SAFE KIDS WORLDWIDE™

Dangerous Waters:

Profiles of Fatal Childhood Drownings in the U.S. 2005-2014

June 2016

Executive Summary

Advancements in medicine, technology and research have guided the water safety community in making changes to decrease the chance of fatal drowning among children over the past three decades. Improvements in the physical environment, national, state and local legislation, parental education and community awareness have contributed to an almost 60 percent decrease in the number of drowning deaths.[1,2,3] Despite this, drowning remains a leading cause of unintentional injury death in children and in 2014, almost 800 children – or two a day - lost their lives to drowning.[3]

To better understand this complex issue and guide prevention efforts, Safe Kids Worldwide, in collaboration with the National Center for Fatality Review and Prevention and with the support of Nationwide's Make Safe Happen program, analyzed existing datasets to explore national trends and circumstances surrounding fatal drownings in children ages 0-17 for the years 2005 to 2014.

Consistent with previous analyses we found that age, gender and race are key determinants in childhood drowning. In the years examined, the greatest number and highest rate of drowning occur among those under the age of 5. In fact, children in that age group die at more than three times the rate of those ages 5-17. Boys are more likely to drown than girls, accounting for 72 percent of deaths, and although greater numbers of Caucasian children drown each year, African American children drown at higher rates. Almost two-thirds of fatal drownings in children under age 18 occur between May and August.[4]

Differences in age, gender and race become even more evident when the setting in which the drowning occurred is considered. To highlight these differences we developed three profiles for fatal drowning corresponding to the common settings where drownings occur: in and around the home (excluding home pools), swimming pools and natural bodies of water.

In and around the home we found it is very young children who are most effected. They most often drown in bathtubs, although other household items which collect or hold water also pose a risk. From 2005 to 2014, the majority of fatal bathtub drownings were among children under age 2, and this group was at 13 times greater risk of a fatal bathtub drowning than those ages 2-17.[4] Inadequate supervision was a factor in a majority of these cases.[5]

For swimming pools, it is likely the increased curiosity and mobility of 1-4 year olds that explains their increased risk of drowning in this setting. More than 7 out of 10 fatal pool drownings in children from 2005 to 2014 occurred among those under age 5, and most of these occurred in backyard pools.[4-5] Racial disparities increase with age, such that fatal drowning rates in pools for African American teens are more than four times the rate of Caucasian children of the same age.[4] Lack of supervision and failure of physical barriers were key factors in many of the fatal pool drownings examined by child death review teams.[5]

For natural bodies of water we found the greatest risk occurs in older children. This likely reflects increasing independence coupled with decreased supervision.[6] Unfortunately, the likelihood of timely rescue and resuscitation is typically lower for adolescents in this setting, leading to less favorable clinical outcomes and increased fatality.[7] More than half of the children who drowned in lakes, rivers and other natural bodies of water between 2005 and 2014 were over the age of 10. Overall, 15-17 year olds have more than twice the risk of a fatal drowning in natural water than those under 15 years, and boys ages

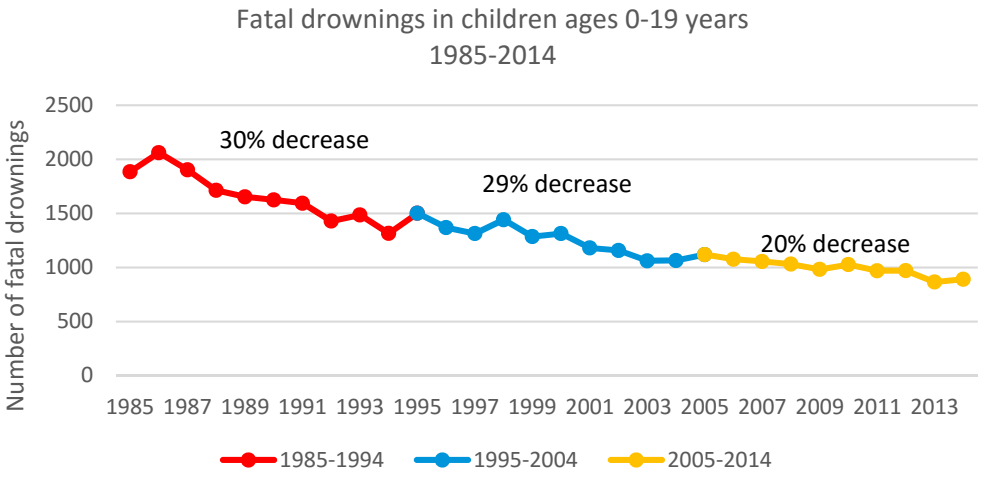
15-17 are five times more likely to drown in natural water than girls of the same age. Racial disparities were also most obvious in 15-17 year olds where the drowning rate for African American boys is almost two times the rate of Caucasian boys, more than 13 times the rate of African American girls and 24 times the rate of Caucasian girls.[4]

The data in these profiles are intended to help guide awareness raising and education efforts, program and policy development and suggest direction for further research.

Introduction

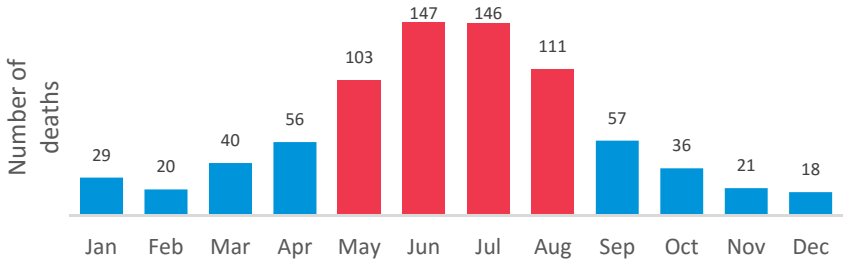
Drowning remains a leading cause of unintentional injury death among children despite significant reductions in the number of deaths over the past three decades. The number of drowning deaths in 0-19 year olds decreased from 1,886 in 1985 to 892 in 2014, representing almost a 60 percent reduction in the rate of fatal drowning over the thirty year period (from 2.7/100,000 in 1985 to 1.1/100,000 in 2014). However, a closer look at the change over time reveals that the decrease in number of fatal drownings has slowed over the past ten years (Figure 1).[3]

Figure 1. Reductions in fatal drownings in children have slowed in last decade[3]



Despite this, in 2014 drowning was the leading cause of unintentional injury death for children ages 1 to 4, the second leading cause for those ages 5-14, and the third leading cause for infants under 1 year and teens ages 15 to 17.[3] The 784 fatal drownings that occurred in those under age 18 in 2014 translate into two fatal drownings each day, with nearly two-thirds occurring between the months of May and August (Figure 2).[4] Further, it is estimated that for every death another five children visit an emergency department because of a non-fatal drowning.[1] Between 2005 and 2014 the yearly average number of drownings by state varied from 94 per year in Texas to one per year in Vermont and North Dakota. The states with the highest number of drownings in 2014 were Florida, Texas, California and Georgia (see Appendix A – Table 1).

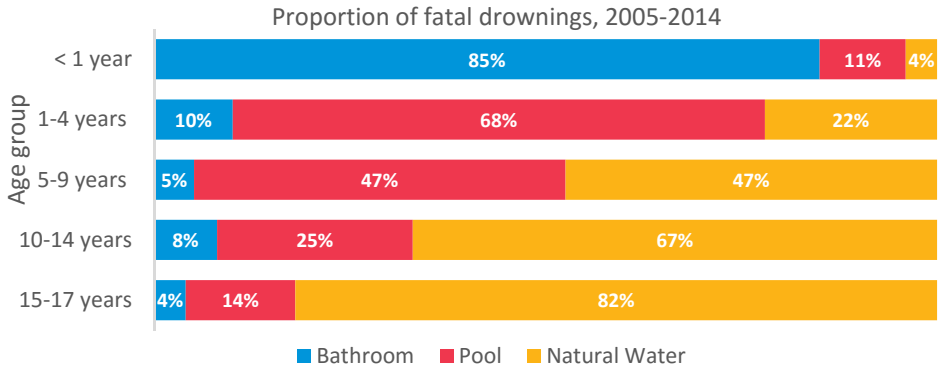
Figure 2. Two-thirds of fatal drownings in 0-17 year olds in 2014 occurred between May and August (n=784)[4]



Drowning can be quick and quiet when it occurs.[8] It can happen in seconds and often, children who drown are out of sight or missing for less than five minutes.[9] Irreversible brain damage may occur within a mere five minutes and most children who die are submerged for only six to 10 minutes. The longer a child is submerged under the water, the more likely they are to suffer poor outcomes.[10-11] Unlike the scenes played out in movies, drowning children may not scream, wave their arms, or call for help. Instead, they slip silently under the water, in some cases even as caregivers and lifeguards look on.[8,12]

This speed and silence is characteristic of childhood drowning, and may be one of the only things that all cases have in common. Personal characteristics of the child, physical and environmental surroundings, socioeconomic status and ethnic or racial background all play a role in the individual drowning experience.[6-8,13-15] While the specific circumstances leading to a drowning death are different in every case, there are themes seen across age groups and types of water. The scenarios describing drowning in infants are very different from what typically happens with teenagers.[7-8] Although any child can drown in any type of water, there are distinct age-related patterns evident in three most common settings- the bathroom or home, the pool and natural water (Figure 3).[4-5,11,16-17]

Figure 3. Age is a key determinant in the setting of childhood drownings[4]



In order to better understand this issue, Safe Kids Worldwide undertook an analysis of existing data on fatal drowning to explore current patterns among children ages 0-17 years. National fatality data from the CDC and data from the National Child Death Review Case Reporting System (CDR-CRS) describing fatal drownings reviewed by child death review teams for the years 2005-2014 were used in this descriptive analysis. This study was completed in collaboration with the National Center for Fatality Review and Prevention at the Michigan Public Health Institute and made possible with support from Nationwide's Make Safe Happen program.

Where Children Drown

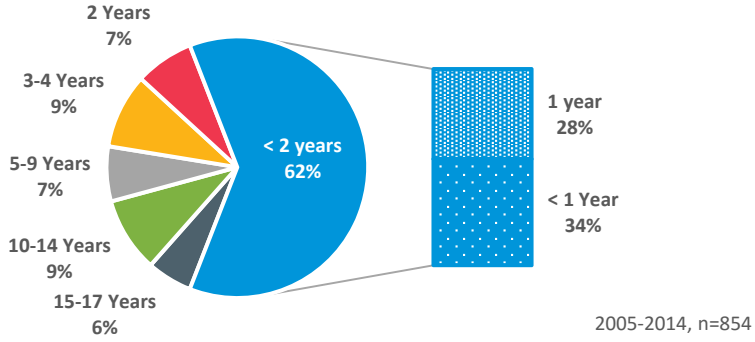
The following profiles provide highlights regarding the three common settings. Detailed tables are available in Appendix A.

Drownings In and Around the Home

The home environment is full of products that can become hazards for little ones, particularly when water is involved. Regular household items such as buckets, wells, cisterns, septic tanks, decorative ponds, toilets and bathtubs provide a potential drowning source for infants and toddlers. The most common location of fatal drowning incidents in this age group is the bathroom, particularly the bathtub.[2,8,18] Between 2005 and 2014, the number of fatal drownings in bathtubs for children 0-17 years decreased 14 percent from 78 to 67 deaths. However, a closer look shows a 54 percent reduction in the number of deaths among infants (from 39 to 18 deaths) and a 26 percent increase for children ages 1-14 years (from 39 to 49 deaths).[4]

Of the 854 children under 18 who fatally drowned in a bathtub in the ten year period between 2005 and 2014, 62 percent were under two years of age (Figure 4). The fatal drowning rate per 100,000 children for those younger than two years of age is over 13 times higher than the rate for older children.[4]

Figure 4. Children under 2 years of age are at greatest risk of fatal bathroom drownings[4]



Overall, similar proportions of boys and girls drown in bathtubs. However, among older children more girls drown than boys in this setting.[4] Additionally, children with seizure disorders are at increased risk of drowning in the bathroom.[7,19]

There were 512 fatal drownings for children in home settings (excluding home pools) in the National Child Death Review Case Reporting System database from 2005 to 2014. The drownings occurred in bathtubs, toilets, wells, cisterns, septic tanks and buckets. A majority of the deaths in bathtubs were among children under 5 years of age (80 percent), but children under 1 year of age alone made up 42 percent. The majority of drownings in toilets also occurred in children under 1 year (82 percent). However for wells, cisterns or septic tanks it was children between 1-4 years who made up the majority of drownings (83 percent).[5]

Supervision

Of the 453 bathtub drownings examined by Child Death Review teams, 85 percent of those where a location was recorded occurred in the child's own home. In the cases where information about supervision was available (n=427), it was either absent or was present but had lapsed in three out of four bathtub drownings.[5] This is backed by previous research which indicates that inadequate supervision is a key factor driving bathtub drownings. Caregivers have reported taking their eyes and hands off their young children in the bath for brief periods of time in order to reach for towels, get diapers, or answer the phone. Parents have also suggested that they would be more likely to leave an infant unattended in the bathtub if an older sibling was present or the child was positioned in a bath seat.[20]

Infants and young toddlers are more dependent on parents/caregivers than older children and can drown in very little water in only a couple of minutes. They are 'head heavy' in that their heads are disproportionately large compared to their bodies, making it harder for them to right themselves or lift their heads in the event they 'tip over' in the water. Thus the main strategy to prevent these incidents when children are supposed to be in the water swimming or bathing is close, uninterrupted adult supervision.[8,20-21]

Rescue and Resuscitation

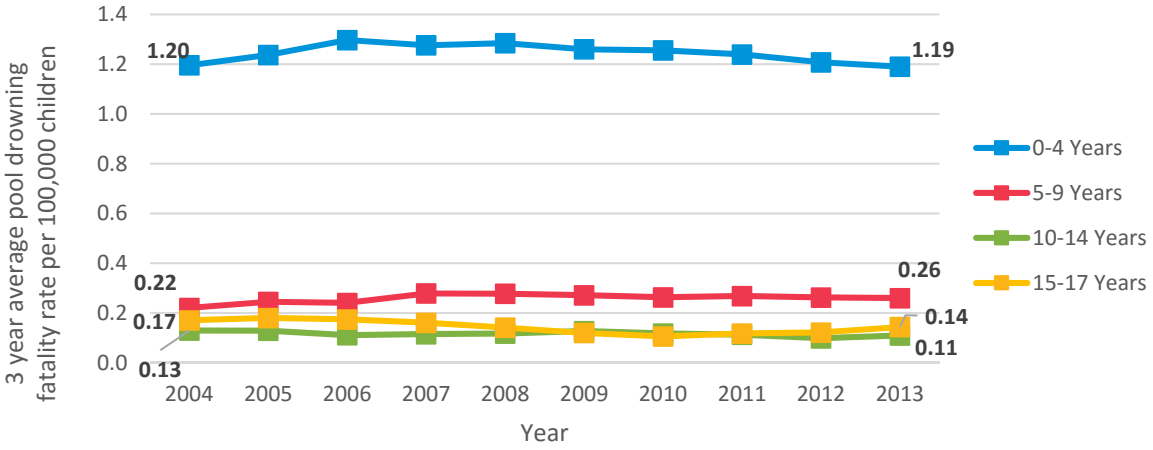
In the event that a small child does gain access to a water source in the home, calling 911 and initiating cardiopulmonary resuscitation (CPR) are vital steps to increasing the chance of survival.[22] If CPR is initiated immediately and Emergency Medical Services (EMS) arrive within nine minutes or less, the child is three to five times more likely to survive with no long term health implications.[11,23] Despite these odds, in a majority of the bathtub drownings captured by the CDR, the child received both rescue efforts and still did not survive.[5] This further underscores the importance of supervision for young children in the home and the dire consequences of lapses in such supervision.

Drownings in Pools

Pool drownings occur in both public and private settings, in backyards, apartment complexes and hotels, and in above ground and in-ground pools, kids' pools and spas. Between 2005 and 2014, an average of 343 children ages 0 to 17 years fatally drowned in a pool each year – that is almost one a day – and this has not significantly changed in the past 10 years. There were 335 deaths in 2005 and 328 in 2014, a decrease of 2 percent (fatality rates over the same period decreased by 1 percent from 0.46 to 0.45 per 100,000). A look at specific age groups between 2005 and 2013 indicates that while slight decreases have occurred in most age groups, the rate of fatal drownings in pools for 5 to 9 year old kids has increased by 18 percent (from 0.22 to 0.26 per 100,000). (Figure 5).[4]

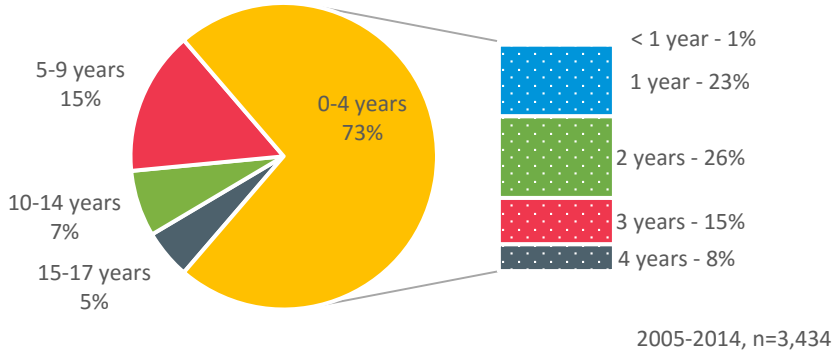
This trend differs noticeably from the trend in non-fatal pool drownings. Data from a recent Consumer Product Safety Commission (CPSC) report indicate there has been a 34 percent increase in the rate of emergency department (ED) visits for non-fatal pool drownings in children ages 0-15 between 2009 and 2015 (6.9 and 9.2 per 100,000, respectively). Children under age 5 make up three quarters of the ED visits for non-fatal drowning and the rate in this age group increased 37 percent between 2009 and 2015 (15.8 and 20.6 per 100,000, respectively).[24-25]

Figure 5. There have been no significant improvements in age-specific pool fatalities in the last 10 years[4]



Of the 3,434 children ages 0-17 who fatally drowned in a pool between 2005 and 2014, almost half (48 percent) were 1 or 2 years of age and 7 out of 10 were under age 5 (Figure 6).[4] Toddlers tend to be curious about everything in their surroundings and as their mobility increases, this can mean they get themselves into risky situations. While some drownings occur in the presence of parents, there are also many cases where a child has wandered away from a supervising adult and fallen or climbed into a backyard pool.[24,26] The fatal drowning rate in pools for 1-2 year olds during this period was 2.08 per 100,000 children, two times higher than the rate for 3-4 year olds, eight times higher than the rate for 5-9 year olds, 15 times higher than the rate of those 15-17 years, and 23 times higher than the rate for those less than 1 year.[4]

Figure 6. Children under the age of 5 years, particularly those ages 1 and 2 years are at greatest risk of drowning in a pool [CDC WONDER]



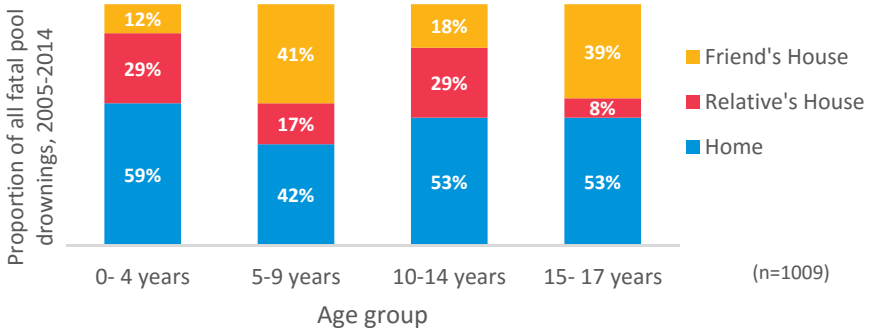
Boys are twice as likely to drown in pools as girls (fatality rate 0.62 versus 0.31 per 100,000) and they make up a greater share of fatal pool drownings among kids 17 years and under (68 percent boys versus 32 percent girls). As children grow older, this gap widens and the risk for drowning increases disproportionately for boys. Among younger children ages 0-9 the risk of drowning is almost two times higher for boys as girls and among older kids ages 10-17, it is three times higher.[4] As reported in

previous research, racial disparities also exist among pool fatalities, [6,13,15] and these are presented later in this report (see section on Racial Disparities on page 13).
Similar demographic trends are found for non-fatal pool drownings. Of the estimated 5,600 ED visits for a non-fatal drowning in children under 15 years of age in 2015, more than 6 out of 10 were in children ages 1-3 and more than three quarters were in children under 5 years. Boys outnumbered girls (60 percent versus 40 percent, respectively).[24,27]

To better understand the circumstances around pool drownings we analyzed 1,466 fatal pool drownings that occurred between 2005 and 2014 and were examined by Child Death Review (CDR) teams reporting to the National Child Death Review Case Reporting System (CDR-CRS). Where data on pool ownership were available we found that 87 percent of the drownings occurred in private pools and 13 percent in public pools. Although specific definitions and guidelines on the ownership, management and responsibility for pools vary by state, for the purposes of the CDR-CRS, "private" refers to single or double family homes, and "public" pools include those in municipal areas, hotels, apartment complexes and condominiums.[5]

A look at specific location of the pool found that the largest proportion of deaths occurred at child's home, particularly for 0-4 year olds where 59 percent happened at their home (Figure 7).[5] This is in line with findings from a recent CPSC report for 2013 to 2015, which found that a majority of pool deaths among children under 5 (79 percent) occurred at the home of the child, a family member or friend rather than a public setting.[24] For the CDR cases where data on type of pool were available, the majority took place in either an in-ground (70 percent) or above ground pool (26 percent).[5]

Figure 7. Children ages 5-9 years are equally likely to drown at a friend's home as their own home[5]



The approach to preventing pool drownings involves ensuring layers of protection that include:

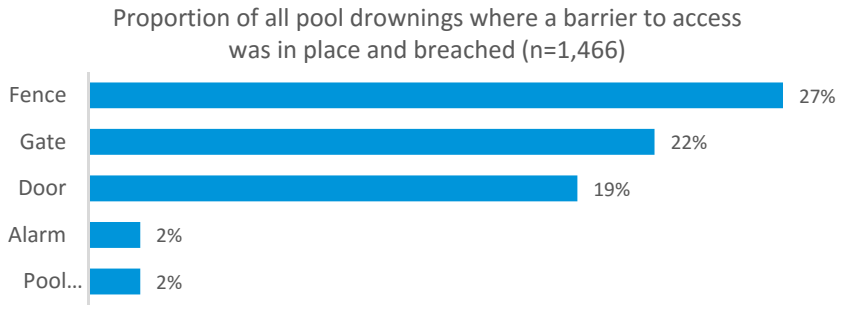
- Barriers around pools – barriers that completely separate the pool from the house and yard to prevent unintended access including 4-sided pool fencing that is at least four feet high with self-closing and self-latching gates and door alarms in areas leading to pools.[8,21-22]
- Appropriate adult supervision – *within arms' reach* supervision for young children and constant visual supervision for all children.[8,28]
- Water safety education – water safety education including water survival skills and swim lessons for both children and parents.[8,22,29-32]
- Rescue and Resuscitation – call for help and learn cardiopulmonary (CPR) to increase the chance of survival in the event of a drowning incident.[8,10,22-23]

When we examined these issues using the CDR data for 2005-2014, we found that breaches in these layers of protection ranged from 7 to 91 percent of cases, so that at least one layer was breached in 9 out of 10 of the fatal drownings reviewed.

Barriers

Available information indicate that in 47 percent of the 1,466 pool drowning deaths during this time period, at least one physical barrier failed to prevent a child from gaining access to the pool. The most common problem was inadequate fencing, followed by lack of proper gates, doors, and pool alarms (Figure 8). Where a fence failure was reported, issues included a gap in the fence, the child climbing the fence, a damaged fence and an inadequate height.[5]

Figure 8. Of barriers in place, fences were most likely to be breached[5]



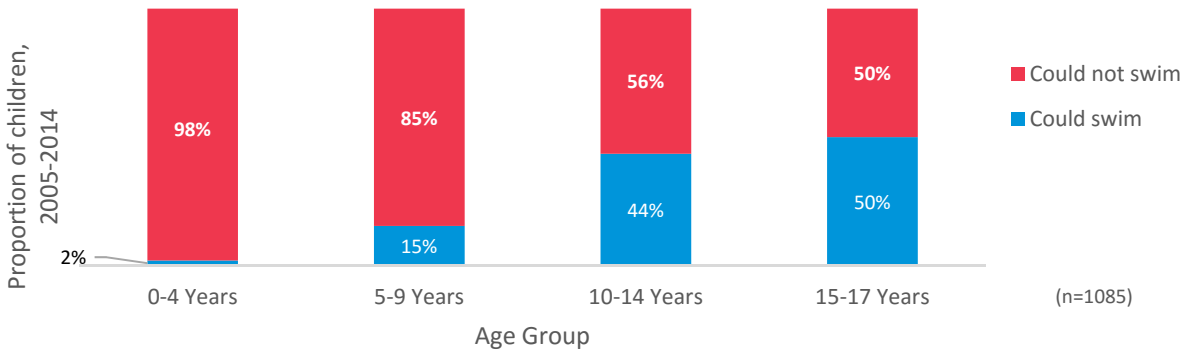
Supervision

Of the 1284 incidents where information was available, supervision was assessed to be missing almost half of the time (49 percent) that children drowned in pools. Even when present, caregivers were often not providing adequate supervision due to drugs, alcohol, injury/ illness or distraction (56 percent of the 659 cases where supervision was documented). Younger children were more likely to be lacking necessary supervision at the time of drowning compared to older kids. Seventy-eight percent of cases with missing supervision were among children ages 0-4, compared to 14 percent among 5-9 year olds, 5 percent among 10-14 year olds and only 2 percent among 15-17 year olds.[5]

Swimming ability

In the cases where information on swimming skill was available and deemed appropriate for the age and developmental stage of the child, only 9 percent of the children who drowned were reported to be able to swim. Reported swimming ability increased with age from 2 percent of children under age 5 years up to 50 percent of those ages 15-17 (Figure 9).[5]

Figure 9. Almost half of 10-17 year olds who drown could reportedly swim[5]



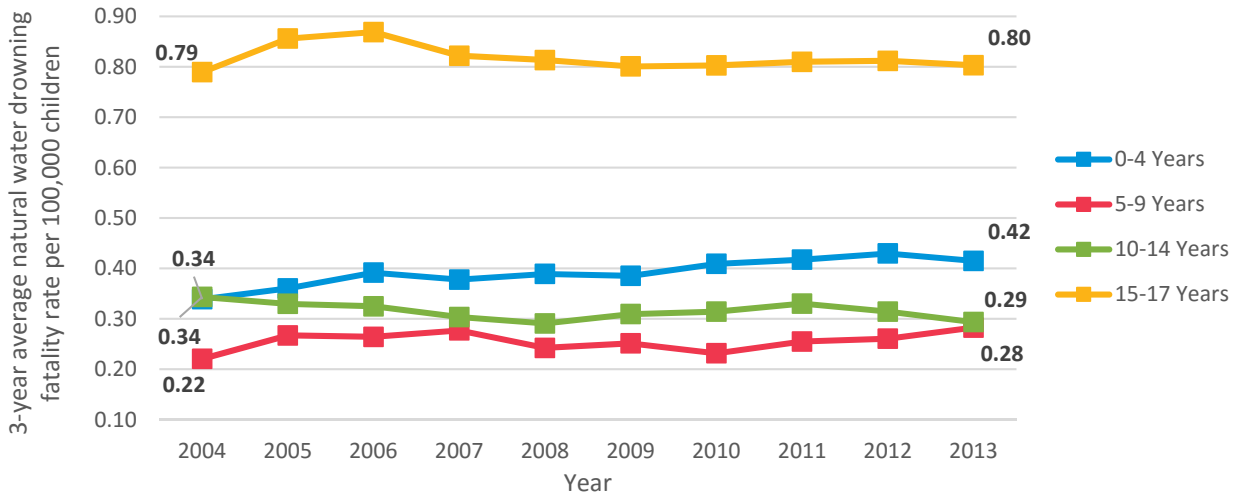
Rescue and Resuscitation

When we looked at the presence or absence of rescue and resuscitation efforts, a vital link in the chain of survival for all drownings, we found that CPR was initiated before the arrival of EMS in 93 percent of pool drownings where information was available. The likelihood of CPR being performed varied with age, decreasing from 95 percent of 0-4 year olds to 79 percent of 15-17 year olds. Of the cases where information was known, emergency services were called 99 percent of the time.[5]

Natural Water Drownings

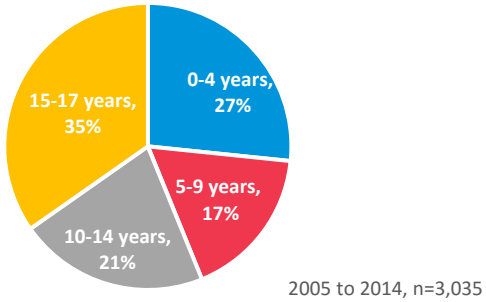
Natural water drownings include those that occur in lakes, rivers, oceans and other unenclosed bodies of water. Drownings occurring in man-made structures such as reservoirs and dams are also included in this category. Due to their open and uncontrolled nature, these settings pose a unique set of risks for swimmers of all ages. In 2014, there were 284 fatal drownings in children ages 0-17 in an incident involving a natural body of water. The rate of fatal drowning in this setting has decreased only slightly over the past 10 years (from 0.44 to 0.39 per 100,000 children). The fatal drowning rate in natural water for teens ages 15-17 is more than three times higher than for children ages 5-9 and two times higher than for those younger than age 5. In light of this, their rates have remained fairly stable and increased by about 1 percent from 2005 to 2013. During this same time period, however, the fatal drowning rate in natural water increased by 24 percent for 0-4 year olds and 27 percent for 5-9 year olds (Figure 10).[5]

Figure 10. The drowning rate in natural water is on the rise for children ages 9 and under[1]



Of the 3,035 children ages 0-17 years who fatally drowned in natural water between 2005 and 2014, more than half were 10 years of age or older and 1 in 3 was ages 15-17 (Figure 11).[5] These differences may be explained by increased exposure to these water settings, reduced supervision, and greater likelihood of risk-taking behaviors by adolescents compared to small children.[2,6,17] However, children under age 5 still accounted for a quarter of these deaths, reiterating that the risks of drowning for young children extend beyond the home and the extreme importance of close and constant supervision.[5]

Figure 11. Natural water deaths occur more often in the older age groups[5]

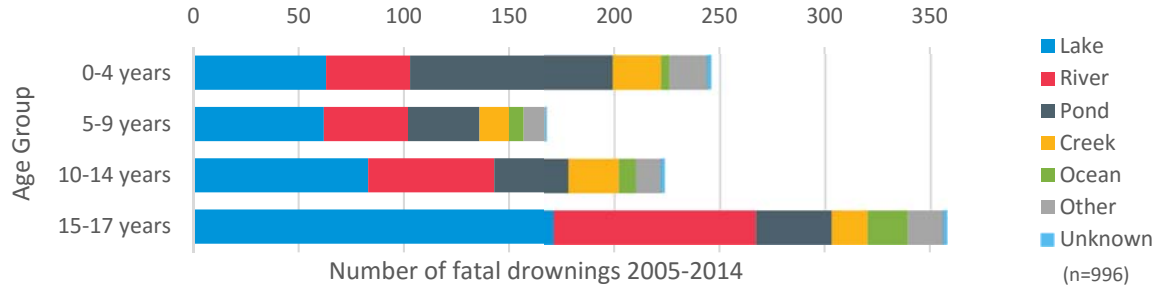


Far more boys drown in natural water than girls (82 versus 18 percent for 0-17 year olds), and the natural water fatal drowning rate is more than four times higher for boys compared to girls (0.66 versus 0.16 per 100,000, respectively). The gender gap increases with age, as evidenced by the fact that boys ages 15-17 are more than 12 times more likely to fatally drown in natural water than girls of the same age.[5] Previous research indicates that increased exposure to natural water, particularly dangerous activities or behaviors and greater alcohol consumption place males at greater risk of drowning.[33-34] Additionally, males are more likely to overestimate their swimming ability and underestimate their risk of drowning, particularly if they have not had swim lessons.[35-36] Societal and cultural norms as well as biology may also contribute to the complexity of this issue.[15] As with pool drownings, there are

disparities by race in the natural water setting, such that African American teenagers have the highest risk of any age group and gender group among children (see section on Racial Disparities on page 13).

While many think of boating and natural water drowning interchangeably, only 7 percent of fatal drownings between 2005 and 2014 were watercraft related.[4] In the 608 cases reviewed by the CDR teams between 2005 and 2014 where data were available, the most frequent locations for natural water drownings were official sport or recreational areas (46 percent), state or country parks (25 percent) and homes with natural water access (15 percent).[5] The three bodies of water most commonly involved in these fatalities were lakes (38 percent), rivers (24 percent) and ponds (20 percent). Oceans were only involved in 4 percent. A breakdown of body of water by age reveals that older children and teens are more likely to fatally drown in lakes and rivers, while ponds pose a greater threat to younger children (Figure 12).[5]

Figure 12. Natural body of water drowning site varies with age[5]



Similar to home and pool water safety, the approach to prevention of natural water drownings incidents involves ensuring layers of protection that include:

- Adequate adult supervision – *within arms' reach* supervision for young children and constant visual supervision for older children when they are in the water.[8,28,36]
- Personal floatation devices (PFD) – the use of a PFD when boating or at any time in natural water for non- or weaker swimmers.[2,21-22]
- Avoid using recreational drugs or alcohol – drugs and alcohol increase risk and their use should be avoided when around water, especially if responsible for supervising children.[1,21]
- Water safety education – water safety education including water survival skills and swim lessons for both children and parents.[8,22,29-32]
- Learning CPR – knowing CPR increases the chance of survival in the event of a drowning incident.[8,10,22-23.]

Supervision

Of the natural water drowning cases where data on supervision were available, 62 percent happened in the presence of an adult. In a quarter of those deaths, the adult supervision was compromised by drugs or alcohol, distraction, sleepiness, injury or illness.[5]

Drugs and alcohol

Drugs and alcohol often play a greater role in natural water drownings when compared to other settings. Data regarding drug and alcohol use were available for more than half of the cases examined

by the CDR and among those that occurred in and around the home and in pools, the child was under the influence of drugs or alcohol in 3 and 2 percent of the cases. Comparatively, in 11 percent of the drownings in natural water, the child was known to have drugs or alcohol in his or her system.[5] Previous studies have documented increased involvement of drug and alcohol use in natural water drowning cases among older children and teens, particularly males.[2,6,17] Available data from the CDR indicate that across all water settings, 24 percent of teens and 5 percent of 10-14 year olds had used drugs or alcohol leading up to their death; in natural water settings 10 percent of 10-17 year olds who drowned had used drugs or alcohol right before their death.[5]

Rescue and Cardiopulmonary Resuscitation (CPR)

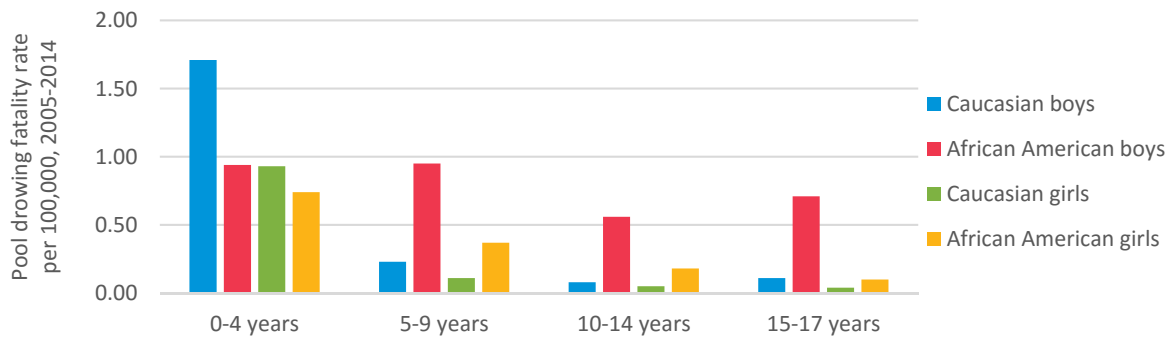
Just as with the other settings, rescue and resuscitation efforts are key to survival in natural water drownings, and perhaps present more of challenge. With half of all natural water deaths taking place in rural settings, proximity and availability of medical services may hamper chances for survival or complete recovery.[22] Emergency services were called in nearly all of the natural water cases examined by a CDR team from 2005 to 2014. Initiation of CPR on the other hand, was less frequent; of the fatal drownings where these data were available, resuscitation was initiated prior to first responder arrival in less than half of the cases (46 percent). The likelihood of the child receiving CPR following drowning in a natural setting decreased with age, from 71 percent among children under five years to 24 percent of teen ages 15-17.[5]

Racial Disparities among Drowning Deaths in Children

While Caucasian children account for greater numbers of childhood drowning deaths (seven out of ten), fatality rates per 100,000 children are higher for African American compared to Caucasian children across multiple settings.[4]

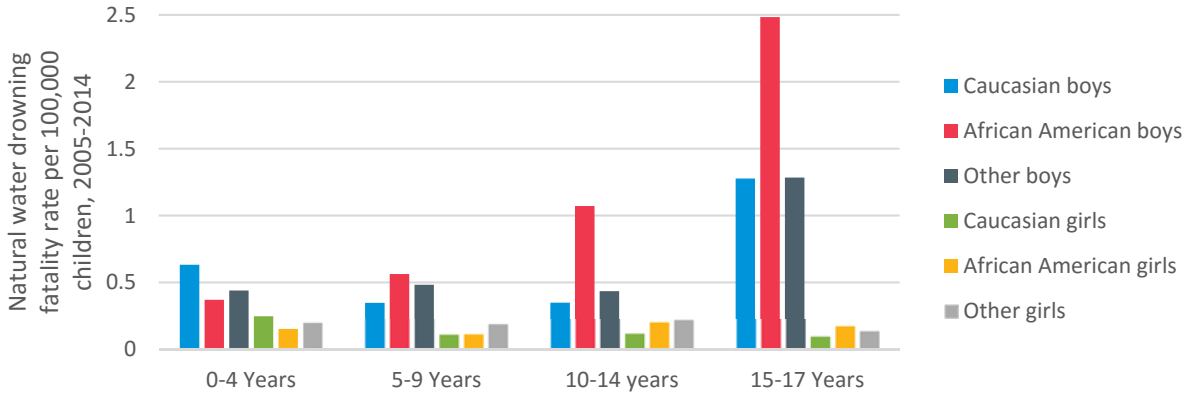
The inequity between races increases with age. Among those under age 5, Caucasian children have higher rates of pool drowning deaths than African Americans, but for older children ages 5-17, African American children fatally drown at 4.5 times the rate of Caucasian children. Gender disparities are also magnified within certain racial groups. The fatal drowning rate for African American boys is 2.6 times higher than the rate for African American girls compared to only a 1.9 times difference between boys and girls for Caucasian children (Figure 13).[4]

Figure 13. When fatal pool drownings are examined by age and race, the two high risk groups that emerge are Caucasian boys ages 1-4 and African American boys ages 1-17[4]



When racial differences in natural water drownings are examined by age and gender, these inequalities become even more evident, particularly for African American teenagers. In this setting, among teens the drowning rate for African American boys is twice the rate of Caucasian boys, 14 times the rate of African American girls and 24 times the rate of Caucasian girls.[4] (Figure 14).

Figure 14. Teen African American boys have the highest drowning fatality rates in natural water[4]



These results are backed by previous research which has reported that African American children have 5 to 10 times the risk of fatal drowning compared to their Caucasian peers,[6,13,15] and are three times more likely to suffer from permanent disability following any submersion incident.[17] Although the data on other races (to include American Indian, Alaska Native, Asian and Pacific Islander) were limited for this report, previous findings have noted higher rates among these groups, particularly in natural water settings.[6]

Possible contributing factors for these racial disparities include differences in swimming ability, access to swim lessons, lower educational attainment and income levels, and cultural differences.[6,13,15,30] While one study found that formal swim lessons were protective for drowning regardless of race,[17] others have noted that African American children continue to have limited swimming ability and access to swim lessons compared to Caucasian children.[6,13,37]

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Appendix A – Detailed Data Tables

Table 1. Fatal Drownings by State 2005 to 2014[4]

State	2005-2014 Total # All Settings	2005-2014 Yearly Average	2005-2014 Average # Pool	2005-2014 Average # Natural Water	2005-2014 Average # Bathtub	2014 Total # All Settings
Alabama	230	23.0	7.3	5.1	n/a	24
Alaska	33	3.3	n/a	2.7	n/a	n/a
Arizona	267	26.7	14.1	4.1	3.4	23
Arkansas	144	14.4	4.6	6.5	1.2	10
California	855	85.5	47.6	17.7	11.2	76
Colorado	98	9.8	1.8	4.2	2.5	11
Connecticut	49	4.9	2.1	1.2	n/a	n/a
Delaware	15	1.5	n/a	n/a	n/a	n/a
Florida	937	93.7	22.8	54.4	5.9	90
Georgia	376	37.6	17.0	12.8	3.2	50
Hawaii	47	4.7	1.2	2.5	n/a	n/a
Idaho	62	6.2	n/a	3.4	n/a	n/a
Illinois	261	26.1	8.8	9.9	2.4	29
Indiana	207	20.7	7.2	7.0	1.5	27
Iowa	79	7.9	2.4	3.3	1.3	n/a
Kansas	82	8.2	3.3	3.3	1.0	n/a
Kentucky	138	13.8	4.6	5.0	n/a	10
Louisiana	245	24.5	7.8	8.0	1.7	26
Maine	27	2.7	n/a	1.5	n/a	n/a
Maryland	107	10.7	4.3	4.3	1.3	11
Massachusetts	84	8.4	3.0	3.7	n/a	n/a
Michigan	237	23.7	8.0	11.5	2.6	11
Minnesota	94	9.4	2.1	5.0	n/a	n/a
Mississippi	144	14.4	6.0	6.2	1.5	16
Missouri	159	15.9	5.6	8.4	1.3	16
Montana	34	3.4	n/a	1.7	n/a	n/a
Nebraska	35	3.5	1.2	1.1	n/a	n/a
Nevada	100	10.0	5.6	2.5	1.3	n/a
New Hampshire	22	2.2	n/a	1.0	n/a	n/a
New Jersey	110	11.0	4.9	3.2	1.1	n/a
New Mexico	59	5.9	1.3	1.8	1.4	n/a
New York	259	25.9	9.9	10.3	1.4	22
North Carolina	273	27.3	7.4	8.7	1.7	35
North Dakota	13	1.3	n/a	n/a	n/a	n/a
Ohio	279	27.9	8.2	11.1	3.6	26
Oklahoma	209	20.9	6.5	7.8	1.4	17
Oregon	122	12.2	2.5	6.9	1.8	n/a
Pennsylvania	234	23.4	9.0	10.0	2.4	17
Rhode Island	18	1.8	n/a	n/a	n/a	n/a
South Carolina	151	15.1	5.4	6.7	1.1	13
South Dakota	29	2.9	n/a	1.8	n/a	n/a
Tennessee	193	19.3	7.3	8.7	1.5	17
Texas	943	94.3	40.3	28.0	7.8	80
Utah	99	9.9	2.9	3.4	1.7	n/a
Vermont	11	1.1	n/a	n/a	n/a	n/a
Virginia	163	16.3	5.9	6.9	2.2	14
Washington	157	15.7	2.9	10.5	1.4	11
West Virginia	27	2.7	n/a	n/a	n/a	n/a
Wisconsin	131	13.1	3.2	7.4	1.6	n/a
Wyoming	19	1.9	n/a	n/a	n/a	n/a

Child Drowning In & Around the Home in the United States - 2005 to 2014

Table 2. Bathtub Drownings 2005 to 2014[4]

Demographic	# Deaths	%	Rate*
Age Group			
< 1 year	286	33.5	0.71
1 year	242	28.3	0.61
2 years	62	7.3	0.15
3-4 years	79	9.3	0.10
5-9 years	58	6.8	0.03
10-14 years	79	9.3	0.04
15-17 years	48	5.6	0.04
< 2 years	528	61.8	0.66
> 2 years	326	38.2	0.05
Total	854		0.12
Gender			
Male			
Overall	462	50.6	0.12
0-4 years	358	53.5	0.35
5-17 years	104	42.6	0.04
Female			
Overall	451	49.4	0.13
0-4 years	311	46.5	0.32
5-17 years	140	57.4	0.05

* 10 year average rates per 100,000 children based on U.S. Census population

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Table 3. Drownings In And Around the Home - 2005 to 2014[5]

All drownings	Total deaths #	Total deaths %	< 1 year #	< 1 year %	1-4 years #	1-4 years %	5-17 years #	5-17 years %
Setting (n=512)								
Bathtub	453	88.5	191	42.2	172	38.0	90	19.9
Toilet	17	3.3	14	82.4	2	11.8	1	5.9
Well/cistern/septic tank	12	2.3	0	0.0	10	83.3	2	16.7
Bucket	30	5.9	10	33.3	19	63.3	1	3.3

Bathtubs only	# Deaths	%		# Deaths	%
Location (n=468)			**Supervision (n=427)**		
Child's home	397	84.8	Not needed	25	5.9
Relative's home	22	4.7	Absent	233	54.6
Friend's home	5	1.1	Present	169	39.6
Other	31	6.6	Impaired*	93	55.0
CPR Initiated (n=316)			**911 called (n=453)**		
Yes	263	83.2	Yes	400	88.3
No or N/A	53	16.8	No	9	2.0
			Unknown	44	9.7

* Impaired due to drugs, alcohol, injury/ illness or distraction; percent (%) is of those where supervision was marked 'Yes'

Child Drowning In Pools in the United States - 2005 to 2014

Table 4. Child Fatal Drownings in Pools in the United States from 2005 to 2014[4]

Demographic		Number	Percent	Rate*
Age Group	<1 year	36	1.1	0.09
	1-2 years	1,663	48.4	2.08
	3-4 years	794	23.2	0.99
	5-9 years	523	15.2	0.26
	10-14 years	240	7.0	0.12
	15-17 years	178	5.2	0.14
	Total	3,434	100.0	0.47
Gender	Male	2,336	68.0	0.62
	Female	1,098	32.0	0.31
Race	African American	809	23.6	0.66
	Caucasian	2,463	71.7	0.44
	Other	162	4.7	0.30
Age & Gender	**0-9 years (n=3,016)**			
	Male	2,017	66.9	0.98
	Female	999	33.1	0.51
	10-17 years (n=418)			
	Male	319	76.3	0.19
	Female	99	23.7	0.06
Age & Race	**0-4 years (n=2,493)**			
	African American	373	15.0	1.12
	Caucasian	2,021	81.1	1.33
	Other	99	4.0	0.65
	5-17 years (n=941)			
	African American	436	46.3	0.49
	Caucasian	442	47.0	0.11
	Other	63	6.7	0.17

* 10 year average rates per 100,000 children based on U.S. Census population.

Table 5. Details of Child Fatal Drownings in Pools from 2005 to 2014[5]

Pool information		# Deaths	%
Pool Ownership (n=1224)			
	Private	1067	87.2
	Public	157	12.8
Pool Location (n=1466)			
	Child's home	582	39.7
	Relative's home	277	18.9
	Friend's home	167	11.4
	Sport/ rec center/ park	108	7.4
	Other	332	22.6
Pool Type (n=1287)			
	Above ground	330	25.6
	In ground	898	69.8
	Wading	24	1.9
	Hot tub/spa	35	2.7
Layers of protection		**# Deaths**	**%**
Supervision (n=1377)			
	Not needed	93	6.8
	Absent	625	45.4
	Present	659	47.8
	Impaired*	372	56.4
Reported as Able to Swim (n=1085)			
	0-4 years	16	2.0
	5-9 years	23	15.4
	10-14 years	27	43.6
	15-17 years	31	50.0
Physical Barriers Breached^ (n=1466)			
	Fence	390	26.6
	Gate	326	22.2
	Door	282	19.2
	Alarm	22	1.5
	Cover	24	1.7
	None	390	26.6

* Impaired due to drugs, alcohol, injury/ illness or distraction
^ Barriers are not mutually exclusive

Layers of protection		# Deaths	%
CPR Performed (n=1098)			
	0-4 years	762	94.9
	5-9 years	148	90.2
	10-14 years	60	88.2
	15-17 years	50	79.4
	Total	1020	94.0
911 Called (n=1330)			
	Yes	1316	99.0
	No	14	1.0

Child Drowning In Natural Water in the United States - 2005 to 2014

Table 6. National Child Drowning In and Around Natural Water, 2005 to 2014[4]

Demographic	# Deaths	%	Rate*
Age Group (n=3,035)			
0-4 years	808	26.6	0.40
5-9 years	523	17.2	0.26
10-14 years	650	21.4	0.31
15-17 years	1,054	34.7	0.82
Total	3,035	100.0	0.41
Gender (n=3,035)			
Male			
0-4 years	589	72.9	0.58
5-17 years	1,887	84.7	0.69
Total male	2,476	81.6	0.66
Female			
0-4 years	219	27.1	0.22
5-17 years	340	15.3	0.13
Total female	559	18.4	0.16
Activity by Age Group (n=3,035)			
Watercraft Related			
0-4 years	19	9.5	
5-9 years	37	18.6	
10-14 years	57	28.6	
15-17 years	86	43.2	
Total	199	6.6	
Non-watercraft Related			
0-4 years	789	27.8	
5-9 years	486	17.1	
10-14 years	593	20.9	
15-17 years	968	34.1	
Total	2,836	93.4	

Demographic	# Deaths	%	Rate *
Race (n=3,035)			
African American	713	23.5	0.58
Caucasian	2111	69.6	0.38
Other**	211	7.0	0.40
Age Group by Race and Gender (n=3,035)			
0-4 years			
Caucasian Male	492		0.63
African American Male	63		0.37
Other Male**	34		0.44
Caucasian Female	184		0.25
African American Female	20		0.15
Other Female**	15		0.20
5-9 years			
Caucasian Male	273		0.35
African American Male	94		0.56
Other Male**	36		0.48
Caucasian Female	87		0.12
African American Female	19		0.12
Other Female**	14		0.19
10-14 years			
Caucasian Male	284		0.35
African American Male	188		1.07
Other Male**	32		0.44
Caucasian Female	95		0.12
African American Female	35		0.21
Other Female**	16		0.22
15-17 years			
Caucasian Male	647		1.28
African American Male	275		2.48
Other Male**	58		1.28
Caucasian Female	49		0.10
African American Female	19		0.18
Other Female**	6		0.14

* 10 year average rates per 100,000 children based on U.S. Census population.
** Other includes Asian, Pacific Islander, Native Hawaiian, Alaska Native, American Indian

Table 7. Circumstances Surrounding Select Child Drownings in Natural Water, 2005 to 2014[5]

Natural Water	# Deaths	%	Layers of Protection	# Deaths	%
Location of Water (n=608)			**Supervision (n=602)**		
Sport or recreation area	281	46.2	Absent	228	37.9
State or county park	150	24.7	Present	374	62.1
Child's home	93	15.3	Impaired*	90	24.1
Friend's/relative's home	45	7.4			
Farm	17	2.8			
Other	22	3.6			
Type of Natural Water (n=996)			**CPR Performed (n=663)**		
Lake	379	38.1	0-4 years	117	70.5
River	236	23.7	5-9 years	58	48.7
Pond	201	20.2	10-14 years	73	49.0
Creek	78	7.8	15-17 years	55	24.0
Ocean	38	3.8	Total 0-17 years	303	45.7
Canal	44	4.4			
Quarry/Gravel pit	13	1.3			
Unknown/Not specified	7	0.7			
Used Drugs or Alcohol (n=592)			**911 Called (n=880)**		
Yes	63	10.6	Yes	865	98.3
No	529	89.4	No	15	1.7

* Impaired due to drugs, alcohol, injury/ illness or distraction

Appendix B
Methodology and Data Sources

Data used for analyses in this report are clearly referenced in the text, figures and tables and were obtained from three sources: The Centers for Disease Control and Prevention's (CDC) Web-based Injury Statistics Query and Reporting System (WISQARS) and Wide-ranging ONline Data for Epidemiologic Research (WONDER) databases and the National Center for Fatality Review and Prevention's Child Death Review Case Reporting System (CDR-CRS).

CDC WISQARS and CDC WONDER

Overall numbers of fatal drownings for children ages 0-17 were obtained using CDC's WISQARS database. Selection criteria used were years 1985 to 2014, ages <1 to 17 years, unintentional nature, and drowning/submersion injuries.

CDC WONDER was used to extract more specific data to explore the circumstances and related national trends of fatal childhood drownings. The three settings for profiles utilized the following codes: W65-W66 for bathtub, W67-W68 for pool, and V90, V92, and W69-70 for natural water. Selection criteria used were years 2003-2014, ages <1 to 17, 2013 urbanization (all categories), and underlying cause of death ICD-10 codes related to drowning (V90 - accident to watercraft causing drowning and submersion, V92- water-transport-related drowning and submersion without accident to watercraft and W65-W74 - accidental drowning and submersion. Rates were calculated based on U.S. Census population for the given time period and relevant subgroup.

Data were stratified by year, gender, age group, race, Hispanic origin, and underlying cause of death for subgroup analyses and proportions were generated. 'Other specified and unspecified drowning' numbers were included when calculating rates and proportions for overall drowning deaths in the target age group, but not the specific profile settings. Chi-Square statistic was used to identify statistically significant differences between subgroups at an α level of $p<0.05$.

National Center for Fatality Review and Prevention CDR-CRS

CDR-CRS was used to provide increased detail on the circumstances of fatal drownings in the three profile settings. The CDR-CRS facilitates the collection of comprehensive information on the circumstances surrounding the death of a child in order to identify key risk factors and recommend actions which may prevent future deaths. The Child Death Review process involves the cooperation of multiple agencies and entities at the local and state level and results in detailed reports for select cases of death, but is not a requirement for all child deaths across the nation. Therefore, the information reported cannot be considered nationally representative and caution must be taken when interpreting and generalizing the results of this analysis.

Cases involving drowning deaths occurring between 2005 and 2014 captured by the CDR-CRS were selected for analysis by H. Dykstra, an analyst at the NCFRP, and descriptive analyses were conducted to fill a series of dummy tables for each of the three profile settings. Variables included in the analyses were age, gender, location, type of area and those related to layers of protection (supervision, swimming ability, barriers, CPR and use of emergency services). Additional variables examined included

setting (urban, suburban, rural, frontier), pool ownership, type of pool, type of natural water source, and specific locations within the home (bathtub, toilet, bucket, well, cistern, septic tank). Efforts were also made to examine socioeconomic status using a variety of measures (insurance type, caregiver employment status, caregiver income, education and use of social services). However as greater than 70 percent of the data for these variables were missing or incomplete, the information was excluded from final analyses.

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