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## 2013–2017 Reported Circulation/Suction Entrapment Incidents Associated with Pools, Spas, and Whirlpool Bathtubs, 2018 Report

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April 2018

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

## Executive Summary

This report characterizes the information on circulation entrapment incidents associated with pools, spas,<sup>1</sup> 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 2013 through 2017. Highlighted findings 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 (7 victims, 64 percent) than males (4 victims, 36 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
  - 27 percent (3 victims) experienced limb entrapment
  - 18 percent (2 victims) experienced body entrapment
- Hazard Scenario<sup>2</sup>
  - 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

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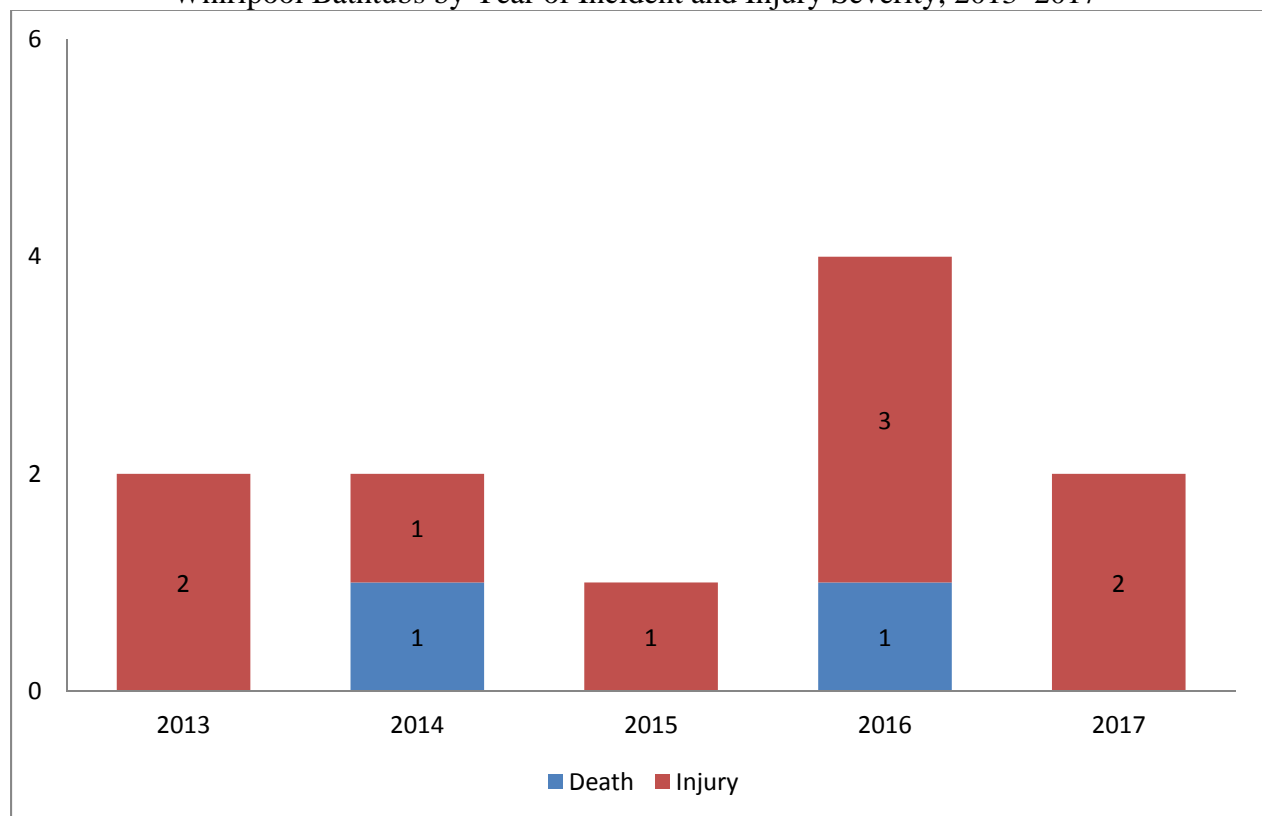
<sup>1</sup> The term “spa” is used to refer to spas and hot tubs.

<sup>2</sup> 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.

## Circulation Entrapment

CPSC staff received reports of 11 incidents involving 11 victims of circulation entrapments from 2013 through 2017. 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 2015 through 2017.

Figure 1  
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Year of Incident and Injury Severity, 2013–2017



Source: CPSC database, including the Consumer Product Safety Risk Management System (CPSRMS) and National Electronic Injury Surveillance System (NEISS). Reporting is ongoing for 2015–2017.

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 2013 through 2017. Table 1 shows these counts by year.

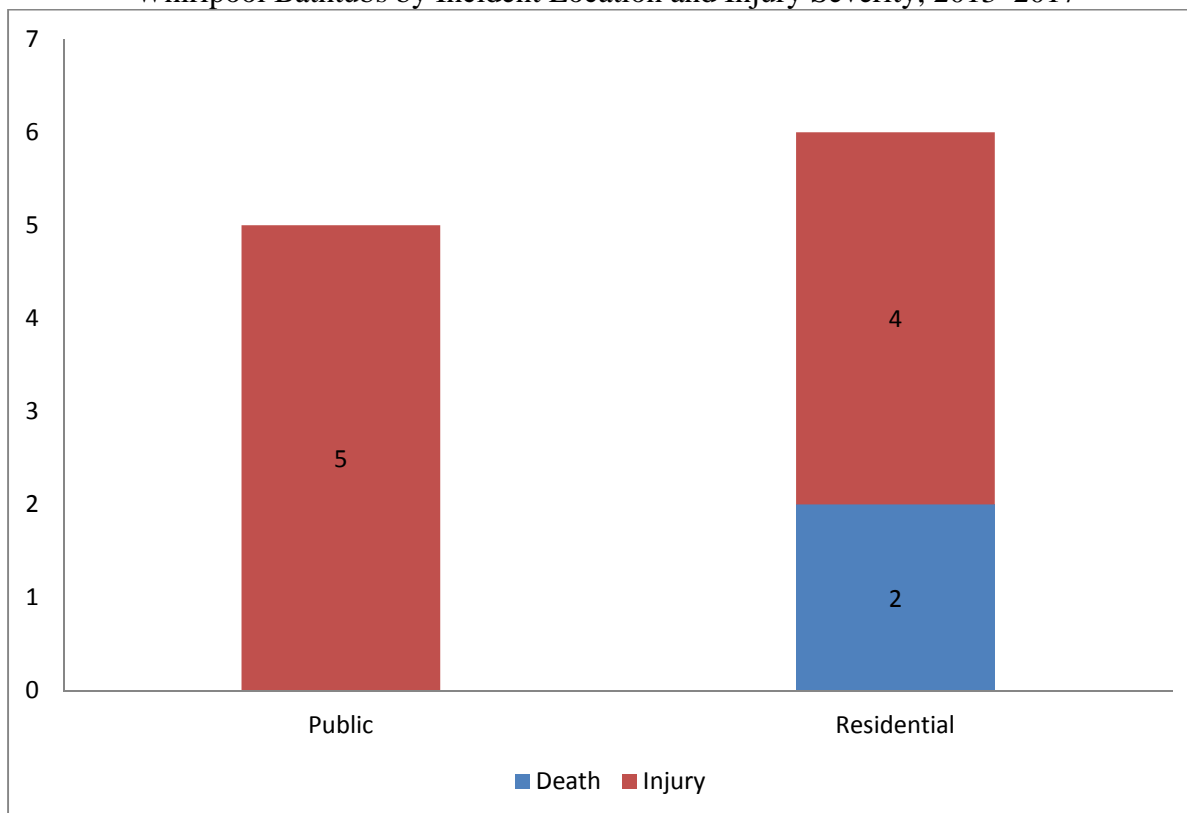
**Table 1**  
**Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Year of Incident and Product Category, 2013–2017**

<b>Year</b>	<b>Pool</b>	<b>Spa</b>	<b>Total</b>
<b>2017</b>	2	-	2
<b>2016</b>	-	4	4
<b>2015</b>	-	1	1
<b>2014</b>	-	2	2
<b>2013</b>	2	-	2
<b>Total</b>	4	7	11

Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015-2017. No incident associated with whirlpool bathtubs was reported to have occurred from 2013 through 2017.

One more incident occurred in residential locations (6 victims, 55 percent) than in public 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, 2013–2017**



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015-2017.

Among the four pool victims, 75 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.

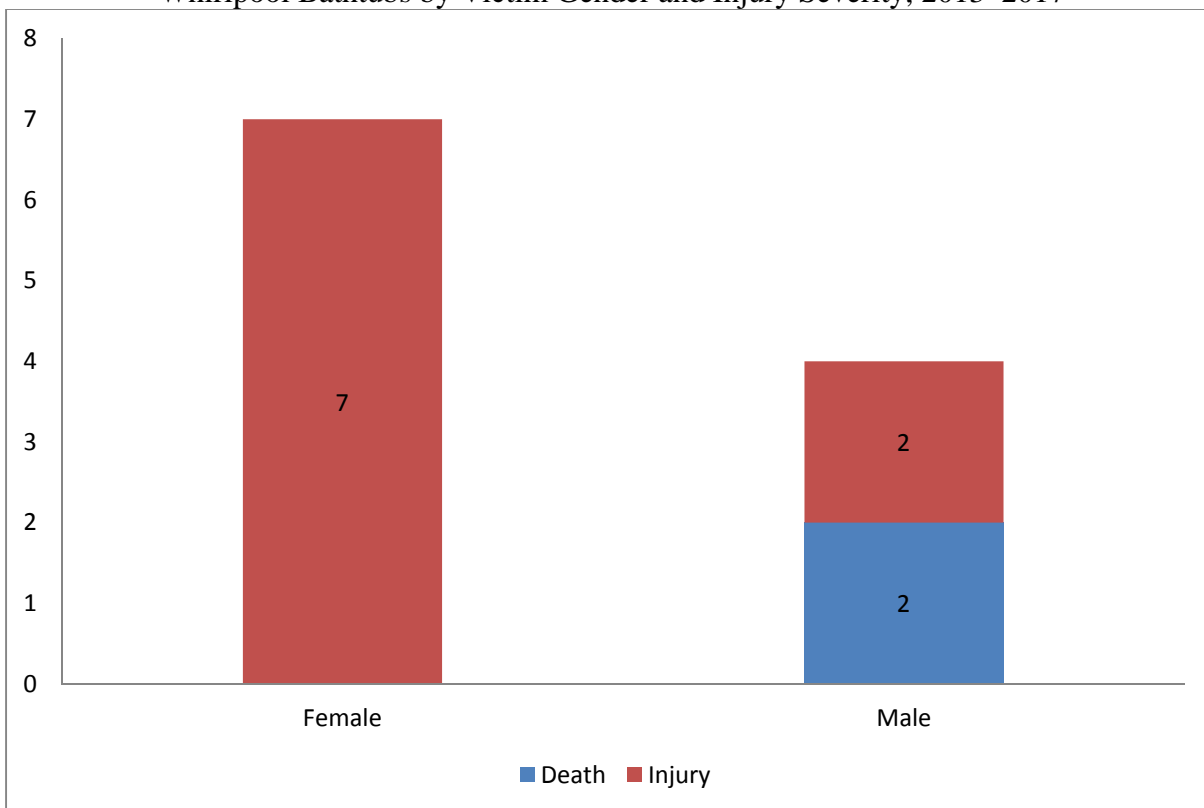
**Table 2**  
 Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Incident Location and Product Category, 2013–2017

Location	Pool	Spa	Total
Public	1	4	5
Residential	3	3	6
<b>Total</b>	4	7	11

Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017. No incident associated with whirlpool bathtubs was reported to have occurred from 2013 through 2017.

More females (7 victims, 64 percent) were involved in these incidents than males (4 victims, 36 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, 2013–2017



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017.

There were more female victims (75 percent for pool, 57 percent for spa) than male for both product categories, pools and 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, 2013–2017

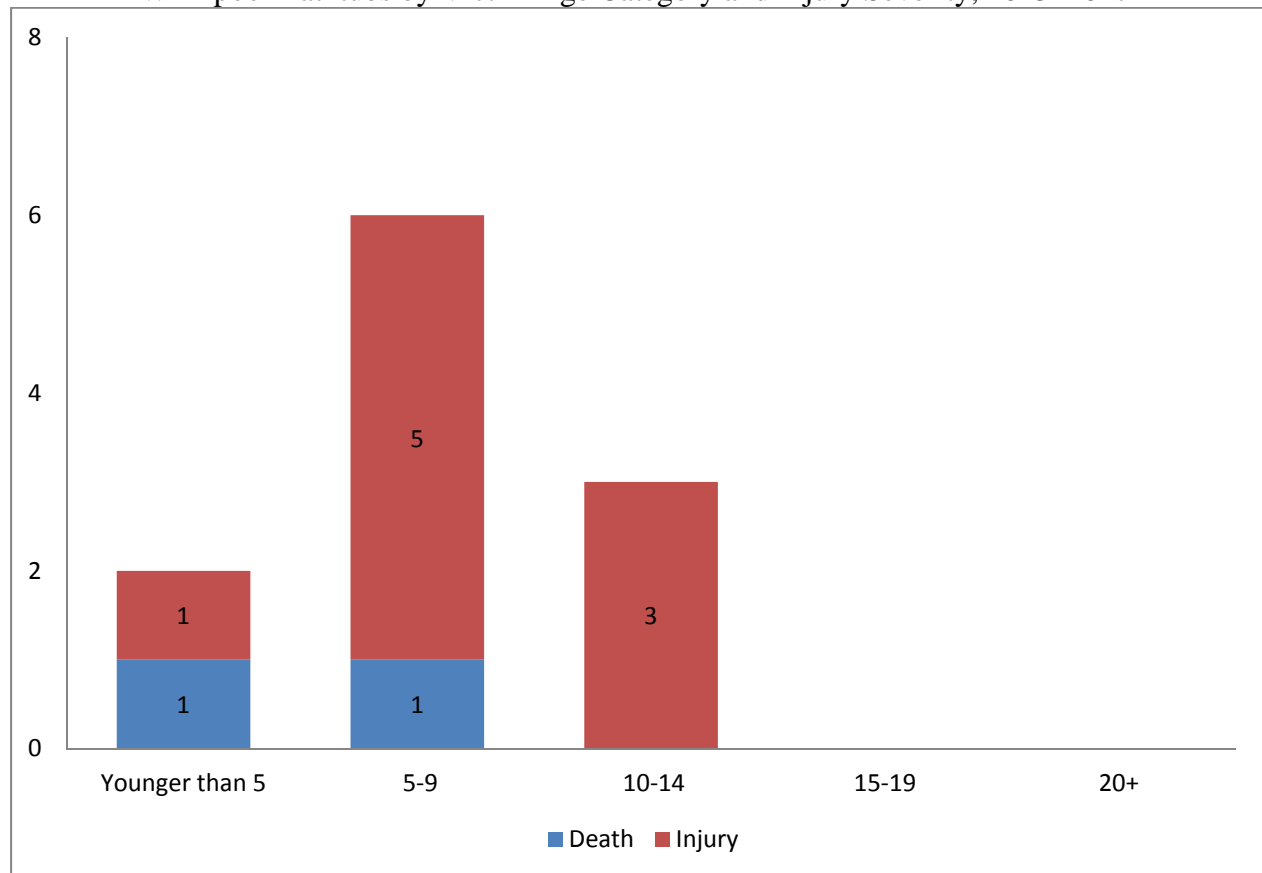
Gender	Pool	Spa	Total
Female	3	4	7
Male	1	3	4
Total	4	7	11

Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017. No incident associated with whirlpool bathtubs was reported to have occurred from 2013 through 2017.

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 (3 victims, 27 percent) and the younger than 5 year (2 victims, 18 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, 2013–2017



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017. No victim falls in the 15- to 19- year age category and other age categories for 20 years and older.

Among the children 9 years of age or younger, four (100 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, 2013–2017

Victim Age Category (years)	Pool	Spa	Total
<b>Younger than 5</b>	1	1	2
<b>5–9</b>	3	3	6
<b>10–14</b>	-	3	3
<b>15–19</b>	-	-	-
<b>20–29</b>	-	-	-
<b>30–39</b>	-	-	-
<b>40–49</b>	-	-	-
<b>50 and Older</b>	-	-	-
<b>Total</b>	4	7	11

Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017. No incident associated with whirlpool bathtubs was reported to have occurred from 2013 through 2017.

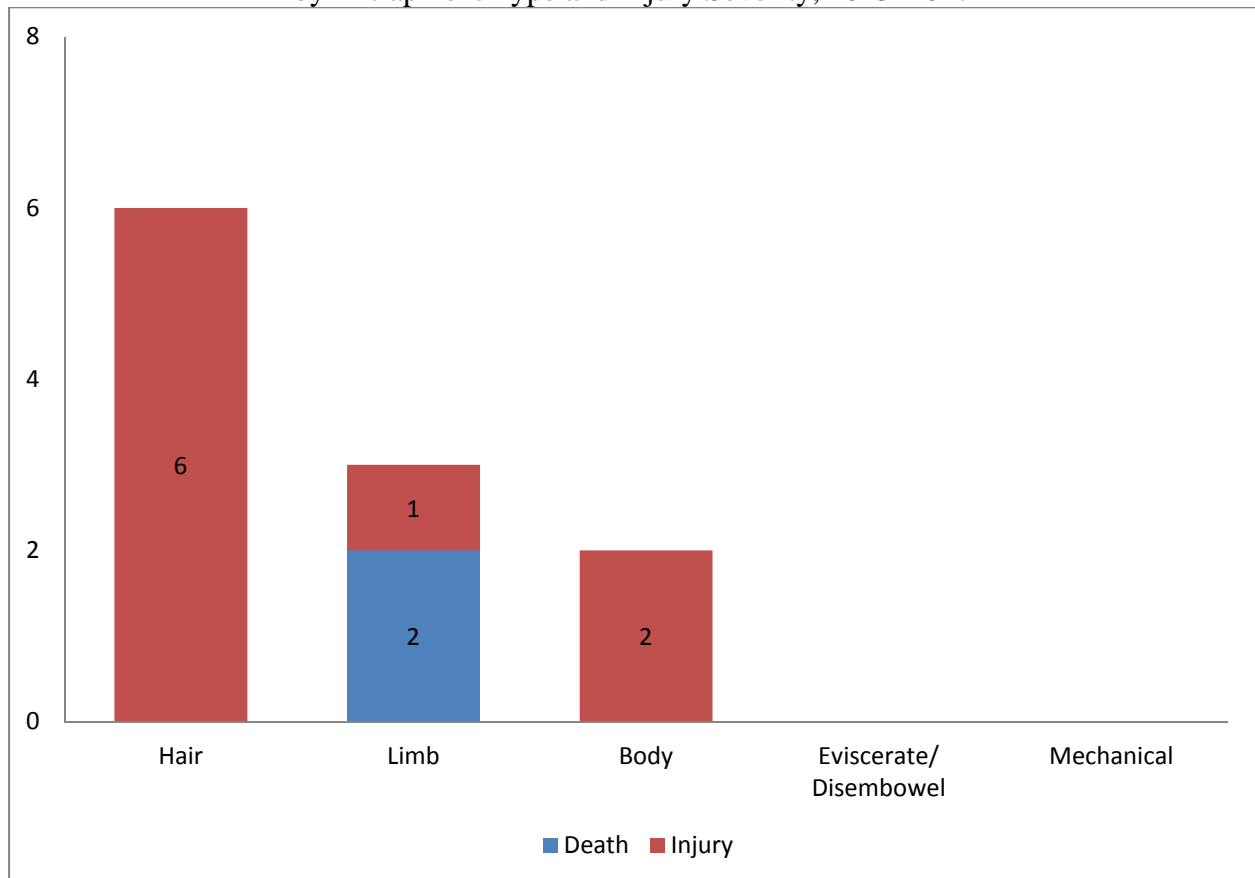
Using definitions developed by the Association of Pool and Spa Professionals (APSP), there are five types of circulation entrapment: (1) body, (2) limb, (3) evisceration/disembowelment, (4) hair, and (5) mechanical.<sup>3</sup> “Limb entrapment” happens when a limb is sucked or inserted into an open 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/disembowelment<sup>4</sup>” 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.

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

<sup>4</sup> 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.

The incidents reported to CPSC staff identified hair (6 victims, 55 percent) as the most frequent type of entrapments. This is followed by limb (3 victims, 27 percent) and body (2 victims, 18 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, 2013–2017



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017.

Among the four pool entrapment victims, half of them experienced hair (2 victims, 50 percent) entrapments, and the other two experienced a limb (1 victim, 25 percent) entrapment and a body (1 victim, 25 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 2013 through 2017. 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, 2013–2017

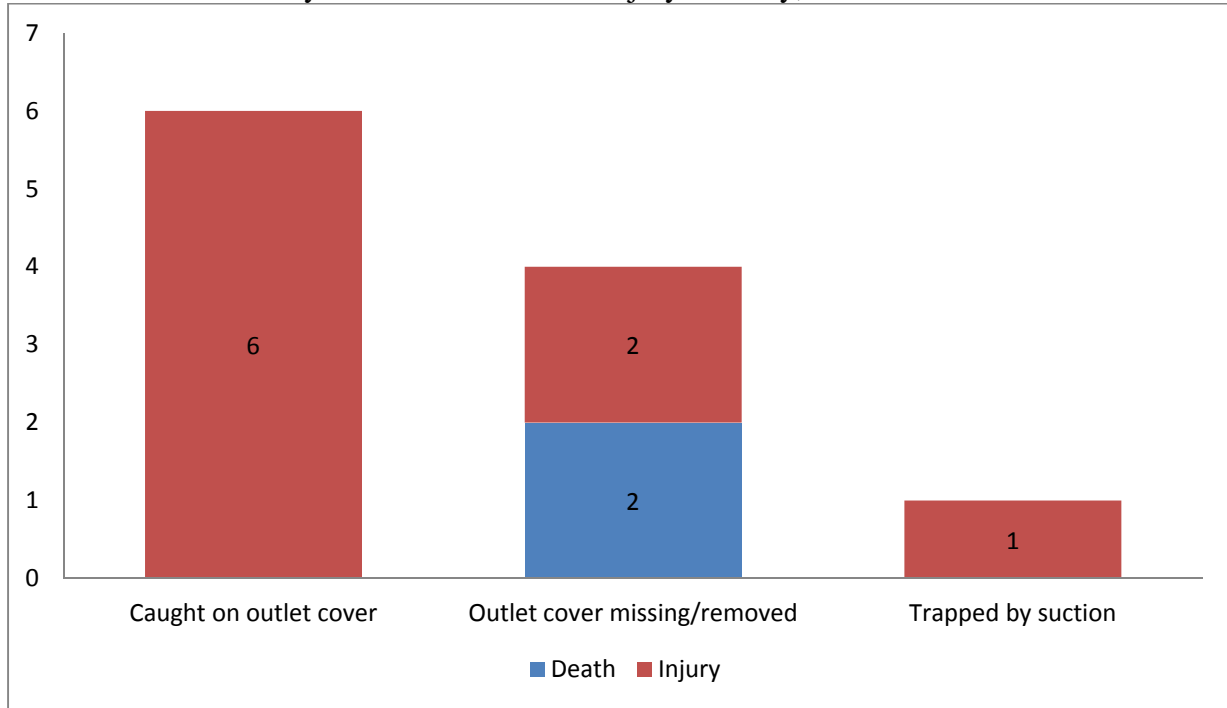
<b>Circulation Entrapment Type</b>	<b>Pool</b>	<b>Spa</b>	<b>Total</b>
<b>Hair</b>	2	4	6
<b>Limb</b>	1	2	3
<b>Body</b>	1	1	2
<b>Eviscerate/Disembowel</b>	-	-	-
<b>Mechanical</b>	-	-	-
<b>Total</b>	4	7	11

Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017. No incident associated with whirlpool bathtubs was reported to have occurred from 2013 through 2017.

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, 2013–2017



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017.

The pool victim scenarios were evenly distributed between “caught on an outlet cover” (2 victims, 50 percent) and “outlet cover missing/removed” (2 victims, 50 percent). The spa victims 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, 2013–2017

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

Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2015–2017. No incident associated with whirlpool bathtubs was reported to have occurred from 2013 through 2017.

Besides the incidents discussed in the preceding section, 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 this incident was definitely in scope, it is not included in the report, but it is listed in the 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 2013 through 2017. Data were extracted on March 8, 2018, 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 2017. These data were merged with the data from the 2017 report, which covered 2012-2016. The period was adjusted for the 2016 report to focus on recent 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 are 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) 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, 2013–2017**

Report #	Year	Product type	Severity	Age (yrs.)	Sex	Entrapment type	Scenario	Narrative
1	2017	Pool	Injury	6	F	Hair	Caught on outlet cover	A six-year-old female 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.
2	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.
3	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.
4	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 new York city department of health & mental hygiene on February 29, 2016.
5	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.
6	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.

Report #	Year	Product type	Severity	Age (yrs.)	Sex	Entrapment type	Scenario	Narrative
7	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.
8	2014	Spa	Death	4	M	Limb	Outlet cover missing/removed <sup>5</sup>	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.
9	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.
10	2013	Pool	Injury	2	F	Body	Outlet cover missing/removed	The consumer stated that her 2-yo daughter (25 lbs.) lifted up the lid of the pool skimmer, stepped into it and squatted down when it sucked her into the intake. The consumer stated that the child's front vaginal region had some tears, severe bruising and swelling.
11	2013	Pool	Injury	5	M	Limb	Outlet cover missing/removed	A five year old male spent several days in the hospital following a near drowning experience. The victim was being supervised by his aunt while swimming in a residential in-ground swimming pool. The victim attempted to retrieve a toy that was lodged in the pool's main drain and his arm became entrapped in the drain. It is suspected that the drain lacked a cover. After several attempts he was successfully extracted and resuscitative measures were taken. The victim was conscious and alert by the time emergency personnel arrived and transported him to the hospital.
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 down swimming, also noting abrasions to face and chipped tooth.

<sup>5</sup> The scenario is based on the updated review.