



## 1999–2010 Reported Circulation/Suction Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs, 2011 Report



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*John*  
*5/12/11*

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 characterizes 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 collaboratively developed this definition and the types of products of interest regarding circulation entrapments. The circulation entrapment-associated products that were determined to be of interest include: pools, spas, and whirlpool bathtubs.

From 1999 through 2010,<sup>2</sup> CPSC staff is aware of 97 reports of circulation entrapments. Highlighted findings include:

- Victims
  - Fatality (12 incidents, 12 percent)
    - 11 involved children, ages 6 to 17 years
    - 1 involved an adult, age 48 years
  - Injury (82 incidents, 85 percent)
    - 64 involved children, ages 2 to 15 years
    - 18 involved adults, ages 21 to 55 years
  - No injury (3 incidents, 3 percent)
    - 2 involved children, ages 7 and 10 years
    - 1 involved an adult, age 50 years
  - Majority of the entrapments (77 incidents, 79 percent) involved individuals younger than 18 years
- Product
  - 49 percent associated with a pool
  - 33 percent associated with a spa
  - 18 percent associated with a whirlpool bathtub
- Location
  - 51 percent in residential settings
  - 37 percent in public settings
  - 12 percent unknown
- Entrapment Type
  - 35 percent were body entrapments
  - 33 percent were limb entrapments
  - 15 percent were mechanical entrapments
  - 13 percent were hair entrapments
  - 2 percent were evisceration/disembowelment entrapments
- Hazard Scenario
  - 33 percent were trapped by suction
  - 31 percent had issues involving broken, missing, or removed/disengaged outlet covers
  - 13 percent were categorized as caught on an outlet cover
  - 23 percent did not provide sufficient details in the source document to classify the hazard scenario

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

<sup>2</sup> Italics is used to denote periods for which reporting is ongoing (2007, 2008, 2009, and 2010).

## Circulation Entrapment

There were 97 reports concerning circulation entrapments for the period 1999 through 2010. Table 1 gives the yearly frequency of reports based on incident severity (fatality, injury, and no injury).

Table 1  
Reports to CPSC Staff Concerning Circulation Entrapments  
Associated with Pools, Spas, and Whirlpool Bathtubs by Year of Incident, 1999–2010<sup>3</sup>

<b>Year</b>	<b>Fatality</b>	<b>Injury</b>	<b>No injury</b>	<b>Yearly Total</b>
<i>2010</i>	<i>0</i>	<i>3</i>	<i>0</i>	<i>3</i>
<i>2009</i>	<i>0</i>	<i>7</i>	<i>1</i>	<i>8</i>
<i>2008</i>	<i>2</i>	<i>7</i>	<i>1</i>	<i>10</i>
<i>2007</i>	<i>2</i>	<i>2</i>	<i>0</i>	<i>4</i>
<b>2006</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>9</b>
<b>2005</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>10</b>
<b>2004</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>4</b>
<b>2003</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>6</b>
<b>2002</b>	<b>1</b>	<b>13</b>	<b>0</b>	<b>14</b>
<b>2001</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>6</b>
<b>2000</b>	<b>3</b>	<b>10</b>	<b>1</b>	<b>14</b>
<b>1999</b>	<b>2</b>	<b>7</b>	<b>0</b>	<b>9</b>
<b>Total</b>	<b>12</b>	<b>82</b>	<b>3</b>	<b>97</b>

Source: CPSC databases, including NEISS (National Electronic Injury Surveillance System), IPII (Injury and Potential Injury Incidents), DTHS (Deaths), and INDP (In Depth Investigations). Italics denote period for which reporting is incomplete.

Table 2 provides a cross-tabulation of the frequency of reports by circulation entrapment severity and product type.

<sup>3</sup> Reporting is ongoing for 2007, 2008, 2009, and 2010.

Table 2  
 Reports to CPSC Staff Concerning Circulation Entrapments  
 Associated with Pools, Spas, and Whirlpool Bathtubs by Product Type, 1999–2010

<b>Product Type</b>	<b>Fatality</b>	<b>Injury</b>	<b>No Injury</b>	<b>Total</b>
<b>Pool</b>	9	38	1	48
<b>Spa</b>	3	28	1	32
<b>Whirlpool Bathtub</b>	0	16	1	17
<b>Total</b>	12	82	3	97

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

Table 3 presents the frequency of reports by location and severity.

Table 3  
 Reports to CPSC Staff Concerning Circulation Entrapments  
 Associated with Pools, Spas, and Whirlpool Bathtubs by Location, 1999–2010

<b>Location</b>	<b>Fatality</b>	<b>Injury</b>	<b>No Injury</b>	<b>Total</b>
<b>Public</b>	5	29	2	36
<b>Residential</b>	7	41	1	49
<b>Unknown</b>	0	12	0	12
<b>Total</b>	12	82	3	97

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

Table 4 records circulation entrapment frequencies for reported fatalities, injuries, and no injuries by gender.

Table 4  
 Reports to CPSC Staff Concerning Circulation Entrapments  
 Associated with Pools, Spas, and Whirlpool Bathtubs by Gender, 1999–2010

<b>Gender</b>	<b>Fatality</b>	<b>Injury</b>	<b>No Injury</b>	<b>Total</b>
<b>Male</b>	5	34	1	40
<b>Female</b>	7	48	2	57
<b>Total</b>	12	82	3	97

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

Table 5 gives the frequency of reports for victim age for circulation entrapment fatalities and injuries. Individuals in the 5- to 9-year-old category have the highest frequency (38 percent) of circulation entrapment reports. This is followed by the 10- to 14-year-old (23 percent) and younger than 5-year-old (13 percent) categories. Children 14 years of age or younger were involved in 72 (74 percent) of the reported circulation entrapment incidents.

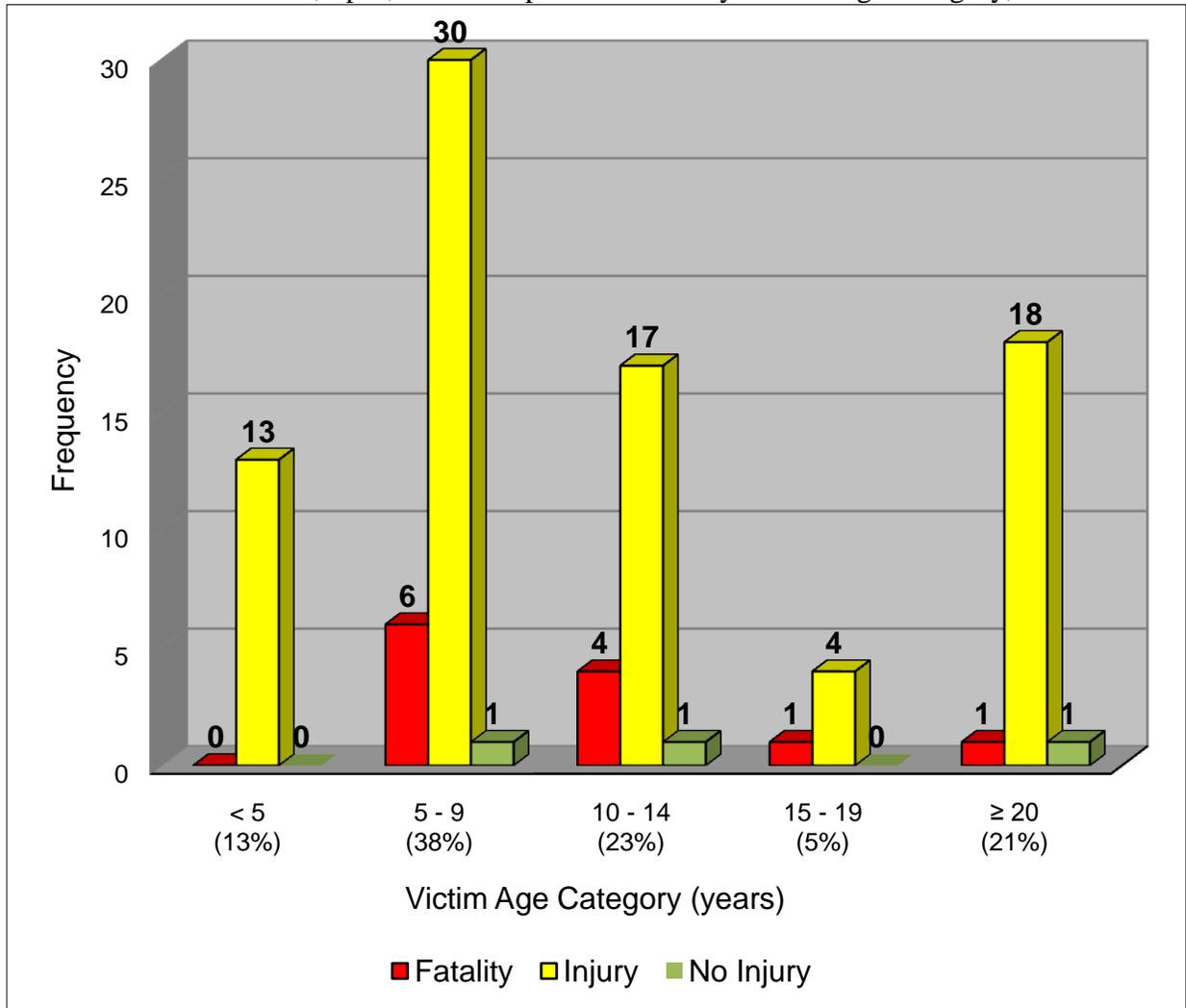
Table 5  
 Reports to CPSC Staff Concerning Circulation Entrapments  
 Associated with Pools, Spas, and Whirlpool Bathtubs by Victim Age Category, 1999–2010

<b>Age Category (years)</b>	<b>Fatality</b>	<b>Injury</b>	<b>No Injury</b>	<b>Total</b>
< 5	0	13	0	13
5–9	6	30	1	37
10–14	4	17	1	22
15–19	1	4	0	5
20–24	0	3	0	3
25–29	0	2	0	2
30–34	0	3	0	3
35–39	0	5	0	5
40–44	0	1	0	1
45–49	1	2	0	3
50–54	0	0	1	1
55–59	0	2	0	2
≥ 60	0	0	0	0
<b>Total</b>	12	82	3	97

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

Figure 1 presents counts of reported fatalities and injuries by victim age categories for circulation entrapments associated with pool, spas, and whirlpool bathtubs.

Figure 1  
 Reports to CPSC Staff Concerning Circulation Entrapments  
 Associated with Pools, Spas, and Whirlpool Bathtubs by Victim Age Category, 1999–2010



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

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>4</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 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 only 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 these items 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

<sup>4</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.

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 the abdomen, back, hip, or shoulder and arm.

The majority of the incidents reported to CPSC staff (68 percent) identified body and limb entrapment. This is followed by mechanical and hair entrapment (29 percent). For incidents where the exact nature of the circulation entrapment was ambiguous, the incident was categorized as “unclear.” Table 6 summarizes circulation entrapment incidents based on entrapment type.

Table 6  
Reports to CPSC Staff Concerning Circulation Entrapments  
Associated with Pools, Spas, and Whirlpool Bathtubs by Entrapment Type, 1999–2010

<b>Circulation Entrapment Type</b>	<b>Fatality</b>	<b>Injury</b>	<b>No Injury</b>	<b>Total</b>
<b>Body</b>	3	31	0	34
<b>Limb</b>	4	26	2	32
<b>Mechanical</b>	1	14	0	15
<b>Hair</b>	3	9	1	13
<b>Evisceration/ Disembowelment</b>	1	1	0	2
<b>Unclear</b>	0	1	0	1
<b>Total</b>	12	82	3	97

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

Hazard scenarios for the reported incidents were categorized by reviewing the report narratives and coding the incident based on the following hierarchical categories. If the report indicates that an outlet cover was broken, missing, or disengaged/removed, then the incident was assigned to the 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.” Incidents in which neither the outlet/outlet cover nor suction were indicated were categorized as “unknown.”

Many of the incidents (33 percent) involved scenarios where the victim was being held to the drain by the suction force. Another large portion (31 percent) involved issues with broken, missing, removed, or disengaged outlet covers. An additional set of incidents (13 percent) involved the victim being caught on the outlet cover. The remaining incidents (23 percent) did not provide sufficient details to categorize the hazard scenario. Table 7 enumerates the results of the hazard scenario categorizations for circulation entrapments related to pools, spas, and whirlpool bathtubs.

Table 7  
 Reports to CPSC Staff Concerning Circulation Entrapments  
 Associated with Pools, Spas, and Whirlpool Bathtubs by Hazard Scenario, 1999–2010

<b>Hazard Scenario</b>	<b>Fatality</b>	<b>Injury</b>	<b>No Injury</b>	<b>Total</b>
<b>Broken Outlet Cover</b>	3	1	0	4
<b>Outlet Cover Missing</b>	4	16	0	20
<b>Outlet Cover Removed/Disengaged</b>	0	5	1	6
<b>Caught On Outlet Cover</b>	2	10	1	13
<b>Trapped By Suction</b>	3	28	1	32
<b>Unknown</b>	0	22	0	22
<b>Total</b>	12	82	3	97

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

## Appendix

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

Data were extracted on March 3, 2011, from the National Electronic Injury Surveillance System (NEISS), Injury and Potential Injury Incidents (IPII), Deaths (DTHS), and In Depth Investigations (INDP) databases for the product codes enumerated in Table 8 for data entered in 2010, and merged with data from last year's memorandum (1999–2009) to update the data for the 1999 through 2010 timeframe.

Table 8–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 is 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 IPII and DTHS. In particular, additional reports generally are 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. As fatal incidents are notable events in the community where they occur; often, for a single incident, there were 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). 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 of the deaths has been received. Once the incident set was established, the incident reports were examined to code the additional characteristics of circulation entrapment type and hazard scenario.