

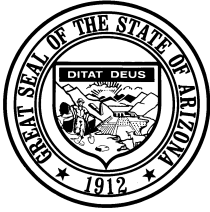
# **WATER-RELATED INCIDENTS IN MARICOPA COUNTY, 2013**

## **Annual Report for the Drowning Prevention Coalition of Arizona**



**Arizona Department of Health Services  
Bureau of Public Health Statistics**

**September 25, 2014**



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# WATER-RELATED INCIDENTS IN MARICOPA COUNTY, 2013

## **SUMMARY**

This report describes water-related incidents that have activated the 9-1-1 emergency system. Data in this report are derived mainly from case reports submitted by fire departments in the Phoenix metropolitan area. In 2013 there were 89 serious water-related incidents that occurred in the metro area among persons of all ages. Children 0-4 years of age accounted for 47 of these incidents, 43 of which occurred in swimming pools. Of the 47 young children, 12 are known to have died (11 due to incidents occurring in pools). Of the remaining children, many survived the incident without apparent medical complications, but this year 2 children sustained an impairment. Although there has been a 60% increase in the number of young children who live in the county since 1990, the count of serious incidents in swimming pools has remained fairly constant.

In 2013 the child deaths in pools occurred in both warm and cold months. The Maricopa drowning death rate for children 0-4 years of age in 2013 rose to 4.4 deaths per 100,000 children (in all bodies of water), and has been slowly increasing since 2006. The rate of deaths in swimming pools rose similarly, but non-pool related deaths have been decreasing. While the drowning rates have markedly improved since the 1980s and 1990s, better control of this cause of injury and death appears possible.

Emphasis on issues relating to supervision of children will have the greatest impact on nonfatal incidents, especially in the summertime. But, to prevent child drowning deaths (in contrast to incidents in which the child survives intact) continued attention needs to be paid to the placement of pool barriers, self-closing gates with latches, and their maintenance. Community campaigns are needed to address the incidents occurring in home pools in the summer time.

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## INTRODUCTION

In the mid-1980's the drowning death rate of Arizona's preschoolers ranked first in the nation.<sup>1</sup> Warm weather, long summers, and the presence of more than 300,000 residential swimming pools make Arizona prone to water-related incidents. Furthermore, death is just one outcome of water-related incidents: in about 9% of incidents the child survives, albeit with some degree of neurological impairment.<sup>2</sup>

To address the problem of water-related incidents in the Phoenix metropolitan area (called "Maricopa County" in this report), the Drowning Prevention Coalition of Arizona was formed in 1988. This Coalition is comprised of municipal fire departments, hospitals, the state and county health departments, community organizations, pool builders, suppliers of pool safety equipment, parents of drowned victims, corporations, and others.

The following report presents the data collected for 2013, and compares the findings to those in previous years. Much of the report focuses on children under five years of age, and specifically on incidents occurring in swimming pools.

## DIMENSIONS OF THE DROWNING DATA PYRAMID

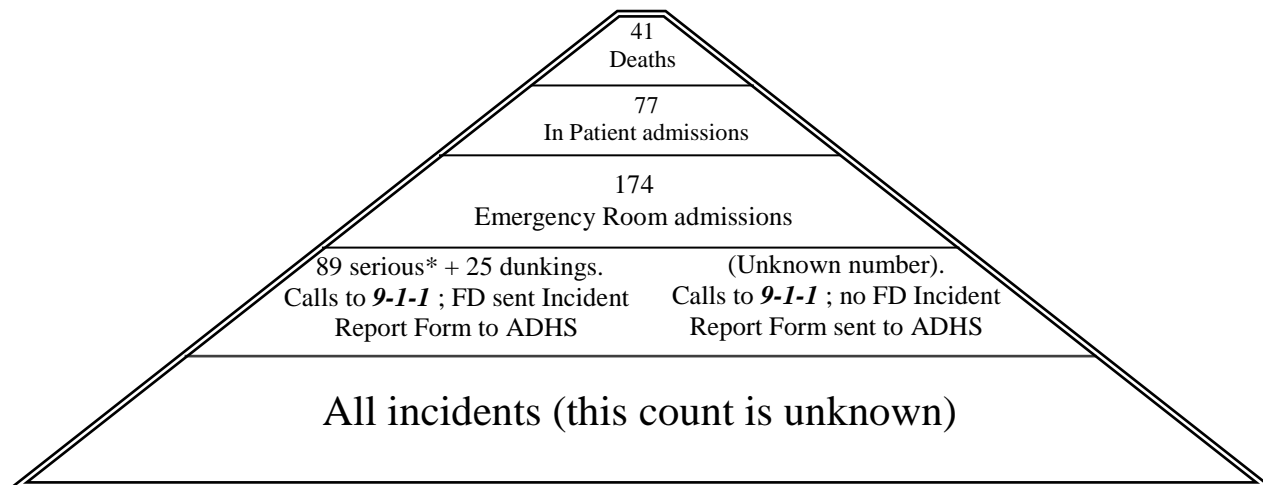
With various data systems now in place (namely, fire department reports and news clippings; hospitalization data; death certificates) we see a clearer picture of the magnitude of water related incidents and drowning deaths in Maricopa County. By using the data obtained from the various data systems the scope of the various layers can be seen in the injury pyramid.

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<sup>1</sup> Arizona Department of Health Services. Unintentional Drowning Deaths, Arizona, 1980-1989. Office of Planning & Health Status Monitoring, October 1990.

<sup>2</sup> Beyda, D. and Masuello, J. Phoenix Children's Hospital. Oral communication, July 1999.

**Injury Data Pyramid.** Estimated count of water-related events at various levels of the injury pyramid for events occurring in Maricopa county in 2013. These data include persons of all ages. The definitions of events are not entirely comparable between the levels. Most of this annual report focuses on the incidents indicated by “\*” in the pyramid.



## METHODS AND DATA SOURCE

**Case Definition:** In this report a water-related incident is defined as an incident in which a fire department (FD) responded to a 9-1-1 emergency call originating in Maricopa county. We include in the analysis any incident in which the victim was given CPR, was not breathing, and was submerged or not struggling when retrieved from the water. (Some of these cases die the same day or at a later time; some fully recover.) We exclude from analysis any incident that did not appear to be life-threatening; for example, we exclude from analysis an incident in which a victim was struggling and did not require CPR.<sup>3</sup>

**Procedures:** Since 1988, the Arizona Department of Health Services (ADHS) has monitored water-related incidents as reported by local fire departments. The fire departments usually are first on the scene of 9-1-1 calls and are generally able to provide information about the event from information provided by witnesses. We assume that very few serious incidents occur without activation of 9-1-1. The fire departments submit case reports on standard Incident Report Form (see appendix) developed in conjunction with the Coalition. The reported data items include the age

<sup>3</sup> These relatively minor 9-1-1 incidents that were excluded sometimes are called “dunkings, close calls, or near misses.” In recent years, the count of these minor incidents ranged from 22 to 54; in 2013 there were 25 such incidents. ADHS requests that fire departments submit all such incidents, but we exclude these minor incidents from further analysis in the yearly reports. Obviously trivial incidents that would not even qualify as “dunkings” are not submitted by most fire departments.

and gender of the victim, the location of the incident, and the apparent circumstances surrounding the event. The ADHS Bureau of Public Health Statistics receives and analyzes these case forms.

So far, the data inconsistently includes the calls to the Maricopa County Sheriff's Office, which responds to incidents on the surrounding lakes, or the nearby Salt or Verde Rivers. These are popular recreational areas located just outside of the Phoenix metropolitan area. Incidents outside the boundary of Maricopa county are generally excluded.

Starting with the 2008 data the ADHS staff who enter data has been reduced to one person (TJF) who receives and codes the forms of each reported incident. Usually, fewer than six incidents per year are questionable as to whether the incident was life-threatening. The fire departments do not submit reports of calls to 9-1-1 that are canceled. This data surveillance system relies mainly upon fire departments to report all the serious cases occurring within their jurisdictions.

Supplemental sources: In conjunction with the Coalition, the surveillance system searches the local newspaper (the Arizona Republic) and television daily for reports of water-related incidents. When found, articles are downloaded<sup>4</sup> or clipped, and attached to the fire department reports. Rarely, there is no associated fire department report. If a report from the fire department is missing, then ADHS contacts the fire department to request a submission. If the fire departments do not submit a case report, then we assume the case was serious, and we use the information from the news clipping to create a case report. We use death certificates only to document the outcome status for incident cases reported by fire departments.<sup>5</sup>

Analysis: Analysis of data is performed using Microsoft Access on the database of the 3,261 records entered since 1988. We have excluded the apparently minor (non life-threatening) incidents,<sup>3</sup> also called "dunkings", from subsequent analyses reported herein. The database was managed during 2010-2012 by a separate office at ADHS and there is some discontinuity in the data for those years. The graphs and tables that follow may show dips in ascertainment that reflect the less intense tracking during those years.

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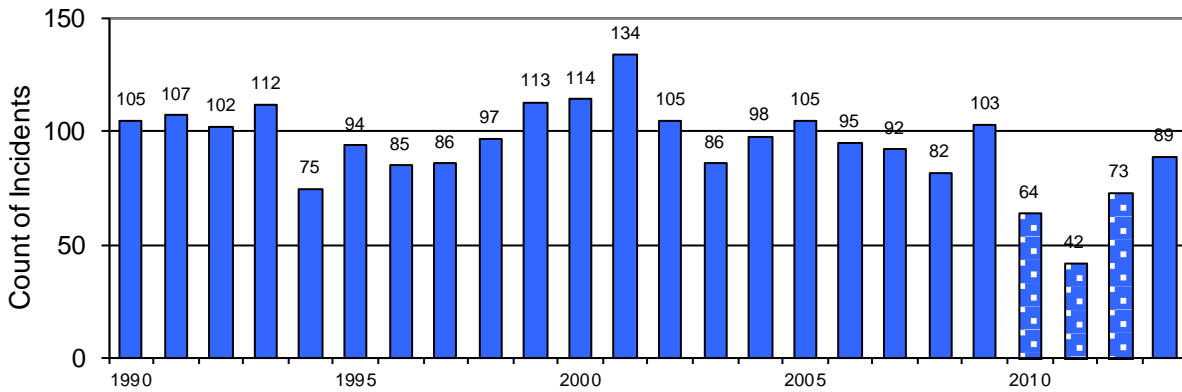
<sup>4</sup> The Children's Safety Zone collaborates with local fire departments, hospitals and media to gather statistics and stories on water related incidents and fatalities in Arizona. See <http://childrensafetyzone.com/go/>

<sup>5</sup> We do not use death certificates to supplement the count of incidents reported by fire departments. However, as explained in a later section, we use death statistics as an independent method of tracking drowning trends.

## FINDINGS

In 2013, fire departments and the news clips reported 89 serious water-related incidents in Maricopa County among persons of all ages. Ten incidents in 2013 were reported only in the news clips, a decrease compared to 2008 and 2009. The count of 89 serious incidents in 2013 was somewhat lower than the annual count of cases since 1990 (see Figure A).

**Figure A. Count of reported, serious water-related incidents in Maricopa County among persons of all ages in all bodies of water. An incident may lead to an outcome of death, or survival with impairment or no impairment.**



The distribution of the 89 incidents in 2013 according to the city and age of the victim is shown in **Table 1**.

**Table 1. Water-related incidents reported for 2013 according to age group and city of incident in Maricopa County. Only life threatening incidents are included in the analysis.**

City of Incident	Years of Age of the Victim						Total
	0-4	5-14	15-34	35-64	65+	UNK	
Apache Junction	1						1
Avondale	4		1	1			6
Cave Creek	1						1
Chandler	1	1					2
El Mirage	1						1
Gilbert	3			2			5
Glendale	4			1			5
Litchfield Park	1						1
Mesa	7	4		4			15
Paradise Valley				1			1
Peoria		1	2	1	1		5
Phoenix	19	3	3	1	4	1	31
Queen Creek	2						2
Maricopa Co, rural			3	2			5
Scottsdale	1			1	2		4
Sun City	1	1					2
Surprise	1						1
Tempe				1			1
<b>All Areas</b>	<b>47</b>	<b>10</b>	<b>9</b>	<b>15</b>	<b>7</b>	<b>1</b>	<b>89</b>

The body of water of the incidents according to age group is presented in **Table 2**. Most incidents took place in pools. Pools, either above ground or in ground, were involved in 65 (73%) of the 89 events. Forty-three of the 65 incidents in pools involved children aged 0-4 years. Bathtubs (8 incidents), rivers and lakes (13 incidents), a bucket (1 incident), spas (1 incident), and canals (1 incident) were the next most common places for water-related incidents among all ages. Only one serious incident in 2013 involved a pre-schooler who submerged in a bathtub.

**Table 2. Water type by age group, 2013. Only life threatening incidents are included in the analysis.**

Water type	Years of Age of the Victim						Total
	0-4	5-14	15-34	35-64	65+	UNK	
Bathtub	1		2	2	2	1	8
Bucket	1						1
Canal/Irrigation Ditch	1						1
Fish/Decorative Pond							
Other							
Pool, in ground	43	10	1	6	5		65
Pool, above ground							
River/Lake	1		6	6			13
Spa				1			1
Toilet							
Unknown							
Missing							
<b>All water bodies</b>	<b>47</b>	<b>10</b>	<b>9</b>	<b>15</b>	<b>7</b>	<b>1</b>	<b>89</b>



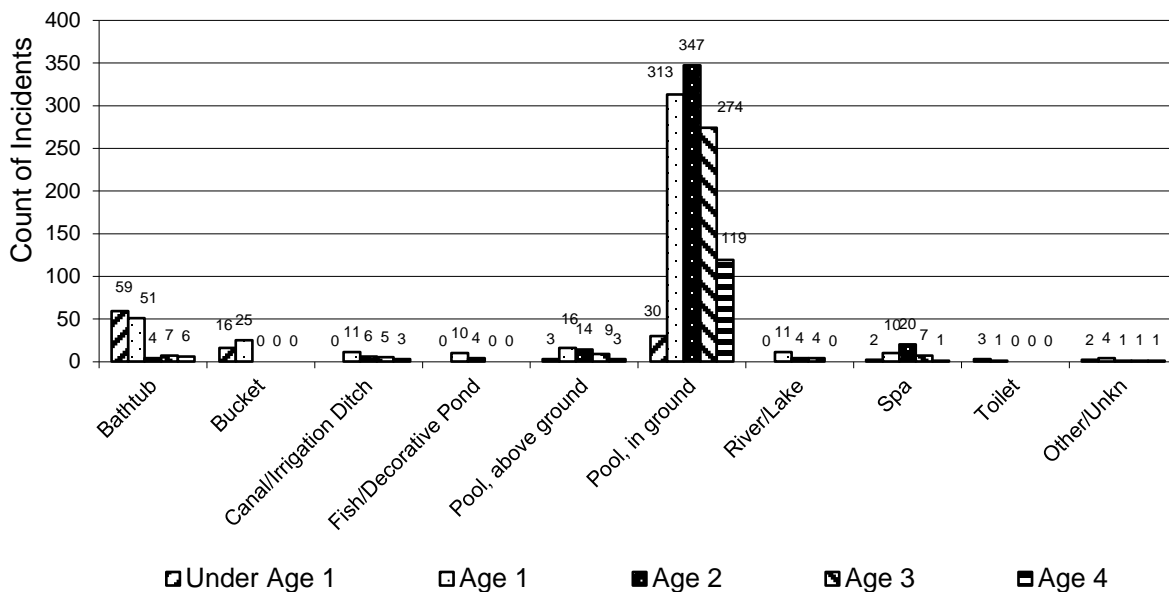
## Young Children

Children, ages 0-4 years, comprised the largest group experiencing a water-related incident. Although older individuals are equally important to consider in terms of loss of life, society generally feels a greater sense of responsibility to prevent injury to persons in the youngest, highly vulnerable, age group. The remainder of this report analyzes the findings among the 0-4 year old age group.

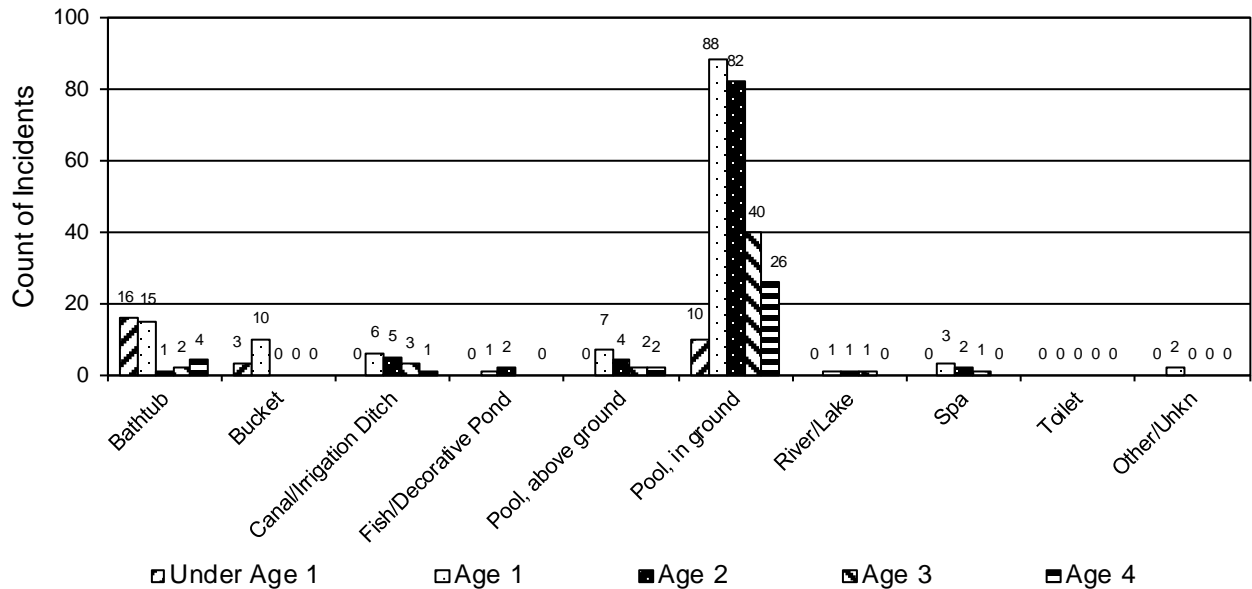
Some data elements were not collected in the early years of our surveillance, and space considerations make it difficult to include all years of data. For those reasons, the graphs that follow may display a variety of time periods. For a few, selected graphs we display data according to the child's outcome: "died"; "survived but with impairment"; and "survived in apparently normal condition."

The distribution of cases among single ages of the 0-4 year old group is shown in **Figure 1**. Among children 1-4 years old, the count of incidents in swimming pools far overshadows the count in all other bodies of water combined. Among infants (i.e., under one year of age) bathtubs are the most common water body in which incidents occur. **Figure 1b** shows the count when the outcome was death or impairment.

**Figure 1. Count of incidents according to the body of water in which life threatening incidents occurred, by single age category, reported in Maricopa County, 1990-2013. Outcome status: all.**

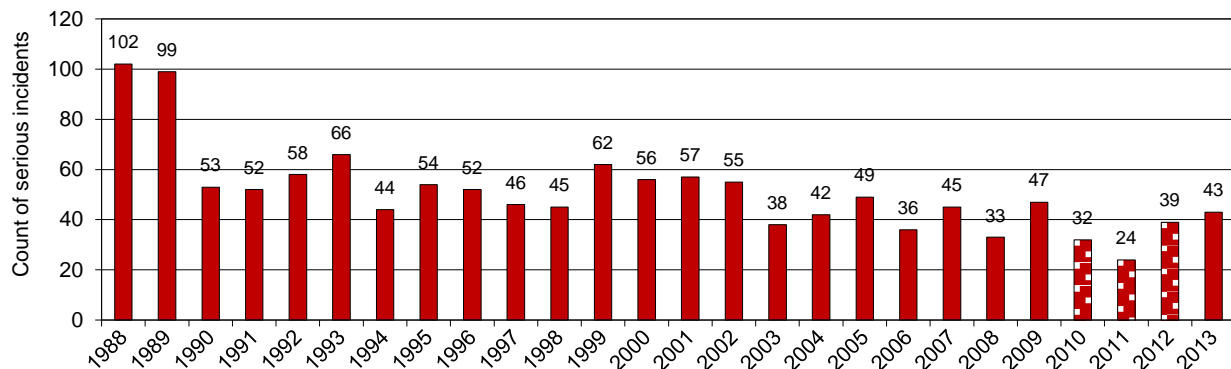


**Figure 1b. Count of incidents according to the body of water in which the incident occurred, by single age category, reported in Maricopa County, 1990-2013, where the child's outcome was death or impairment.**

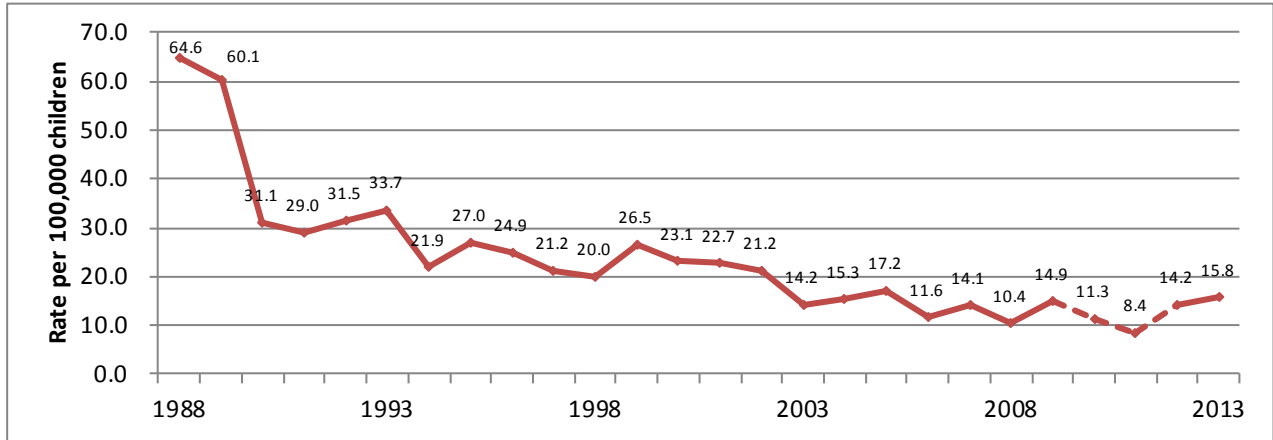


The next tables and figures provide information about incidents occurring in swimming pools for this age group. **Figure 2** shows the count of pool-related incidents reported over the previous 22 years. In 2013, the count (43) appears similar to those in previous years. Because of the increasing population of children residing in the metro area (from 170,182 resident children in 1990 to 272,278 in 2013 – an 60% increase), **Figure 3** displays the rate of pool incidents, expressed per 100,000 children residing in Maricopa County. The rate of 15.8 for 2013 is the highest rate since 2003. The inverse of this rate ( $100,000 / 15.8$ ) reveals that for every 6,329 children, one child experienced a life-threatening pool incident in 2013 in Maricopa county.

**Figure 2. Count of life-threatening incidents in pools, by year, among 0-4 year olds. Outcome status: all.**

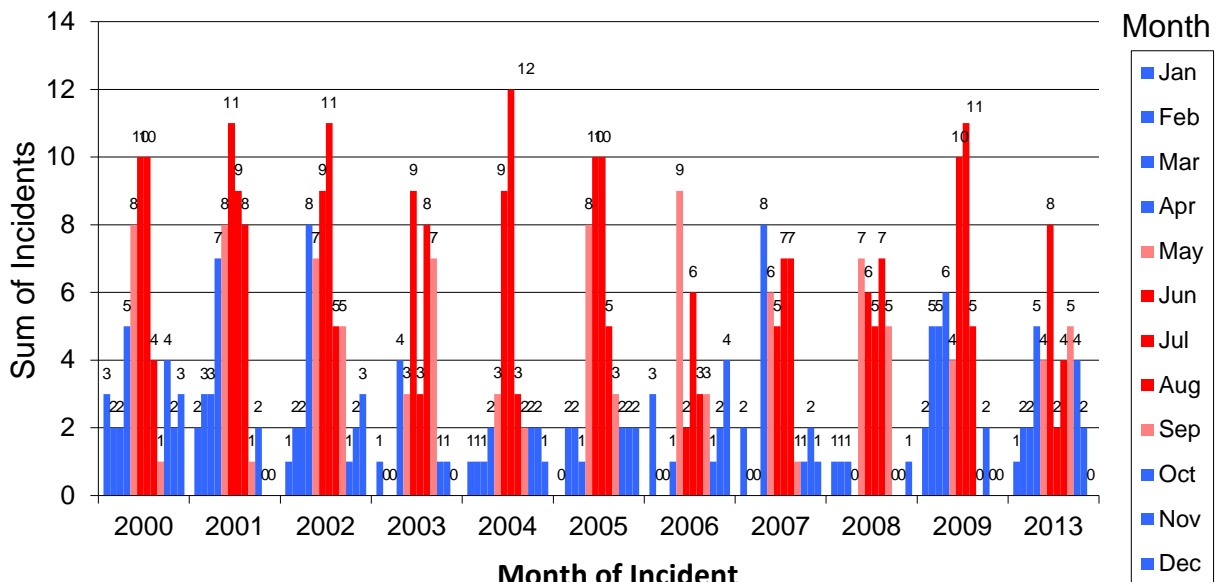


**Figure 3. Rate (per 100,000 children aged 0-4) of life threatening pool incidents occurring in Maricopa County. The rates consider the increasing population of children in the county. The numerators for the rates are the counts of incidents (shown in Figure 2) regardless of the county in which the child resided. Outcome status: all.**



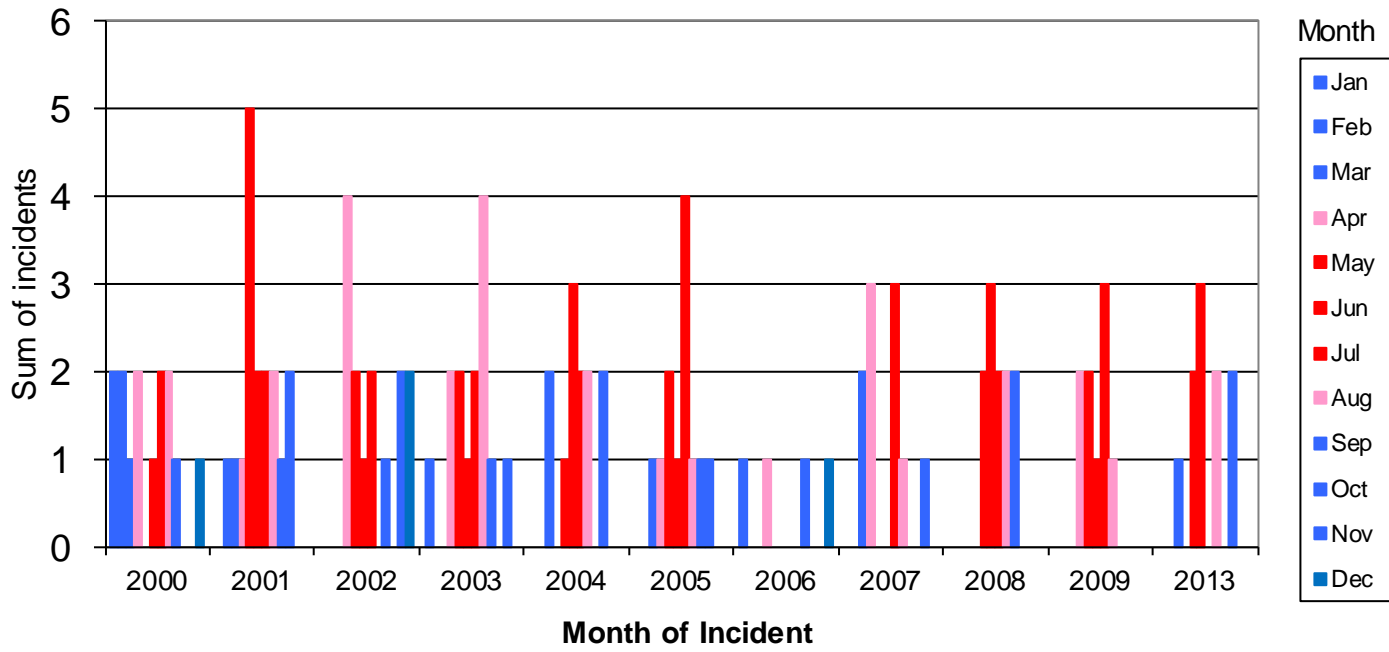
The occurrence of incidents by month is shown in **Figure 4**. We note the typical pattern seen in previous years, with the number of pool-related incidents peaking during the summer months of June, July, and August. In 2013 the counts were below the Coalition's goal of seeing fewer than 10 serious incidents in any month. In 2006 the fire departments reported not a single pool-related death all summer. However, the summer again turned deadly for young children when most of the fatal pool incidents in 2013 occurred in the hotter months (see **Figure 4b**).

**Figure 4. Monthly sum of life-threatening swimming pool incidents, 0-4 year olds, Maricopa County. Outcomes: all.**



Source: DPCCA Fire Depts and news clippings.

Figure 4b. Monthly sum of incidents in pools in which the child's outcome was "died."



Source: DPCCA Fire Depts and newsclippings.

As shown in **Table 3**, boys comprised a majority of the pool-related victims in 2013. This finding has been present in most years.

**Table 3. Gender of 43 children, 0-4 years old, involved in pool-related incidents, 2013. Outcome: all.**

<b>Gender</b>	<b>Count</b>	<b>(%)</b>
<b>Male</b>	30	70%
<b>Female</b>	13	30%

Race and ethnicity are difficult variables to analyze because of the way that Hispanic ethnicity is often mistakenly considered a race group. Currently, most demographers consider Hispanic as an ethnic group, not a race group. For analysis here, we count Whites as either Hispanic or non Hispanic. The remaining races are counted regardless of Hispanic ethnicity. **Table 4** presents the tabulation.

**Table 4. Race and ethnic characteristics of children, 0-4 years of age, involved in water-related incidents in pools in 2013. Outcome: all.**

<b>Race/Ethnicity</b>	<b>Count</b>	<b>%</b>
Asian	0	0.0%
American Indian	0	0.0%
Black	3	7.0%
Hispanic	12	27.9%
White, non Hispanic	13	30.2%
Other	0	0.0%
Unknown	15	34.9%
<b>TOTAL</b>	<b>43</b>	<b>100.0%</b>

The 2000 Census found that 40.1% of children age 0-4 residing in Maricopa County were Hispanic.<sup>6</sup> Furthermore, starting in 2003 the number of births to Hispanic mothers exceeded that of white mothers. However, in 2009 the number of births to Hispanic mothers dipped below that of White, non-Hispanic mothers.<sup>7</sup> The proportion of Hispanic families that actually have pools is not known, but is probably less than the population as a whole.

<sup>6</sup> To calculate the percentage of Hispanic children in Maricopa County, the numerator was derived from the U.S. Census Bureau at <http://factfinder.census.gov/> and the denominator was derived from the Arizona Department of Economic Security's Population Statistics at <http://www.de.state.az.us/>

<sup>7</sup> Arizona Health Status and Vital Statistics, 2012. page 10. ADHS, published November 2013.

**Table 5** presents the incidents according to the body of water and the site of the 47 incidents involving children between the ages of 0 and 4. The most common site of incidence was an in-ground pool located at the victim's home (30 incidents). In four incidents the site was a relative's pool. Four incidents occurred at a friend's pool. In four incidents the pool site was not documented. The bathtub incident and a bucket incident also occurred at the victim's home.

**Table 5. The body of water according to the site of incident for children, 0-4 years of age. Life-threatening incidents only, Maricopa County, 2013. Outcomes: all.**

<b>Body of Water</b>	<b>Friend's Home</b>	<b>Neighbor's Home</b>	<b>Public &amp; Semi-pub</b>	<b>Relative's Home</b>	<b>Victim's Home</b>	<b>Other / Unknown</b>	<b>All Sites</b>
<b>Bathtub</b>					1		<b>1</b>
<b>Bucket</b>					1		<b>1</b>
<b>Canal/Irrigation Ditch</b>						1	<b>1</b>
<b>Fish/Decorative Pond</b>							<b>0</b>
<b>Pool, above ground</b>							<b>0</b>
<b>Pool, in ground</b>	4		1	4	30	4	<b>43</b>
<b>River/Lake</b>						1	<b>1</b>
<b>Spa</b>							<b>0</b>
<b>Toilet</b>							<b>0</b>
<b>Other/ Unknown/ Missing</b>							<b>0</b>
<b>TOTAL</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>32</b>	<b>6</b>	<b>47</b>

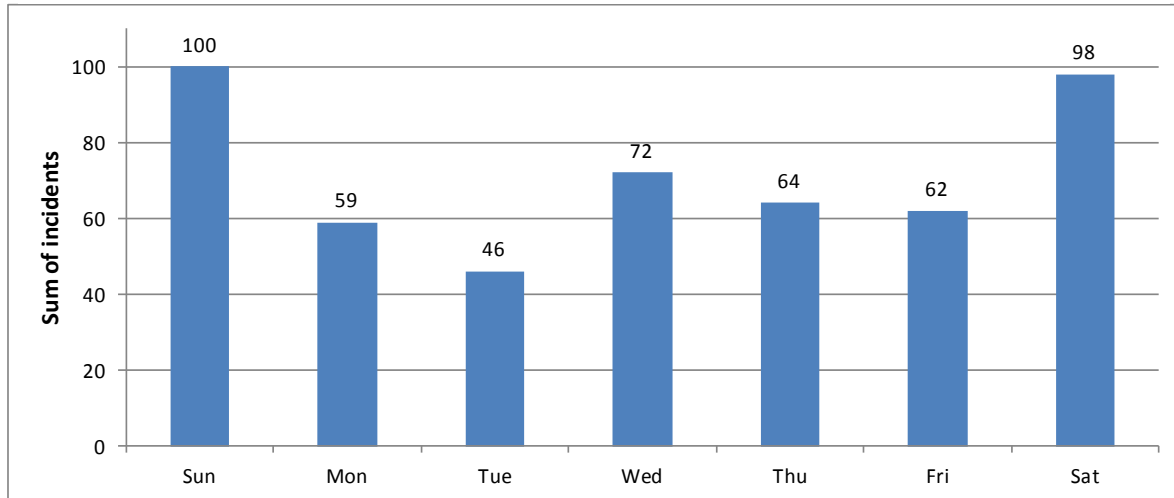
**Table 6** presents the type of dwelling where the incidents took place. Thirty-three (77%) of the 43 pool incidents occurred at a single family home. Seven of the 43 pool incidents occurred in apartments, condos, hotels, or other multi-unit dwellings.

**Table 6. The body of water according to the type of dwelling for children, 0-4 years of age, who experienced a water-related incident in 2013. Outcomes: all.**

<b>Body of Water</b>	<b>Apt/ Condo</b>	<b>Hotel/ Motel</b>	<b>Single Home</b>	<b>Multiple Units</b>	<b>Trailer/ Mobile</b>	<b>Unknown/ Other/NA</b>	<b>Total</b>
<b>Bathtub</b>						1	1
<b>Bucket</b>			1				1
<b>Canal/Irrigation Ditch</b>						1	1
<b>Fish/Decorative Pond</b>							0
<b>Pool, above ground</b>							0
<b>Pool, in ground</b>	5	1	33	1		3	43
<b>River/Lake</b>			1				1
<b>Spa</b>							0
<b>Toilet</b>							0
<b>Other/Unknown</b>							0
<b>Total</b>	<b>5</b>	<b>1</b>	<b>35</b>	<b>1</b>	<b>0</b>	<b>5</b>	<b>47</b>

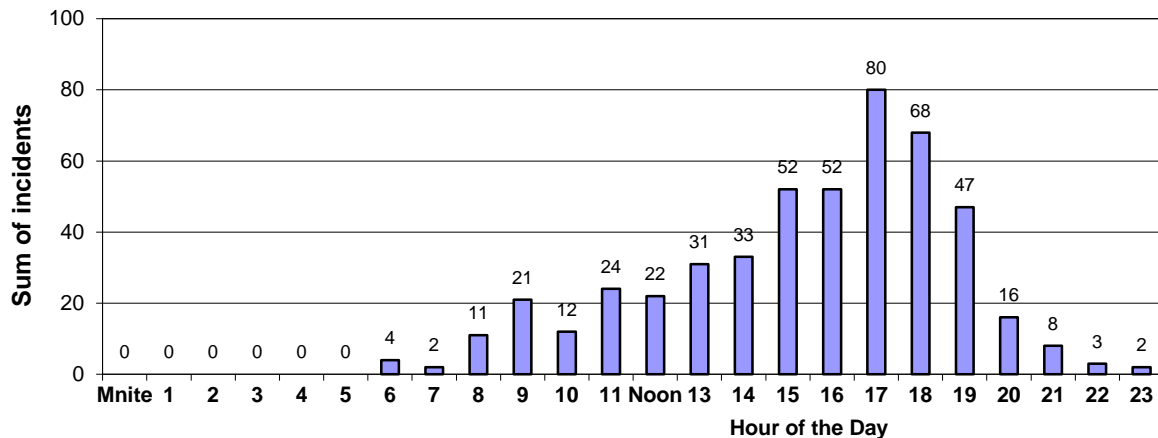
Figure 5 displays the occurrence of pool-related incidents by day of week. Incidents occurred on every day of the week, and there was no day when vigilance would not have been important. The graph shows that pool incidents tend to occur more often during the weekend.

**Figure 5. Day of the week of life-threatening pool incidents among children 0-4 years old, Maricopa County, 2000-2009; 2013. Outcomes: all.**



The distribution of pool incidents by hour of the day is shown in Figure 6. Not surprisingly, the incidents occurred when children were likely to be awake. The peak time for an incident in the 0-4 year old age group was in the mid to late afternoon.

**Figure 6. Life threatening pool-related incidents by hour of the day among children 0-4 years of age. Cumulative count, 2000-2009; 2013, Maricopa County. Outcomes: all.**





**Table 7. Clothing worn by children ages 0-4 who experienced a life threatening water related incident in a pool, 2013. Outcomes: all.**

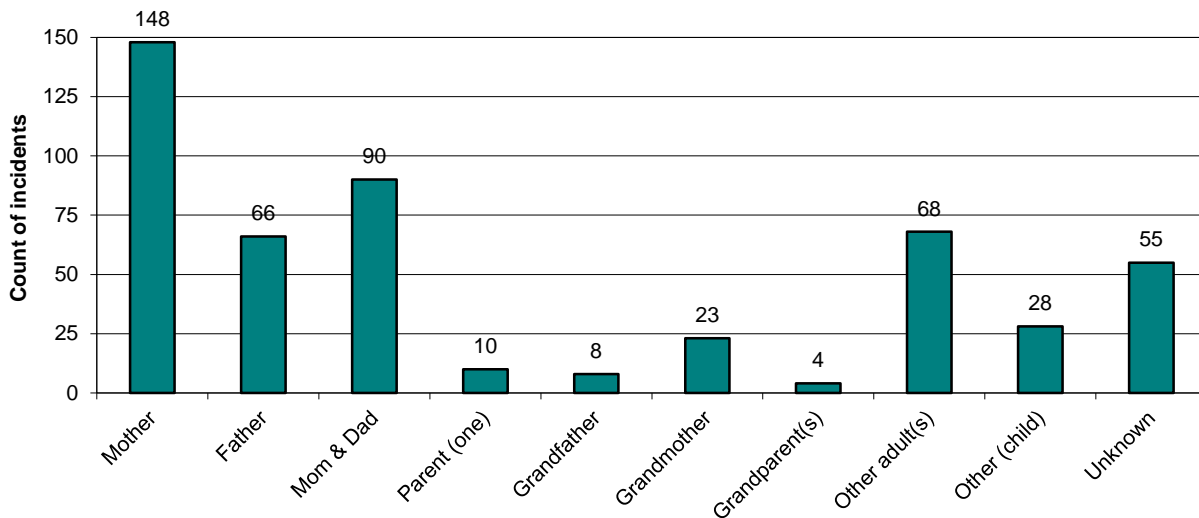
Clothing	Number	%
None	1	2.3%
Swimwear	10	23.3%
Other clothes	24	55.8%
Unknown	8	18.6%
<b>Total</b>	<b>43</b>	<b>100.0%</b>

Table 7 presents information about the type of clothing worn at the time of a pool-related incident. In at least 24 ( 56%) of the cases, the children were not wearing swimming attire. These incidents did not occur in a swimming situation; rather, they occurred at a time when the children were not expected to be in or near the pool.

A major purpose of this surveillance system is the identification of the factors surrounding water-related incidents in young children. To assist in this effort, the personnel from the responding fire departments attempt to determine the apparent circumstances surrounding each event. In gathering this data, a firefighter asks about supervision at the time of the incident and looks for breaches in layers of protection that likely allowed a young child to access the pool.

Information about the supervisor of the victim at the time of incident is shown in Figure 7. Since 2000, a mother or father or both was supervising the child in 314 (63%) of the 500 life-threatening incidents involving children 0-4 years old. In 186 (37%) incidents, the supervisor was someone other than the child’s parent. This seems to be a higher proportion than the amount of time that children in this young age group spend outside the supervision of a parent. Thus, babysitters, grandparents, and other supervisors also need to be even more alert to the potential for a pool-related incident to occur.

**Figure 7. Cumulative count of presumed supervisor in life-threatening pool incidents involving children, age 0-4, 2000-2009 and 2013. Outcomes: all.**



## Outcomes

To determine outcomes, we used data from fire departments, and supplemented it with data from death certificates and other sources. We documented that at least 12 of the 47 young children (0-4 years old) who experienced a serious water-related incident in 2013

have died (see **Table 8**). Eleven children died from incidents in pools, and one from an incident in a canal. No child died from an incidents in a bathtub this year. Of the 47 children, 30 had no reported impairment when released from the hospital. But, there were two document-

**Table 8. Outcome status of children 0-4 years of age reported as having a life-threatening water related incident in 2013.**

Water type	Outcome Status				Total
	Unknown	Died	Impairment	No Impairment	
Bathtub				1	1
Bucket				1	1
Canal/Irrigation Ditch		1			1
Fish/Decorative Pond					0
Other & Unknown					0
Pool, above ground					0
Pool, in ground	3	11	2	27	43
River/Lake				1	1
Spa				0	0
<b>Total</b>	<b>3</b>	<b>12</b>	<b>2</b>	<b>30</b>	<b>47</b>

ed or presumed cases of neurological impairment in this age group in 2013; this is average compared to the number seen in previous years.

Concerns about confidentiality make it difficult to properly document the outcome of cases that enter the medical care system. The outcome status of 3 of the 47 children was unknown. Our linkage to hospital discharge records allows assignment of a presumed outcome status to many cases that the fire fighters have not been able to follow up. Since firefighters try to obtain the follow-up status on cases which have not responded to their resuscitative efforts, we speculate that in most cases a follow-up status of “unknown” means that the child probably recovered well.

The narrative section of the incident report form often provides additional information concerning the incident. This narrative section reveals that a family member or other person often resuscitated the child at the scene by promptly administering CPR when the child was pulled from the water. It is our belief that this immediate resuscitation is a vital step in stabilizing the child and counteracting the detrimental effects of the submersion. However, we cannot determine whether prompt CPR leads to the survival in a vegetative state of some children who otherwise would have died.

When the 501 serious, reported incidents in pools from 2000-2009 and 2013 are assessed we note the following outcomes: 25.5% died; 3.4% had a neurological or other impairment at last contact (usually at the time of discharge from the hospital); 41.7% were reported as normal (usually as determined at time of discharge from the hospital); and 29.3% had an unknown or undocumented outcome. Currently, we do not have resources to conduct a longer term assessment of the surviving children’s status.

## Attributed Cause

Upon review of the incident form, we assign a single, “attributed cause” of each pool incident to one of the following six categories:

- No barrier to pool
- Inadequate fence
- Gate or latch failed or was propped open
- Back safety door or latch failed
- Supervision issue
- Other or unknown.

This information is further classified into events that occurred during the seven “cold” months, October through April, and the five “warm” months, May through September.

## Similarity to Arizona Child Fatality Review data

The findings in our analysis are similar to that of the ADHS Arizona Child Fatality Review (CFR) Program. The CFR program has published their findings of drowning of young children, 1995-1999, and reported that only 4 of 81 drowning **deaths** of children less than 5 years of age occurred in backyard pools in which it was known that there was an adequate pool fence that had a properly functioning locked gate.<sup>8</sup>

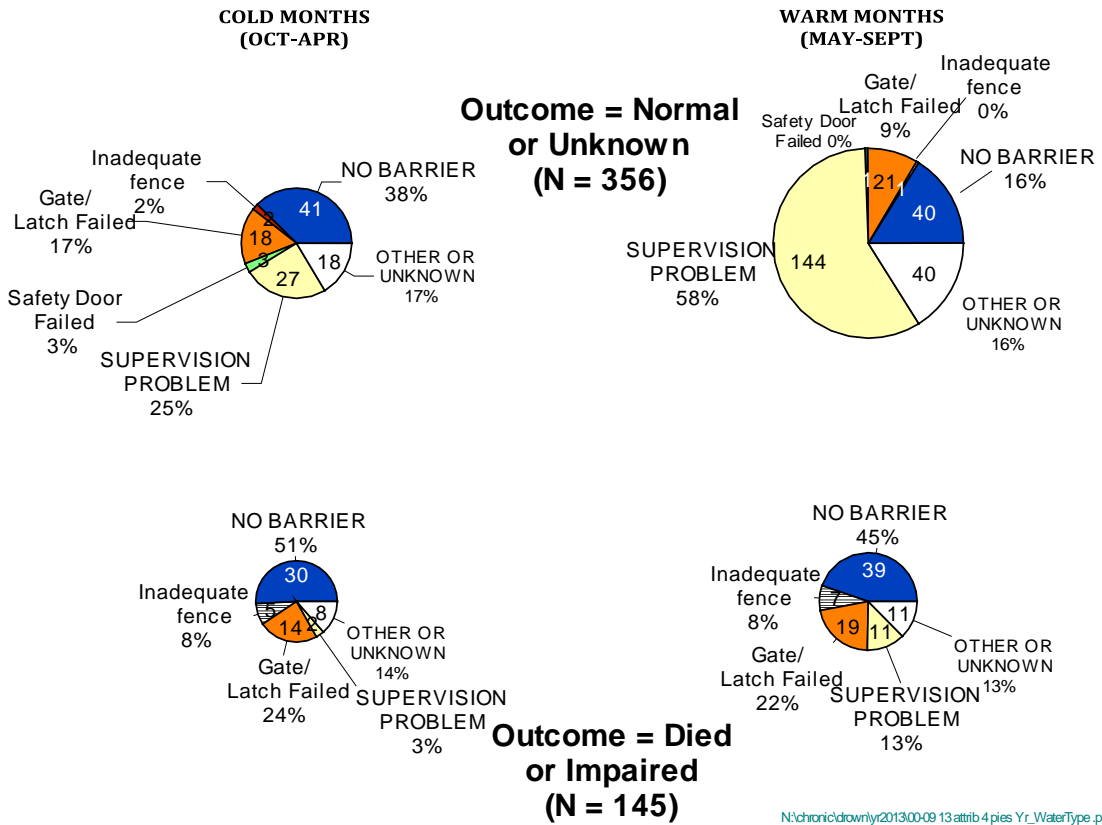
A comparable analysis of our data, looking specifically at the children who died or were impaired, yields similar findings. To relate the incidence data reported by fire departments to the mortality data from CFR, we combined the categories of the 145 incidents occurring in 2000-2009 and year 2013 where the child’s outcome was “died (128) or impaired (17).” For additional comparison, we also analyzed the combined category of 356 incidents where the outcome was “normal (209) or unknown (147).” As in previous reports, we display the findings according to season (warm or cold). The results are shown in the four pie charts of **Figure 8**.

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<sup>8</sup> Rimza ME, Schackner RA, Bowen KA, Marshall W. Can Child Deaths Be Prevented? The Arizona Child Fatality Review Program Experience. *Pediatrics*. 2002; 110(1). [www.pediatrics.org/cgi/content/full/110/1/e11](http://www.pediatrics.org/cgi/content/full/110/1/e11)

**Figure 8. Comparison of the single attributed cause of incidents in pools, according to time of year (cold vs warm months) and outcome of the child (normal and unknown vs. died and impaired). This figure analyzes cases occurring in 2000-2009 and 2013. Data are derived from reports submitted by fire departments in Maricopa County.**

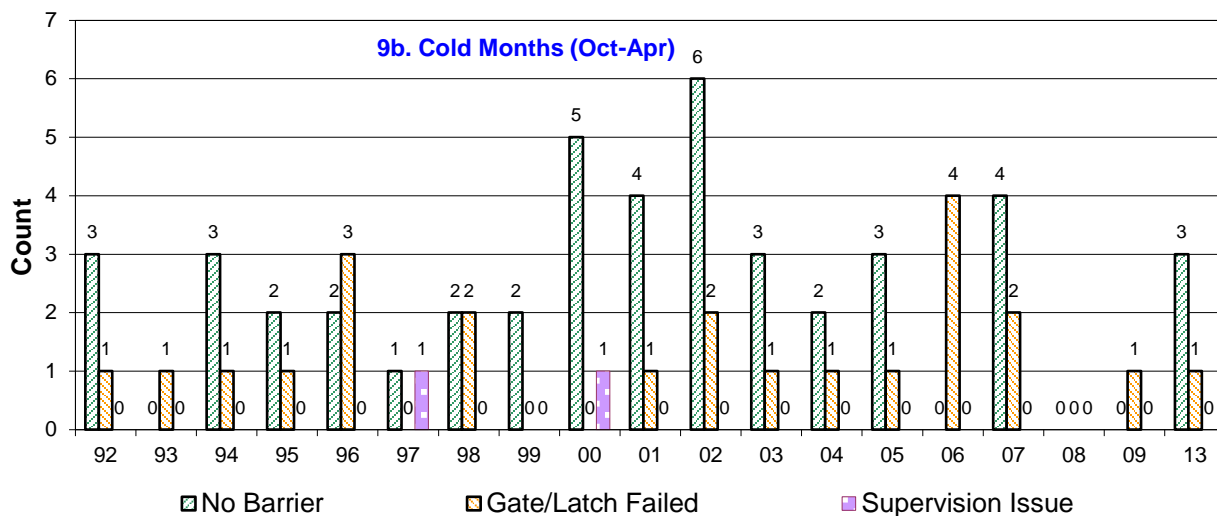
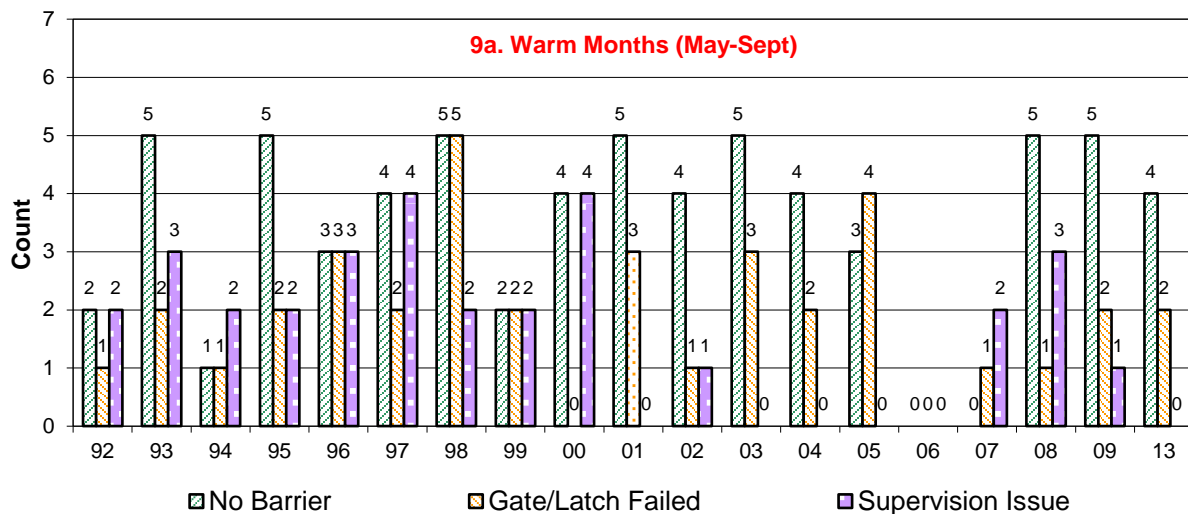
### Attributed cause in pools, children under 5 years of age, Maricopa County, 2000-2009 and 2013



This approach reveals a notable finding for incidents that occurred during the warm months. The roles of supervision and barriers differ for the outcome categories. The role of barriers (absent or failed) for cases whose outcome is “died or impaired” markedly differs compared to those cases whose outcome is “normal or unknown.” Absent barriers appear to be a significantly more prominent factor in cases where the child died or was impaired than is supervision. On the other hand, supervision is the predominant factor in warm month incidents in which the child survived with normal or unknown outcome. In cold months, **Figure 8** shows that an absent barrier is the major factor regardless of outcome. The data here support the findings of the CFRT regarding the role of inadequate barriers as a major factor that contributes to child drownings in swimming pools.

**Figures 9a and 9b** present data on the trend of the attributed cause of pool-related incidents over the 19-year period. As noted above, the attributable cause is best analyzed by excluding cases in which the outcome is “normal” or “unknown.” An interesting and probably more relevant pattern is noted by analyzing the cases where the child’s outcome is death or impairment. Approximately 7-10 deaths occurred annually from pool incidents in warm months, and about 4-5 deaths annually from incidents that occurred in cold months (see Figure 4b). The counts swing widely from year-to-year because the counts are relatively small. From these data we could not discern a trend in the count of attributed causes in warm months. Similarly, for events occurring in cold months (see next page) we hesitate to draw conclusions about a time trend because the counts are so small and year-to-year variability so great.

**Figures 9a (warm) and 9b (cold).** Trend of attributed causes (expressed as the count of all cases in the warm or cold season) of pool incidents in Maricopa County involving children 0-4 years of age in which the outcome of the incident was death or impairment. The graphs do not show the counts of the few cases attributable to “Inadequate barrier” and “Other & Unknown.”



## LIMITATIONS OF ACCURACY OF INCIDENCE DATA

Our surveillance system relies mainly upon voluntary reporting by fire departments and is subject to under-reporting if they reduce their participation in submitting the report forms. The downturn in the local economy and municipal revenues since 2008 and cutbacks in staff at fire departments clearly affect their ability to report cases.

The surveillance system assumes that few serious water-related incidents occur without the activation of the 9-1-1 system. However, this assumption has not been rigorously tested. Cases that generally lack a fire department report include those that are obviously dead when the law enforcement responders arrive on scene, crime scene cases, and cases under the jurisdiction of the sheriff's office or a tribal government.

One of the ways we evaluate completeness of case ascertainment is by matching the case reports to a list of cases discharged from hospitals. For 2013 we note 5 child cases in Maricopa county, hospitalized for 3 or more days or who died, were not captured by the incidence system.<sup>9</sup>

Information from death certificates (described below) reveals that no child drowning in 2013 in Maricopa county was missed by the reports we received from fire departments or from news clippings.<sup>9</sup> The incidence data recorded 12 deaths of children in this age group for incidents occurring in 2013.

## DEATH CERTIFICATE DATA

Death certificates provide an independent data source to measure the counts, rates, and trend of child drownings. While we use information from death certificates to supplement the outcome status of cases identified through fire department reports (described above), we do not add otherwise unreported drowning cases to the incidence database. Thus, the mortality data can help to measure the accuracy and completeness of the incidence surveillance system for the cases who die. However, the case definitions used for vital statistics differ slightly compared to those used in the incidence data.

Customarily, mortality data show deaths of the resident population during a given year. However, for this report we present an unconventional analysis that more precisely reflects the local, year-to-year findings. We reviewed Arizona death statistics to find child cases who died in Maricopa County, regardless of where they resided. We include only the cases whose incident occurred in Maricopa County and whose death occurred in Arizona. Thus, we present the local rates of drowning deaths, regardless of residency. To calculate the mortality rate, we divided the count by the estimated number of children age 0-4 each year residing in Maricopa county. This method

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<sup>9</sup> For consistency with methods used in previous years, we do not add missed cases to the surveillance database.

improves the accuracy of identifying locally occurring events which is important for the Coalition that relies upon this surveillance system to provide yearly feedback about the effectiveness of their prevention programs.

**Figure 10** (see next page) shows these drowning death rates for children under five years of age.<sup>10</sup> The data are shown for drownings in all bodies of water, and separately for drownings that occurred in swimming pools (including spas), and in bodies of water other than pools and spas.<sup>11</sup> In 2013, the Maricopa drowning rate for all bodies of water rose to 4.4 deaths per 100,000 resident children, an increase since the low rate of 3.2 seen in 2006. Similarly, the death rate for pools increased slightly to 4.4 per 100,000 children, also an increase since 2006. For comparison, the goal of *Healthy Arizona 2010* was to reduce drowning fatalities to no more than 0.9 deaths per 100,000 young children.<sup>12,13</sup> Maricopa County's drowning rate in the 2000's generally ran 5 times higher than that statewide goal. Nonetheless, the overall decline in the pool death rate during the past 3 decades looks generally similar to the decline in the rate of pool incidents reported by the fire departments shown in **Figure 3**.

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<sup>10</sup> To calculate this rate, the numerator includes non-residents and Arizona residents, age 0-4 years old, whose death occurred in Maricopa County. The denominator, however, is the Maricopa County population of children 0-4 years old. We chose this unconventional method for calculating the rate because we occasionally encounter nonresident visitors whose incident and death occurred in Maricopa county. We count these cases because the Drowning Prevention Coalition is focused on reducing the number of local incidents regardless of whether the child is a county resident or a visitor.

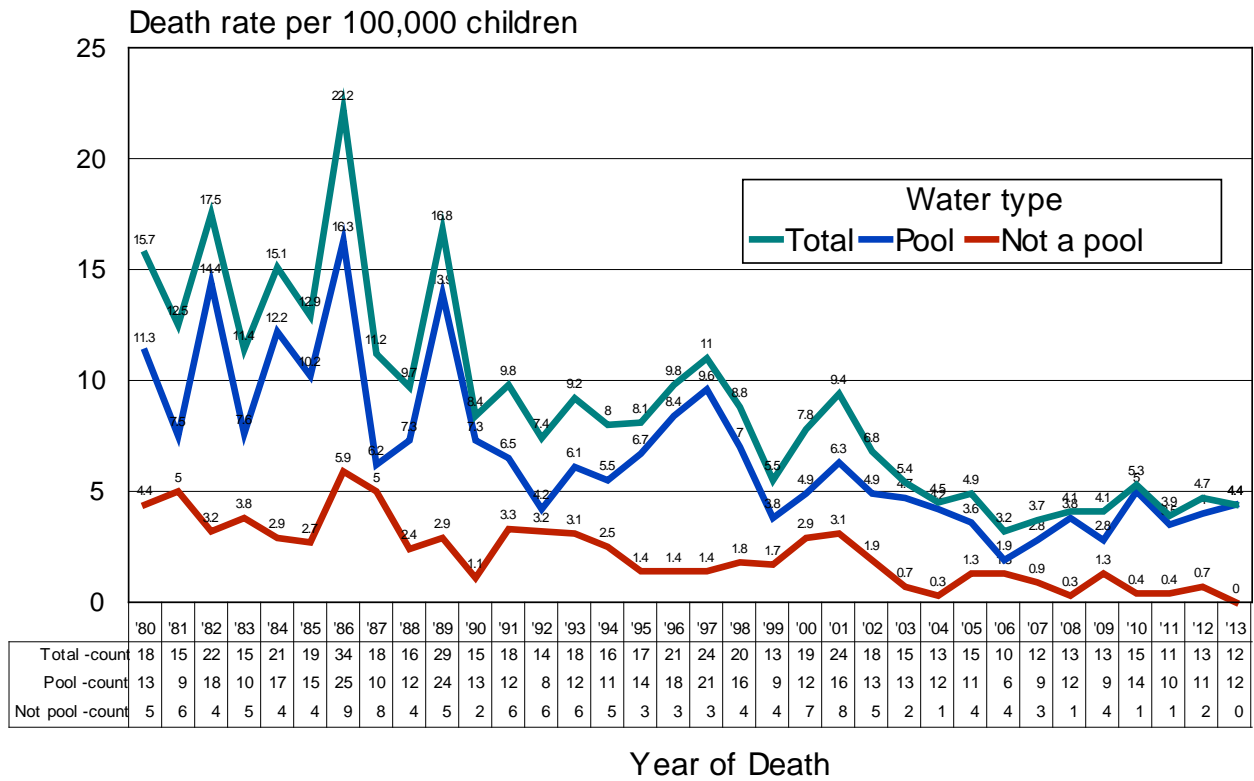
<sup>11</sup> We consider a hot tub or spa in the same category as swimming pool.

<sup>12</sup> U.S. Department of Health and Human Services. *Healthy People 2010*, 2<sup>nd</sup> ed., Volume 2. Injury Prevention, Section 15-29: Reduce Drownings, page 15-40. U.S. Government Printing Office, November 2000.

<sup>13</sup> <http://www.azdhs.gov/bems/trauma-pdf/injuryprevplan.pdf> ADHS Injury Surveillance and Prevention Plan, 2002-2005.

**Figure 10. Drowning death rate for children, 0-4 years of age, where the occurrence of the death and the incident was in Maricopa County. [Data Source: ADHS, Vital Statistics, death certificates coded with underlying cause of death as: E830, E832, or E910 (prior to year 2000); or W65-W74, V90-V92, or Y21 (year 2000 and later). Manner of death: accidental or undetermined].**

**Child drowning rate and count in Maricopa County, Arizona**  
Deaths occurring in 1980-2013; 0-4 years of age





## DISCUSSION

The rates of child incidents and deaths in pools in Maricopa county for the early part of the 2010 decade have been cut by a half compared to the rates seen in the 1980's or 1990's. Informal conversations with the Board of the Drowning Prevention Coalition of Arizona have not identified a specific factor that explains this favorable trend. However, we believe that a combination of factors contributes to this trend: pool safety awareness campaigns sponsored by private and public sectors; intense media support in reporting individual incidents; widely publicized prosecution of cases of gross negligence; prompt use of CPR; and the slowly accumulating, favorable impact of pool barrier laws passed in the early 1990s. Further reduction of the drowning death rate could be achieved through wider use of barriers (eg, fences) and working gates.

In 2009 a journal article was published that showed a reduced risk of drowning among children age 1-4 years who received formal swim lessons compared to those children who had not received such lessons.<sup>14</sup> The Maricopa surveillance system does not determine the swimming ability of the young children. The Coalition may wish to consider adding this factor to the data collected locally.

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<sup>14</sup> Brenner RA, Taneja GS, Haynie DL, et al. Association between swimming lessons and drowning in childhood. *Arch Pediatr Adolesc Med.* March 2009; 163(3):203-210.

**INCIDENT REPORT FORM: DROWNING  
OR NEAR-DROWNING IN ARIZONA – 2013**

DATE OF INCIDENT \_\_\_\_\_ : HOUR \_\_\_\_\_ : AGE \_\_\_\_\_ SEX \_\_\_\_\_ INCIDENT # \_\_\_\_\_  
(MM/DD/YR) (24:00) (yrs)

PLAT or ZIP CODE \_\_\_\_\_

(Reporting agency)

FIRE DEPT. \_\_\_\_\_

**CITY OF INCIDENT:**

- Chandler  Mesa  Rural area  
 Gilbert  Peoria  Scottsdale  
 Glendale  Phoenix  Tempe  
 Other: \_\_\_\_\_

**RACE/ETHN:**

- Hispanic  White  Amer. Indian  
 Black  Asian/PI  Unknown  
 Other: \_\_\_\_\_

**WATER TYPE:**

- Pool--in ground  Spa  
 Pool--above ground  Bathtub  
 Canal or Irrigation Ditch  Bucket  
 Lake  Other: \_\_\_\_\_

**AT WHOSE HOME DID INCIDENT OCCUR:**

- Victim's Home  Neighbor's  
 Relative's  Friend's  
 Not at a home \_\_\_\_\_

**TYPE OF DWELLING OR FACILITY:**

- Single Home  Apt/Condo  
 Hotel/Motel  Other: \_\_\_\_\_

**ATTIRE OF VICTIM:**

- Swimwear  Swimwear  
 None  Other Clothes

**PATIENT'S ACTIVITY AND LOCATION  
IMMEDIATELY PRIOR TO INCIDENT:**

- Swimming  Playing inside  
 Bathing  Playing outside  
 Other: \_\_\_\_\_

**CHILD SUPERVISION AT TIME OF INCIDENT:**

- Mother  Father  N/A  
 Other (Specify) \_\_\_\_\_

**SUPERVISOR'S ACTIVITY PRIOR TO INCIDENT:**

- Sleeping  Watching TV  On phone  
 Yard work  Housework  Other: \_\_\_\_\_

**STATUS OF PATIENT WHEN FOUND IN WATER:**

- Submerged  Floating  
 Struggling  Unknown  
 Other: \_\_\_\_\_

**RESPIRATORY EFFORT WHEN PULLED  
FROM WATER:**

- Present  Absent

**ESTIMATED DURATION OF ANOXIA:** \_\_\_\_\_

**RESCUER(S) ACTIONS PRIOR TO FD ARRIVAL:**

- Chest compressions AND breaths (CPR)  
 Chest compressions only  
 Rescue breaths only  
 None attempted  Unknown

**For pool incidents at dwellings AND patient < 6 y/o:**

**BARRIER**

- | BARRIER                           | IS IT PRESENT?   |
|-----------------------------------|--|
| Fence between house and pool      | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Gates Self-Close with Latch       | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Gates Work Properly               | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| House Doors Self-Close with Latch | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Doors Work Properly               | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Pool Cover, Type: _____           | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Door or Window Alarm              | <input type="checkbox"/> Yes <input type="checkbox"/> No |

**LIKELY METHOD OF ACCESS TO POOL OR SPA:**

- Supervisor allowed child into pool or deck area  
 No barrier -- child wandered in  
 Climbed (specify): \_\_\_\_\_  
 Child entered unsecured or propped gate  
 Other: \_\_\_\_\_

**DISPOSITION (if known):**

- D.O.A.  
 Transported to: \_\_\_\_\_  
 Died in E.D.  Admitted  
 Treated as outpatient and released  
 P.O.V. transport to: \_\_\_\_\_  
 Evaluated and left on-scene

**FOLLOW-UP & DATE PATIENT WAS LAST SEEN:**

- Died \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
 No Impairment \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
 Impairment \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

**DESCRIBE THE APPARENT CIRCUMSTANCES** (how/why it happened; how child was found & revived): \_\_\_\_\_

(Initials)

(Today's Date)