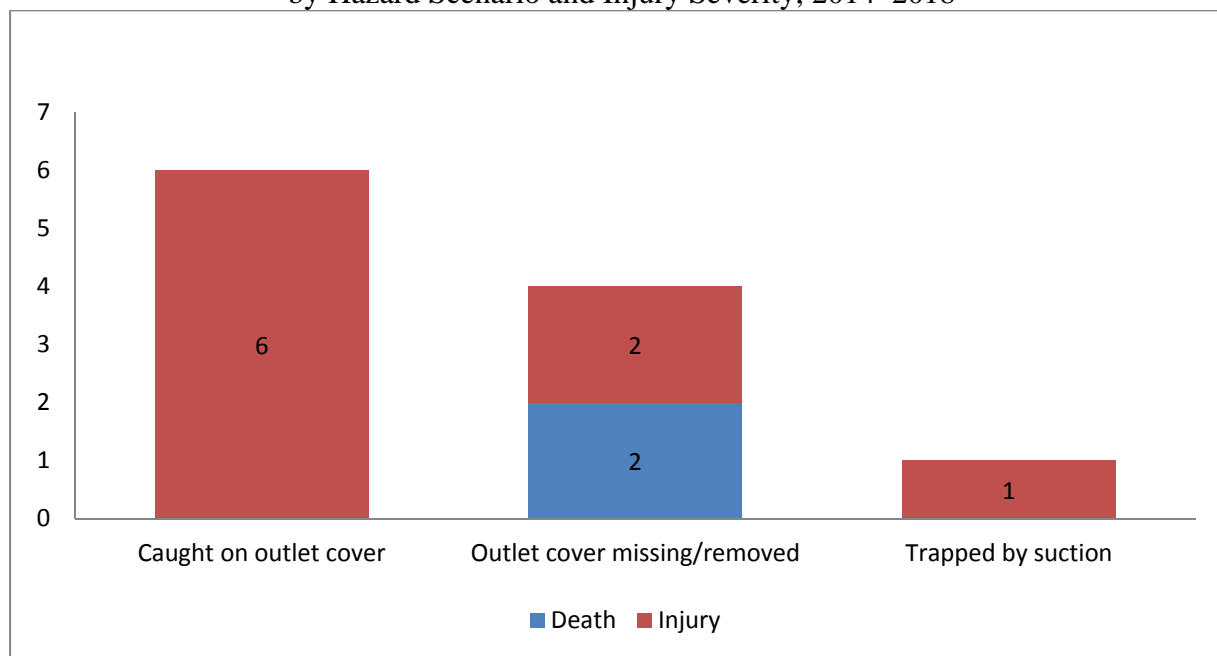
Source: CPSC databases, including CPSRMS and NEISS. Reporting in CPSRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

Hazard scenarios for the reported incidents fall into one of the following categories: trapped by suction; outlet cover missing/removed; caught on outlet cover; miscellaneous; and unknown. The incident scenarios were categorized by reviewing the report narratives and coding

the incidents based on the following hierarchical categories. If the report indicates that an outlet cover was missing or removed, then the incident was assigned to that respective category. If the report states that the individual was caught on the outlet cover, but there is no further description of the status of the cover, the incident was characterized as “caught on outlet cover.” If the report indicates that the suction was holding the individual down, but there is no further mention of the outlet, then the incident was classified as “trapped by suction.” An incident in which neither the outlet/outlet cover, nor suction was mentioned was categorized as “unknown.” An incident was classified as “miscellaneous” if the scenario was known but did not fit into the other categories.

More than half of the incidents (6 victims, 55 percent) involved scenarios where the victim was caught on the outlet cover. This is followed by the category “missing or removed outlet covers” (4 victims, 36 percent) and “trapped by suction” (1 victim, 9 percent). Figure 6 enumerates the results of the hazard scenario categorizations for circulation entrapments related to pools, spas, and whirlpool bathtubs.

Figure 6
Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs
by Hazard Scenario and Injury Severity, 2014–2018



Source: CPSC databases, including CPSRMS and NEISS. Reporting in CPSRMS is ongoing for 2016–2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

The entrapment scenarios in pools were evenly distributed between “caught on an outlet cover” (2 victims, 50 percent) and “outlet cover missing/removed” (2 victims, 50 percent). The victims in spas were mainly caught on an outlet cover (4 victims, 57 percent) or related to a missing or removed outlet cover (2 victims, 29 percent). Table 6 shows these counts.

Table 6
Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs
By Hazard Scenario and Product Category, 2014–2018

Hazard Scenario	Pool	Spa	Total
Caught on outlet cover	2	4	6
Outlet cover missing/removed	2	2	4
Trapped by suction		1	1
Total	4	7	11

Source: CPSC databases, including CPRMS and NEISS. Reporting in CPRMS is ongoing for 2016-2018. No incident associated with whirlpool bathtubs was reported to have occurred from 2014 through 2018.

Besides the incidents discussed above, CPSC staff is also aware of another possible entrapment incident. According to the narrative from the hospital, “an 8 year old female was near drowning in a pool when she felt something pulled her down. Abrasions to the face and a chipped tooth were also noted.” Because the information is insufficient to determine whether this incident was definitely in scope, it is not included in the report, but it is listed in Appendix B as a “possible” case.

Appendix A

Methodology for Extracting Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs

This report covers the time frame from 2014 through 2018. Data were extracted on February 27, 2019 from the Consumer Product Safety Risk Management System (CPSRMS) and the National Electronic Injury Surveillance System (NEISS) databases for the product codes enumerated in Table A for data entered in 2018. These data were merged with the data from the 2018 report, which covered 2013-2017. The period was adjusted for the 2017 report to focus on recently reported incidents.

Table A–Product Codes Used in Extracting Circulation Entrapment Data

Product Code	Description
3221	Above-ground swimming pools
3251	Built-in swimming pools
3262	Swimming pool equipment
5043	Portable swimming pools
1246	Wading pools
1284	Swimming pools, not specified
3274	Swimming (activity)
698	Hot tubs or home spas
609	Glass bathtub or shower enclosures
610	Non-glass bathtub or shower enclosures
611	Bathtubs or showers
4030	Bathtub or shower enclosures, not specified

Within these product codes, suction/entrapment incidents were identified using the following keyword search terms: “SUCTION”, “SUCK”, “STUCK”, “TRAP”, “CAUGHT”, “HELD”, “TANGLE”, “UNDER”, “WEDGE”, “JAMM”, “DRAIN”, “PUMP”, “FILTER”, “PIPE”, “INTAKE”, “GRATE”, “COVER”, “HAIR”, “LIMB”, “ARM”, “HAND”, “FINGER”, “THUMB”, “LEG”, “FOOT”, “FEET”, “TOE”, “BRUISE”, “DROWN”, or “SUBMER”. Also, all NEISS cases were reviewed that had a diagnosis of “submersion (69)”. NEISS data are from a probability-based sample. Sampling weights can be used to project the cases from NEISS hospitals to national estimates, provided the sample counts are large enough. Due to the small number of suction/entrapment cases in NEISS, these cases were used in the case count and not projected nationally.

Reports were reviewed to eliminate cases that did not involve circulation entrapments. It should be noted that, for a given year, incidents are included on an ongoing basis for CPSRMS. CPSRMS combines death certificates (DTHS), In-Depth Investigations (INDP), and Injury and Potential Injury Incidents (IPII) databases with reports from newspaper clippings, consumer complaints, state/local government referrals, and medical examiners/coroners. In addition, reports generally continue to be received for the most recent years. Information from these cases was extracted into an Excel spreadsheet and sorted by incident state and date. Source documents were checked to eliminate duplicate incident reports. Once the incident set was established, the

incident reports were examined to code the additional characteristics of circulation entrapment type and hazard scenario.

Appendix B - Summary of 11 Reported (11 victims) Circulation/Suctions Entrapment Incidents for Pools, Spas, and Whirlpool Bathtubs, 2014–2018

Report #	Year	Product type	Severity	Age (yrs)	Sex	Entrapment type	Scenario	Narrative
1	2018	Pool	Injury	12	M	Limb	Outlet cover missing/removed	On March 19, 2018 at 2125, a 12 year old boy (victim) and a friend were in an indoor lazy river inside a hotel. The victim discovered a large grate which covered one of two drain sumps and intake lines which supplied water to the pumps which circulated water in the lazy river. The victim and his friend submerged themselves 22 times at the grate before the victim lifted the grate off of the drain sump. On the seventh submersion into the exposed drain sump, one of the victim's legs became entrapped in the six inch suction line at the center of the sump. The victim remained underwater for almost eight minutes before first responders were able to remove him from the drain and the water. The victim was rushed to a local emergency room. The victim was released from the hospital days later.
2	2018	Pool	Injury	7	M	Limb	Outlet cover missing/removed	The seven year old boy was at his grandparents home swimming in their in ground pool. The pool cleaner had been removed from the pool by his brother and it appears the vacuum cap had been removed at that same time. He put his hand in the hole and his arm was sucked into the pvc pipe. Emergency services was able to cut out the pipe and victim and he appears to have fully recovered. He spent one night in the hospital.
3	2017	Pool	Injury	6	F	Hair	Caught on outlet cover	6 YOF was swimming in hotel pool and nearly drowned. Her hair got sucked into the filter that operates a waterfall in the pool and she was unable to get up to the surface. She was kept under the water for over 2 minutes. Witnesses saved her life; hair pulled, given CPR, taken to hospital, discharged next morning.
4	2017	Pool	Injury	6	F	Hair	Caught on outlet cover	A six-year-old female's hair became entrapped in a small wall drain in her home's in-ground pool. The child's grandmother was able to free her from the drain and called EMT for assistance. The victim sustained a bruise on her head.
5	2016	Spa	Injury	9	F	Hair	Caught on outlet cover	The incident occurred when minor victim was submerged under the water of the spa and victim's hair became entrapped in the drain cover, keeping victim submerged under the water for an extended period of time. The drain cover was eventually detached from the wall and the victim was taken out of the water. Victim required CPR resuscitation and hospitalization.
6	2016	Spa	Injury	6	F	Hair	Caught on outlet cover	On February 19, 2016, a 6-year-old female nearly drowned in a non-swimming 2,500 gallon spa tub. The victim's hair unexpectedly became entrapped on one of the spa tub's six inch round suction outlet covers. The victim was immediately pulled out of the spa tub and was administered CPR by staff. The victim was able to regain consciousness and was taken to a local hospital by responding emergency medical services. No further information was available for the victim or her injuries. The facility was inspected and ordered closed by the city's Health department.

Report #	Year	Product type	Severity	Age (yrs)	Sex	Entrapment type	Scenario	Narrative
7	2016	Spa	Injury	12	F	Hair	Caught on outlet cover	A 12-year-old female was in an apartment community in-ground spa with friends when her hair became entangled in a drain cover on the wall of the spa. She was submerged under water for about two minutes, and was not able to free herself before her father pulled the drain cover off the spa wall with her hair still attached, and brought her to the surface. She had some difficulty breathing, and was vomiting blood and sputum, but was breathing normal when emergency personnel transported her to a local hospital for treatment related to the non-fatal drowning.
8	2016	Spa	Death	7	M	Limb	Outlet cover missing/removed	On November 5, 2016, a 7-year-old boy drowned in a residential in-ground spa when his hand and foot got caught in the spa's floor drain. The 3 HP pump was on that pulls water from the bottom of the spa and drains into the pool, creating suction pressure. There was no cover on the drain.
9	2015	Spa	Injury	13	M	Body	Trapped by suction	A 13-year-old male became entrapped on a skimmer in a newly constructed spa in the backyard of his residence. EMS responded and the victim was taken to the hospital and released the same day. The victim sustained a large bruise to his back and wrinkling of the skin.
10	2014	Spa	Death	4	M	Limb	Outlet cover missing/removed	On May 30, 2014, a four year-old boy drowned when his left hand became caught in a residential spa's uncovered single suction drain opening. The victim's great grandparents were close by, but they could not remove his hand from the drain. The spa's original flat grate cover had broken many years before and an anti-vortex cover was installed. This cover detached from the drain about two years before the incident and was never re-secured. The victim was a good swimmer and the water was fairly shallow, but the entrapment held the boy submerged at the bottom of the spa.
11	2014	Spa	Injury	12	F	Hair	Caught on outlet cover	On March 10, 2014, a 12 year old girl was playing in a hotel hot tub when her hair became caught in the hot tub's filter, while she was under water. The grandfather had to cut the girl's hair to pull her from under the water. The girl was taken to the hospital for further treatment but has made a full recovery after this incident.
Possible	2015	Pool	No App/Unk Injury	8	F	Unknown	Unknown	8 YOF near drowning in pool at camp when pt states felt something pulled her down swimming, also noting abrasions to face and chipped tooth.