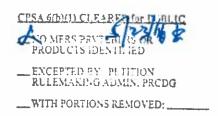


2011–2015 Reported Circulation/Suction Entrapment Incidents Associated with Pools, Spas, and Whirlpool Bathtubs, 2016 Report

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Executive Summary

This report characterizes the information on circulation entrapment incidents associated with pools, spas, and whirlpool bathtubs that were reported to the 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 collaboratively developed this definition and determined the types of products that are of interest regarding circulation entrapments.

CPSC staff is aware of 23 victims of circulation entrapments in incidents that reportedly occurred from 2011 through 2015. Highlighted findings include:

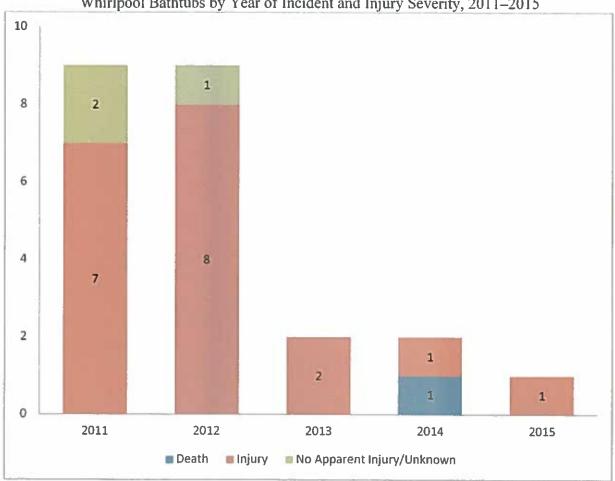
- Victims
 - o Fatality (1 victim, 4 percent)
 - o Injury (19 victims, 83 percent)
 - 15 victims were children, younger than 15 years old
 - 4 victims were between the age of 20 and 49 years old
 - o No injury (3 victims, 13 percent)
 - 2 were children, ages 5 to 14 years old
 - 1 was an adult, age 20 to 29 years old
 - Majority of the entrapment victims (18 victims, 78 percent) were individuals younger than 15 years of age
 - Majority of the victims were females (17 victims, 74 percent)
- Product
 - o 43 percent (10 victims) were associated with a spa incident
 - o 39 percent of the victims (9 victims) were associated with a pool incident
 - o 17 percent (4 victims) were associated with a whirlpool bathtub incident
- Location
 - o 61 percent of the entrapments (14 victims) occurred in public settings
 - o 35 percent (8 victims) occurred in residential settings
 - o 4 percent (1 victims) occurred in an unknown location
- Entrapment Type
 - o 35 percent (8 victims) experienced limb entrapment
 - o 30 percent (7 victims) experienced body entrapment
 - o 17 percent (4 victims) experienced hair entrapment
 - o 9 percent (2 victims) experienced mechanical entrapment
 - o 9 percent (2 victims) experienced evisceration/disembowelment entrapment
- Hazard Scenario
 - o 48 percent (11 victims) were trapped in suction incidents
 - 26 percent (6 victims) were involved in incidents related to missing or removed outlet covers
 - o 22 percent (5 victims) were involved in incidents related to being caught on an outlet cover
 - 4 percent (1 victim) were involved in an incident that had a known scenario that did not fit into the defined scenarios

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

Circulation Entrapment

CPSC staff received reports of 20 incidents involving 23 victims of circulation entrapments from 2011 through 2015. Three of the 20 incidents reported two victims each. Appendix A provides the methodology for extracting the data and updating the database, and Appendix B provides the summary of the 20 reports. For this period, there was 1 fatality (spa), 19 injuries (7 pool, 8 spa, 4 whirlpool bathtub), and 3 incidents with no apparent injury or unknown injury (2 pool, 1 spa). Figure 1 displays the yearly counts of reported victims based on severity (fatality, injury, and no apparent/unknown injury). Reporting in CPSRMS is ongoing for the years 2013 through 2015.

Figure 1
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Year of Incident and Injury Severity, 2011–2015



Source: CPSC database, including the Consumer Product Safety Risk Management System ("CPSRMS") and National Electronic Injury Surveillance System ("NEISS"). Reporting is ongoing for 2013-2015.

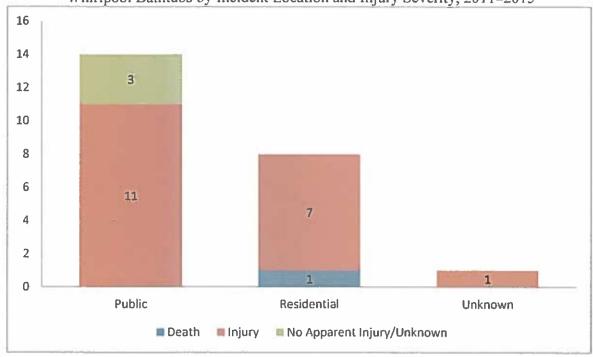
Among the 23 victims, 9 (39 percent) were associated with incidents in pools, 10 (43 percent) were associated with spas, and 4 (17 percent) were associated with whirlpool bathtubs. Table 1 shows these counts.

Table 1
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Year of Incident and Product Category, 2011–2015

Year	Pool	Spa	Whirlpool Bathtub	Total
2015	-	1	-	ı
2014	-	2	-	2
2013	2	7.	•	2
2012	4	3	2	9
2011	3	4	2	9
Total	9	10	4	23

The majority of the incidents (14 victims, 61 percent) occurred in public locations. 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, 2011–2015



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2013-2015.

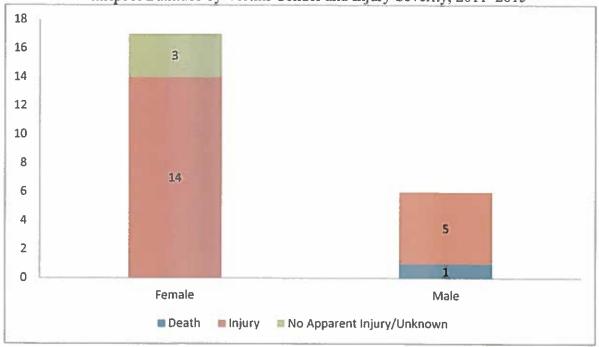
Among the 9 pool victims, 78 percent were in public pools. Among the 10 spa victims, 50 percent occurred at nonresidential locations, such as a hotel or motel. Whirlpool bathtub incidents were evenly distributed between public and residential locations. Table 2 shows the counts by incident location and product category.

Table 2
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Incident Location and Product Category, 2011–2015

Location	Pool	Spa	Whirlpool Bathtub	Total
Public	7	5	2	14
Residential	2	4	2	8
Unknown	-	1	-	1
Total	9	10	4	23

More females (17 victims, 74 percent) were involved in these incidents than males (6 victims, 26 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, 2011–2015



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2013-2015.

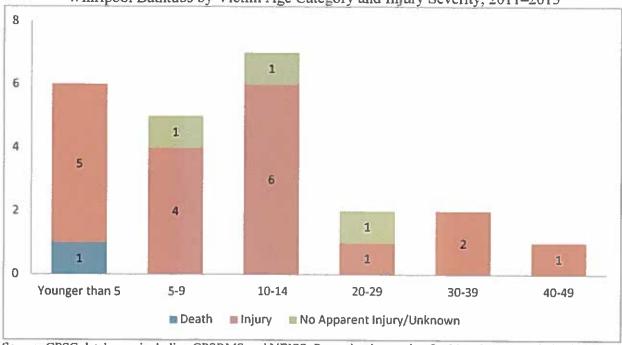
Most of the victims (67 percent for pool, 70 percent for spa, 100 percent for whirlpool bathtub) for each product category were female. Table 3 illustrates these counts.

Table 3
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Victim Gender and Product Category, 2011–2015

Gender	Pool	Spa	Whirlpool Bathtub	Total
Female	6	7	4	17
Male	3	3	-	6
Total	9	10	4	23

Figure 4 shows the counts of reported victims by age category and injury severity. The majority of the victims (18 victims, 78 percent) were children and minors younger than 15 years of age; the rest were adults (5 victims, 22 percent). Children in the 10 to 14 year (7 victims, 30 percent) age category had the highest frequency of circulation entrapments. This is followed by the younger than 5 year (6 victims, 26 percent) and 5 to 9 year (5 victims, 22 percent) age categories.

Figure 4
Number of Victims of Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Victim Age Category and Injury Severity, 2011–2015



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2013-2015. No victim falls in the 15 to 19 year age category or the 50 and older age category.

Among children 14 years of age or younger, more were involved in entrapments associated with pools and spas (89 percent of pool victims, 80 percent of spa victims) than whirlpool bathtubs (50 percent of the victims). 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, 2011–2015

Victim Age Category (years)	Pool	Spa	Whirlpool Bathtub	Total
Younger than 5	4	2	-	6
5–9	3	-	2	5
10–14	1	6	-	7
15–19	-		-	•
20–29	1	1	-	2
30–39	-	1	1	2
40–49	-	-	1	1
50 and Older	-	-	-	-
Total	9	10	4	23

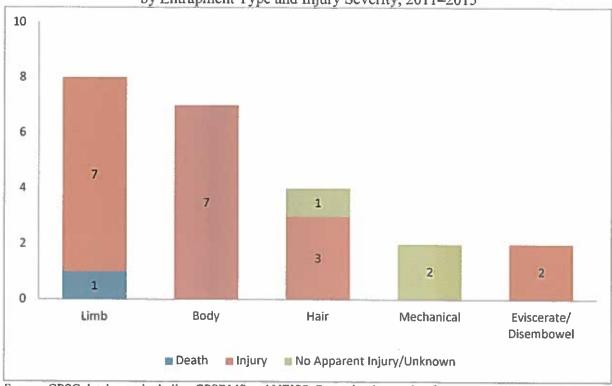
Using definitions developed by the Association of Pool and Spa Professionals ("APSP"), there are five types of circulation entrapment: (1) body, (2) limb, (3) evisceration/disembowelment, (4) hair, and (5) mechanical.² "Limb entrapment" happens when a limb is sucked or inserted into an open sump or pipe. 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" 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 purposes of 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 limb (8 victims, 35 percent) and body (7 victims, 30 percent) entrapments as the most frequent types of entrapments. This is followed by hair (4 victims, 17 percent), mechanical (2 victims, 9 percent) entrapments, and eviscerations/disembowelments (2 victims, 9 percent). Figure 5 displays the circulation entrapment victim data by entrapment type and injury severity.

² ANSI/APSP-7 2006, American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins, p. viii.

³ 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.

Figure 5
Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs by Entrapment Type and Injury Severity, 2011–2015



All but one of the 9 pool entrapment victims experienced limb (4 victims, 44 percent), mechanical (2 victims, 22 percent), or body (2 victims, 22 percent) entrapment; the one remaining pool entrapment victim experienced evisceration/disembowelment. The 10 spa victims experienced more hair entrapments (4 victims, 40 percent) than other kinds of entrapment, and all of the hair entrapments for all products combined were associated with spas. The 4 whirlpool bathtub victims experienced only body (2 victims, 50 percent) and limb (2 victims, 50 percent) entrapments. 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, 2011–2015

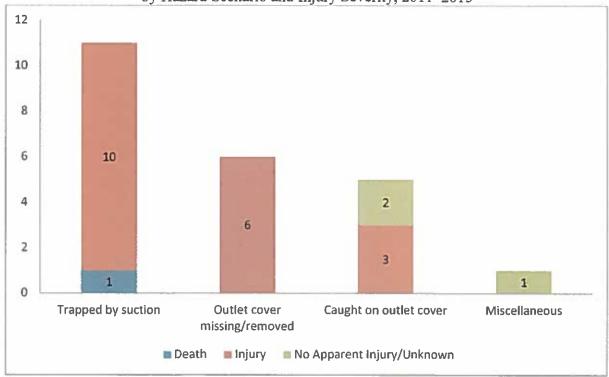
Circulation Entrapment Type	Pool	Spa	Whirlpool Bathtub	Total
Limb	4	2	2	8
Body	2	3	2	7
Hair		4	•	4
Mechanical	2		-	2
Eviscerate/ Disembowel	1	1	-	2
Total	9	10	4	23

Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2013-2015.

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.

Many of the incidents (11 victims, 48 percent) involved scenarios where the victim was being held to the drain by the suction force. It is followed by the category "missing or removed outlet covers" (6 victims, 26 percent) and "caught on the outlet cover" (5 victims, 22 percent). One incident was classified as "miscellaneous" because although the scenario was known, it did not fit into the other categories. 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, 2011–2015



Source: CPSC databases, including CPSRMS and NEISS. Reporting is ongoing for 2013-2015.

Most of the pool victim scenarios (6 victims, 67 percent) were related to a missing or removed outlet cover. The spa victims were mainly trapped by suction (6 victims, 60 percent) or caught on an outlet cover (4 victims, 40 percent). All of the whirlpool bathtub victims were trapped by suction (4 victims, 100 percent). Table 6 shows these counts.

Table 6
Reported Circulation Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs
By Hazard Scenario and Product Category, 2011–2015

Hazard Scenario	Pool	Spa	Whirlpool Bathtub	Total
Trapped by Suction	1	6	4	11
Outlet Cover Missing/Removed	6	-		6
Caught on Outlet Cover	ı	4	-	5
Miscellaneous	1	-	-	1
Total	9	10	4	23

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 years old female was near drowning in a pool when she felt something pulled her down. The abrasions to face and 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 2011 through 2015. Data were extracted on February 26, 2016, 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 2014-2015. This data was merged with the corrected data from the 2014 report which covered 2009-2013. The correction was made to remove one of duplicated reports and to correct the year of incident in the remaining report. The period was adjusted from 2014 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 20 Reported (23 victims) Circulation/Suctions Entrapment Incidents for Pools, Spas, and Whirlpool Bathtubs, 2011-2015

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Narrative	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.	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.	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.	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.	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.	A 31-yr-old female was lounging in a hot tub/bathtub in her hotel bathroom where the hot tub/bathtub drain on the side of the bathtub pulled the right side of her leg into the drain. She had to have her husband help her pull her leg off the drain. She suffered a bruise that was red and purple and was the size of about two to three inches in diameter. She did not seek medical treatment. The injury took about a week to heal.
Scenario	Trapped by suction	Trapped by suction	Caught on outlet cover	Outlet cover missing/removed	Outlet cover missing/removed	Trapped by suction
Entrapment type	Body	Limb	Hair	Body	Limb	Limb
Sex	Z	Σ	뀨	[1.,	Σ	Ľτ
Age (yrs)	13	4	12	2	٠,	31
Severity	Injury	Death	Injury	Injury	Injury	Injury
Product type	Spa	Spa	Spa	Pool	Pool	Spa
Year	2015	2014	2014	2013	2013	2012
Report #	Street	7	۳,	7	to	9

Narrative	A 3-year old female was entrapped on an uncovered single drain inside a wader pool. The drain cover came off the drain. It was determined that only two screws instead of four secured the drain cover to the drain. The safety vacuum release system ("SVRS") did not activate. The owner of the pool shut off the SVRS and pump using a secondary on/off switch and the child was immediately released. The child was taken to a hospital where she was treated for a prolapsed rectum. She was released the next day.	A four year old female stuck her arm and hand into the open vacuum port hole in the side of the swimming pool where she became stuck. She received only a couple of scratches to her lower left arm. The vacuum pump was not operating at the time of the incident.	A 10-year-old boy suffered bruising on both thighs when he became trapped on a lily pad skimmer in a condominium pool. Bystanders broke the skimmer to release suction from the pump and release the victim's legs. The pool pump was on direct suction without a secondary anti-entrapment system.	This incident involved an in-ground, pool, drain entrapment where body jewelry became stuck in a drain in the zero depth area of a public swimming pool. This indoor swimming pool is located inside a recreational center. This incident was not a suction type entrapment. The 29-year-old female, who became stuck in the drain, was uninjured as a result of this incident. The local fire department who responded to this incident, helped free the victim from the drain cover by removing the drain cover from the bottom of the pool. After the drain cover was removed, a fire fighter was able to manipulate the navel ring, so that it was released from the drain and the victim was freed.	3 YOF Patient was home sitting in hot tub when she got stuck onto a vent. Mom pulled her out now w/ rectal prolapse. Diagnosis rectal prolapse.	21 YOF got hair caught in hot tub drain and went under near drowning	Two girls, ages 6 and 7, became suctioned to the intake grate cover in a whirlpool bathtub while taking a bath together. The children sustained bruises on their legs.	No additional medical treatment was sought and the bruising subsequently healed without further complications or injuries.
	A 3-year old female w pool. The drain cover instead of four secure system ("SVRS") did pump using a secondachild was taken to a h released the next day.	A four year old the side of the s of scratches to of the incident.	A 10-year-o lily pad skin suction from suction with	This incident involves became stuck in indoor swimming a suction type en was uninjured as to this incident, he cover from the be was able to manify victim was freed.	3 YOF Patie pulled her o	21 YOF got	Two girls, ag bathtub whil	No additions without furtl
Scenario	Outlet cover missing/removed	Outlet cover missing/removed	Trapped by suction	Caught on outlet cover	Trapped by suction	Caught on outlet cover	Trapped by suction	Trapped by suction
Entrapment type	Eviscerate/ Disembowel	Limb	Limb	Mechanical	Eviscerate/ Disembowel	Hair	Limb	Limb
Sex	ĹĿ	£ - ,	Σ	ᄕ	{ -	ĹŦĄ	(±,	ĮT.
Age (yrs)	m	4	10	29	М	21	9	7
Severity	Injury	Injury	Injury	No App/Unk Injury	Injury	Injury	Injury	Injury
Product type	Pool	Pool	Pool	Pool	Spa	Spa	Whirlpool bathtub	Whirlpool bathtub
Year	2012	2012	2012	2012	2012	2012	2012	2012
Report #	-	60	6	10		12	13a	13b

Narrative	A four-year-old male received severe bruising to the rectal area when he was entrapped on an uncovered drain in an in-ground wading pool. There were no other injuries in this incident.	A metal charm hanging from a string in the hip area of a 5 year-old girl's one-piece bathing suit became snagged on the plastic grate which covered a gutter-style trench around a public pool. The girl's legs and torso entered the water while her hip was stuck against the side of the pool. Her 8 year-old sister assisted her before the metal charm broke off and freed her. The girl was not injured.	An eight year old female was swimming in an in-ground pool at her apartment complex. She attempted to get out of the deep end of the pool by sticking her left arm in a pool vacuum line for leverage. Her arm became stuck in the pipe. Emergency personnel extricated the pipe from the pool deck and the victim was transported to the hospital emergency room where the pipe was cut off of her arm. She sustained minor bruises and is still experiencing cold chills said to be caused by trauma. Treated and released the same day from a local hospital.		submerged while in a 23 person not movepa of an in-door water park facility. Both victims, who are cousins, received first aid at the scene of the incident but no outside medical treatment was sought at the time of the incident.	A 13 year old female's hair became entangled in the skimmer of a hotel hot tub. A guest was able to extract the girl's hair from the drain cover before any serious injury occurred.	let 13 YOF was in hot tub under H20 to retrieve bracelet hair caught into filter 1 min now Left eye pain. Diagnosis- near drowning/left eye hemorrhage.	A 38 year old white female and a 49 year old white female became stuck to the suction intake cover of the whirlpool bathtub they were using in separate incidents.		8 YOF near drowning in pool at camp when pt states felt something pulled down swimming, also noting abrasions to face and chipped tooth.
Scenario	Outlet cover missing/removed	Miscellaneous	Outlet cover missing/removed	Frapped by suction	Trapped by suction	Caught on outlet	Caught on outlet cover	Trapped by suction	Trapped by suction	unknown
Entrapment type	Body	Mechanical	Limb	Body	Body	Hair	Hair	Body	Body	unknown
Sex	Σ	Ľ.	Œ,	M	Ľ.	Ĺī.,	Ľ	[-,	[-	<u>[- </u>
Age (yrs)	7	5	00	10	2	13	13	38	49	8
Severity	Injury	No App/Unk Injury	Injury	Injury	Injury	No App/Unk Injury	Injury	Injury	Injury	No App/Unk Injury
Product type	Pool	Pool	Pool	Spa	Spa	Spa	Spa	Whirlpool bathtub	Whirlpool bathtub	Pool
Year	2011	2011	2011	2011	2011	2011	2011	2011	2011	2015
Report #	14	ñ	16	17a	17b	18	19	20а	20b	Possible