Introduction

While water recreation provides children and their loved ones with hours of fun and exercise, water and kids can be a dangerous mix. Worldwide, drowning is the second leading cause of injury-related death to children ages 14 and under. In the United States, drowning remains the second leading cause of accidental death among children ages 1 to 14, despite a 52 percent decline in child drownings per year from 1987 to 2003. In 2003, 782 children ages 14 and under died as a result of accidental drowning; in 2004, an estimated 3,702 children in this age group were treated in emergency rooms for near-drowning. Of these drowning deaths, an estimated 40 percent occurred in pools.

While drain entrapment is a relatively unknown hazard, from 1985 to 2004, at least 33 children ages 14 and under died as a result of entrapment in a pool or spa drain. In 41 percent of these incidents, the victim’s hair was involved; 35 percent occurred in spas and 65 percent in pools. From 1985 to 2004, nearly 100 children ages 14 and under were injured as a result of pool and spa drain entrapment.

Entrapment occurs when part of a child’s body becomes attached to a drain as a result of the powerful suction of the water circulation system, or an arm or leg is inserted into a drain with a missing or broken cover. Death or serious injury can occur when the force of the suction overpowers the child’s ability to disengage from the drain and rise to the surface of the water. Often, the strength of an adult is still not enough to remove a child trapped by a pool or spa drainage system. Entrapment deaths can also occur when a child’s hair or swimsuit gets tangled in the drain or on an underwater object, such as a ladder. A third type of entrapment is evisceration, caused by the suction when a child sits on an uncovered drain.

To focus attention on the dangers of pool and spa entrapment, Safe Kids Worldwide commissioned Harris Interactive® to conduct a national survey of parents to measure awareness of safety issues related to entrapment. This survey also measured views on parental supervision of children in water; use of pool safety devices to prevent entrapment and accidental drowning; and knowledge of laws governing pool safety. There was a special focus on the areas where 50 percent of all child drowning incidents occur: Arizona, California, Florida, Georgia, Illinois, Massachusetts, New York, Pennsylvania, Texas and the District of Columbia.

Safe Kids Worldwide also researched availability of entrapment data as a subset of drowning data.

Methodology

Harris Interactive conducted the study online within the United States between October 26 and November 12, 2005, among a nationwide cross-section of 4,495 adults aged 18 or older with a child age 14 and under in the household. This includes 1,301 parents with children under 5; 1,386 parents of 5- to 9-year-olds; and 1,808 parents of 10- to 14-year-olds, and among them 2,166 parents who own an in-ground pool, above-ground pool, inflatable pool, or spa. Figures for age, sex, race/ethnicity, education, income and propensity to use the internet were weighted where necessary to bring them into line with their actual proportions in the population. This online sample is not a probability sample and therefore no theoretical sampling error can be calculated.

In Safe Kids’ study of sources of entrapment data as a subset of drowning data, national, state and local data sources were considered. The National Drowning Prevention Alliance, Child Death Review teams and the International Collaboration Effort were contacted to reach experts in the field and obtain copies of their data collection forms. Child Death Review teams in high-risk areas were specifically targeted. National databases such as the CDC’s Web-based Injury Statistics Query and Reporting System and Wide-ranging Online Data for Epidemiologic Research were also explored. Although the WONDER database can be used to specify the location of the drowning (such as in a bathtub, an open body of water, a swimming pool, other or unspecified), it does not specify the mechanism.
Summary of Results

Awareness of Risks
Swimming is a popular activity for children 14 and under. According to the survey, more than 90 percent of parents with children in this age group report that their child swims. In addition, 6 out of 10 parents who say their child swims report that he or she does so at least once a week during swimming season.

Interestingly, only a third (34 percent) of parents recognize that drowning is one of the top two causes of accidental death among children ages 14 and under. In the Southern and Western regions of the United States, where the largest number of drowning deaths occur (48 and 24 percent respectively), a similar pattern appears: only 39 percent of parents in the South and 31 percent in the West recognize that drowning is a top cause of accidental death among children. Among the 10 states (which includes Washington, D.C.) included in the survey, parents reported higher awareness in Arizona (63 percent), Florida (49 percent) and Georgia (42 percent).

Entrapment
Hidden hazards of body entrapment and hair entanglement can have life-threatening consequences. Since 1990, 77 percent of body entrapment deaths and injuries were among children ages 14 and under. In a number of these cases, it appears that the child was playing with an open drain by inserting a hand or foot into the pipe and becoming trapped by the increased suction and resulting tissue swelling.

The picture of entanglement is similarly grim. Since 1990, 93 percent of hair entanglement deaths and injuries were among children ages 15 and under. Typically, these incidents involved females with long, fine hair, who are underwater with their heads near a suction outlet (drain). The hair becomes entangled in and around holes and protusions on both sides of the cover — not necessarily because of strong suction forces, although it is these suction forces that initially draw the hair into the drain cover.

Pool and spa ownership is becoming more popular every year, increasing the risk of death or injury by entrapment. According to the survey, one out of two parents report that they have a pool or spa at home (49 percent), including inflatable pools (22 percent), in-ground pools (15 percent), above-ground pools (13 percent) and spas (8 percent).
When asked where drain entrapment can occur, only 39 percent of parents identified a shallow public wading pool. The most recognized threat was a home in-ground pool, cited by 72 percent of parents. In fact, however, all pools and spas with drains pose an equal threat.\textsuperscript{12}

The majority of parents (93 percent) identify head injuries from shallow-water diving as a risk to children in pools. However, slightly more than half (54 percent) of parents identify hair entanglement in the pool drain or filter as a risk, and 53 percent identify suction of a body part into a pool drain. Findings were similar for pool and spa owning parents, 54 percent of whom identify hair entrapment and 52 percent identifying suction of a body part as a risk to children in the water.

Interestingly, when parents were asked about the general risk associated with entrapment in pool drains, the level of familiarity was higher. More than a quarter of parents (29 percent) reported they were not at all familiar with entrapment risk, while nearly three quarters (71 percent) of parents said they were at least partly familiar with the risk. Of those parents who were familiar with the general risk of entrapment, more than half (55 percent) heard about the risk from television, 35 percent from the newspaper and 26 percent from a lifeguard or swim teacher.
Surprisingly, 26 percent of parents who own a pool or spa report they are not at all informed about ensuring the safety of their pool or spa drain. Slightly more than one quarter of parents who own a pool or spa (26 percent) were not familiar with entrapment risk while about three quarters (74 percent) of parents said they were at least somewhat familiar with the risk. This finding is supported by research that shows that pool owners do not appear to perceive the pool as a hazard for young children.13

Compared to residential swimming pools, the overall number of deaths and injuries is lower for hot tubs and spas.14 However, it is still important for parents to be aware of the risk associated with drain entrapment in these bodies of water. Young children can easily access the drain in wading pools and spas, and may be attracted to the drain cover itself or to the feel of water flowing through the drain.15

Active Supervision

The variety of sites in which children drown, even within specific age groups, emphasizes the need for a multifaceted approach.16 Environmental strategies, such as installation of four-sided fences around swimming pools, and behavioral strategies, such as increased supervision of children while around water, are needed to prevent these tragedies.17

Children have been known to drown while an adult was in the pool area but was not actively supervising. The survey shows that although an estimated two-thirds of parents (64 percent) reported staying in visual contact with the supervised child at all times, only slightly more than one-fifth (22 percent) reported staying within arm’s reach while the child was swimming. Findings were similar across regions and the states focused on in this study. However, they differed across age groups of the child.

Parents’ behavior is drastically different when supervising a school-aged child versus a toddler. For example, while 93 percent of parents say it’s necessary to stay in visual contact doing nothing else at all times when supervising a 2-year-old, only 80 percent of parents express this same necessity with a 6-year-old and only 42 percent with a 10-year-old.
As children grow older, parents participate increasingly in distracting activities. For example, only 6 percent of parents with a child under 5 will read a book or magazine while supervising their child in the water, but this figure jumps to 23 percent among parents with a 5- to 9-year-old and to 40 percent among parents with children ages 10 to 14. Only 6 percent report that they do nothing else while supervising their swimming child.

Safety Devices and Barriers

In addition to supervision, one of the most effective ways to reduce child drownings in residential pools is to construct and maintain barriers to prevent young children from gaining access to pools. Studies show that installation and proper use of four-sided isolation fencing could prevent 50 to 90 percent of residential pool drowning and near-drowning incidents among children. Case control studies that evaluate prevention interventions indicate that pool fencing significantly reduces the risk of drowning.

The need for both supervision and barriers is supported by an extensive study commissioned by the CPSC of swimming pool accidents in California, Arizona and Florida — states in which home swimming pools are very popular and in use during much of the year. Most of the victims were under age 5 and were being supervised by one or both parents at the time; 65 percent of the accidents occurred in a pool owned by the victim’s immediate family; 33 percent occurred in a pool owned by relatives or friends; and only 2 percent were a result of child trespassing. A majority (69 percent) of children who became victims in swimming pool accidents were not expected to be in or at the pool at the time.

Isolation fencing (enclosing the pool completely) is more effective than perimeter fencing (enclosing property and the pool) because it prevents children from accessing the pool area through the house. It is recommended that pool fences have a secure, self-closing, self-latching gate and isolate the pool from the house. Legislation should require isolation fencing with secure, self-latching gates for all pools, public, semi-public and private.

Where children have been able to gain access to fenced pools and have died from drowning as a result, the majority did so via faulty or inadequate gates or through gates that were propped open. This highlights the need for pool owners to install standard approved fences and gates and to maintain existing fences and gates regularly. Of the parents surveyed who owned a pool or spa, only slightly more than a quarter (28 percent) had isolation fencing; half (50 percent) had perimeter fencing and 34 percent had self-closing, self-latching gates.

Pool owners with gates seem to be diligent about keeping them closed: 79 percent of pool and spa owning parents said their gate was never left open or propped open during the last swimming season; 13 percent said it was left open once or twice; and 6 percent said it was left open more than six times.
In addition to barriers to the water, there are devices designed specifically to protect against entrapment. Anti-entrapment drain covers are recommended to prevent the suction from drawing body or hair into the drain, and safety vacuum release systems (SVRS) are an additional protective device. SVRS detect any blockage of a drain and automatically shut off the suction to prevent entrapment. To ensure a safe environment, it is also important to equip new pools and spas with multiple drains, not just one, in order to decrease the amount of suction at any one drain site. Of the parents surveyed who owned a pool or spa, only 15 percent had anti-vortex drain covers and 12 percent had SVRS in place.

### Government Involvement

At least four states (Arizona, California, Florida and Oregon) have enacted safety laws requiring some type of fencing around residential swimming pools and there are many local jurisdictions with fencing ordinances.\(^2\) To date, pool fencing is the only intervention strategy proven to be effective in drowning prevention.\(^2\) However, further evaluation of other drowning prevention strategies (such as swimming lessons) is needed.

According to the survey, many pool-owning parents (38 percent) admit they are not sure whether there is a pool-fencing ordinance in their area, while one-fifth (20%) say there isn’t one. At least 4 out of 10 parents think the government could do more to prevent drowning — 31 percent say government has done some work in this area, but they would like to see it do more, while 12 percent say government has done too little.

### Availability of Entrapment Data

To understand the availability of data pertaining to drain entrapment, two entities were identified by Safe Kids as potential sources: the U.S. Consumer Product Safety Commission and Child Death Review teams.

The CPSC has collected national-level data on this issue since 1985. The data include both fatal and nonfatal entrapments by age, gender, pool location (residential, public or a business such as a health club), pool type (spa, jacuzzi, pool or bathtub) and the body part entangled.\(^2\)

Less-detailed data are collected by CDR teams at the state or local levels. Of the nine states that responded, only teams in Hawaii, Rhode Island, Maryland and Arizona reported the ability to track entrapment-related drowning data in the narrative section of their collection forms. A method of systematically collecting narrative information is not available.

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Door, window and pool alarms can also add an extra layer of protection. Of parents surveyed who own a pool or spa, less than a quarter (21 percent) had alarms that go off when someone opens a door or window; these alarms can alert caregivers to a child leaving the house without supervision. Less than a tenth (7 percent) had alarms that go off when a person or object enters the water. The majority of parents (73 percent) who own a pool or spa relied on the protection of placing locks on their doors and windows.
Conclusions

- **Parents are somewhat aware of the risk of their children drowning.** Only a third (34 percent) of parents recognize that drowning is one of the top two causes of accidental death among children. In the South and West, where the largest number of drowning deaths occur, only 39 percent and 31 percent of parents are aware of this risk.

- **Parents are moderately aware of the risk of entrapment.** More than half of parents (54 percent) identify hair entanglement in the pool drain or filter as a risk to children in pools, and 53 percent identify suction of a body part into a pool drain as a risk. Parents seem to be more familiar with the general risk of entrapment associated with drains. Nearly three quarters of parents (71 percent) say they are at least partly familiar with the risk.

- **Parents who own a pool or spa are moderately aware of the risk of entrapment.** More than half of parents (54 percent) who own a pool or spa identify hair entanglement in the pool drain or filter as a risk to children in pools, and 52 percent identify suction of a body part into a pool drain as a risk. Parents who own a pool or spa seem to be no more familiar than parents in general of the general risk of entrapment associated with drains. Nearly three quarters of pool and spa owning parents (74 percent) say they are at least somewhat familiar with the risk.

- **Although devices are available to prevent entrapment and entanglement, parents who own a pool or spa are not likely to have them installed.** Only 15 percent of pool and spa owners had anti-vortex drain covers and 12 percent had SVRS in place.

- **Parents who own a pool or a spa are moderately likely to have barriers such as fencing and self-closing, self-latching gates.** Only 28 percent had isolation fencing; 50 percent had perimeter fencing; and 34 percent had self-closing, self-latching gates, although pool fencing has been proven an effective drowning prevention measure by experts in the field.

- **While the majority of parents actively supervise their preschool children, parents tend to become less attentive as the children grow older.** While 93 percent of parents say it’s necessary to stay in visual contact with a 2-year-old at all times, only 80 percent of parents express this same necessity with a 6-year-old and only 42 percent with a 10-year-old.

- **Parents would like to see the government more involved in drowning prevention.** At least 4 out of 10 parents think government could do more to prevent drowning; 31 percent say government has done some work in this area, but they would like to see it do more.

Safe Kids Recommendations – Pool and Spa Safety

Parents should practice these measures to help protect their children from drowning:

**Entrapment Prevention**

- Teach children to stay away from pool and spa drains, and tie up long hair securely to guard against entanglement and entrapment.
- If you own a pool or spa, install anti-entrapment drain covers and a safety vacuum release system. For new pools or spas, install more than one drain. Maintain drain covers properly.
- If you find a drain cover that is loose, broken or missing, do not enter the pool or spa; notify the owner or operator.

**General Drowning Prevention**

**All Parents**

- Actively supervise children in and around the pool or spa, giving them undivided attention. Appoint a designated adult “water watcher” to watch the children in the pool, taking turns with other adults. Keep a phone nearby in case of an emergency.
- Enroll your child in swimming lessons after age 4 — they’ll be more likely to practice and retain information. Teach children how to tread water, float and get out of the pool.
- Don’t rely on “water wings” or other inflatable toys. If your child can’t swim, stay within an arm’s reach.
- Make sure you — and your children — know where the deep end is and how far they can safely go. Find out when and where diving is allowed, if at all. Never dive in water less than nine feet deep.
- Learn infant and child CPR and rescue safety tips. Look for lifesaving equipment by the pool.
Pool and Spa Owners

- Install fencing at least five feet tall on all sides of the pool (completely surrounding the pool) and install self-closing, self-latching gates. This can prevent a child from wandering from the house or neighborhood into the pool area unsupervised. Some removable fencing meets these specifications and may be an option for large inflatable pools, but check local regulations.

- Keep spas covered and locked when not in use.

- Install a door alarm, a window alarm or both to alert you if a child wanders into the pool or spa area unsupervised.

- Keep lifesaving equipment by the pool or spa, including a shepherd’s hook, life ring and a telephone.

Legislation is also recommended to encourage environmental changes, such as implementation of the layers of protection, to protect against drowning and entrapment-related dangers.

- States and localities should pass laws that require 4-sided fencing or barriers around all pools and spas.

- States and localities should pass laws that require layers of protection against entrapment: anti-entrapment drain covers, safety vacuum release systems and multiple drains in all pools and spas.

- The federal government (Congress and the U.S. Consumer Product Safety Commission) should encourage states to address drowning and entrapment-prevention issues and to educate pool and spa owners and users about associated risks.

Safe Kids Takes Action


Safe Kids coalitions across the country will participate in Safe Kids Week by hosting family safety fairs and other community events, where parents, caregivers and kids can learn about the importance of active supervision; barriers around pools and spas; and drain safety systems.

In addition to hundreds of local events, Safe Kids Worldwide will draw national media attention to the importance of drowning prevention. Johnson & Johnson and Turner Networks have collaborated with Safe Kids to provide five new television ads focused on pool and spa safety. Additional safety messages will be provided through several channels including Johnson & Johnson and retailer coupon ads and product displays, coalition events and online media.

“Water watcher” cards will be distributed to identify adults responsible for actively supervising the children in the pool.

In addition to educating parents to practice safer behavior, Safe Kids is also calling for legislation at the national, state and local levels to require four-sided fencing around pools and spas and safety devices to protect against entrapment. Safe Kids is providing grants to local coalitions to support advocacy activities in their communities.

Safe Kids will be evaluating the impact of Safe Kids Week by measuring the knowledge and behavior around pool and spa safety in a national survey of parents before and after the educational activities and by tracking the progress of relevant legislation.

Special thanks to Johnson & Johnson for its longstanding commitment to Safe Kids Worldwide and its support of this study and National Safe Kids Week, and thanks to Turner Networks for helping us reach millions of parents with this important information.

Safe Kids would also like to thank Nancy Baker and former Secretary of State James Baker for sharing their heartfelt story about the drowning death of their daughter and granddaughter, Virginia Graeme Baker, due to drain entrapment, and for their advocacy on this important issue.
Endnotes


8 Ibid.

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