International Journal of Aquatic Research and Education, 2010, 4, 19-32

Correlation of Pool Drowning Deaths With Number of Residential Swimming Pools by County in Florida, 2005-2007

Michael Lo, Kristal Hall, Lisa VanderWerf-Hourigan, Bob Vincent, and Robert Pryor

Drowning in residential swimming pools is a significant public health problem in Florida. This study aimed to determine the relationship between the number of pools and pool drowning deaths by county in Florida. County property appraisers' offices were surveyed to obtain a statewide census of appraised residential pools. The number of pool drowning deaths was obtained from death certificate records. Approximately 1.1 million residential pools were appraised in 2006, and 262 unintentional, confirmed pool drowning deaths occurred from 2005 through 2007. Statistical modeling showed that for every 10,000 residential pools that a county has, 2.4 additional pool drowning deaths can be expected to occur over three years. This relationship was therefore determined to be linearly correlated. Greater public health impact may be achieved by focusing drowning prevention efforts, especially among young children, in counties with more residential pools, and thus a greater risk of pool drowning.

Drowning is a perennial and endemic problem of public health significance in Florida. Every year, more people drown in Florida than in any other state except California. Florida also has the highest rate of children ages one to four who drown (Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 1999–2006). While both natural and human-made bodies of water are abundant in Florida and both pose drowning hazards, single-family residential swimming pools are a particular problem. Out of 245 unintentional (accidental) pool drowning deaths of older children and adults ages five and above in Florida from 2005 through 2007, 136 (55.5%) drowned in a confirmed, single-family residential swimming pool; 25 (10.2%) drowned in a public or private community pool; 21 (8.6%) drowned in a pool at a hotel or motel; 19 (7.8%) drowned in a pool at a condominium; 16 (6.5%) drowned in a pool at an apartment complex; two (0.8%) drowned in an above-ground pool at home; and one (0.4%) drowned in a pool at a duplex residence (*Florida vital statistics: Death certificate file, 2005–2007*; Florida Department of Revenue, 2006). The remaining 25 (10.2%) drowned in a swimming pool where either its given residential street address could not be confirmed, or

Michael Lo, Lisa VanderWerf-Hourigan, Bob Vincent, and Robert Pryor are with the Florida Department of Health in Tallahassee. Kristal Hall is with the Institute of Public Health at Florida A&M University in Tallahassee.

the existence of an appraised swimming pool could not be confirmed at the given residential street address in county property appraisers' records.

Pool drowning is a problem especially for young children ages one to four. Out of 205 total unintentional drowning deaths of young children ages one to four in Florida from 2005 through 2007, 120 (58.5%) drowned in a confirmed, single-family residential swimming pool; seven (3.4%) drowned in an above-ground or child's swimming pool; one (0.5%) each drowned in a swimming pool at an apartment complex, a condominium, and a hotel; and 34 (16.6%) drowned in a swimming pool where either its given residential street address could not be confirmed, or the existence of an appraised swimming pool could not be confirmed at the given residential street address in county property appraisers' records (*Florida vital statistics: Death certificate file, 2005–2007*; Florida Department of Revenue, 2006). Of the nonpool drownings, 19 (9.3%) of the 205 total unintentional drowning deaths of young children ages one to four drowned in natural bodies of water such as lakes, ponds, and canals; 14 (6.8%) drowned in bathtubs and hot tubs; and one (0.5%) each drowned in a bucket, a washing machine, and a septic tank. The remaining five (2.4%) drowned in unspecified bodies of water, although a single-family residential swimming pool was confirmed at each of the given street addresses.

In 2005, the Florida Department of Health, Office of Injury Prevention received a grant from the Centers for Disease Control and Prevention (CDC) to strengthen its core public health injury surveillance and prevention capacity. Funding from this grant has renewed a state-led drowning prevention effort in Florida, focusing on young children, ages one to four. Central to this effort is an annual, early childhood drowning prevention awareness campaign called "Keep Your Eyes on the Kids" that begins in April every year (Ragan et al., 2007, November). Led by county health departments and assisted by other local partners such as the Department of Health's Children's Medical Services area offices, Safe Kids coalitions and chapters, and other public and private organizations and individuals, this campaign raises public awareness of the need for active adult supervision of young children in and around water, particularly residential swimming pools, through the distribution of "Water Watcher" tags, educational materials, and other promotional items, in the top 10–15 counties in Florida that had the most unintentional, early childhood drowning deaths during the previous three years (Ragan et al., 2007, November).

During initial planning in spring 2006 for the state-led drowning prevention effort, it became apparent that although residential swimming pools pose a significant drowning hazard in Florida, the total number of such pools in the state was not known. While information on pool drowning deaths was readily available from death certificate records in the Department of Health's Office of Vital Statistics, by contrast, estimates of the number of private residential swimming pools in each county, and thus the level of community exposure to these bodies of water as potential drowning hazards, were not available in the form of a statewide census. Although a database exists of public pools, spas, and other bathing facilities regulated by the Department of Health's Division of Environmental Health (Florida Department of Health, Division of Environmental Health, Bureau of Facility Programs, 1999–2003), including those at multifamily apartment complexes and condominiums, this database does not include private swimming pools located at single-family residences. This information would have to be gathered from each of Florida's 67 county property appraisers' offices, which appraises residential swimming pools in each county (Figure 1) to

Figure 1 — Counties of Florida.

calculate property tax assessments, to obtain a statewide census of these pools. The opportunity to gather this information became available in summer 2006, when the Office of Injury Prevention employed a graduate public health student intern (K.H.) partially funded by the CDC grant to gather this information under the direction of the office's injury epidemiologist at the time (M.L.).

This paper describes a survey of Florida county property appraisers' offices in the first known statewide census of private residential swimming pools by county in the state of Florida. It also describes the correlation between the number of residential swimming pools in a given Florida county and the number of unintentional drowning deaths in confirmed, single-family residential swimming pools that occurred in that county from 2005 through 2007.

Method

Data Sources

Residential Swimming Pools. Contact information for each county property appraiser's office was obtained from a directory listing on the Florida Department of Revenue website (Florida Department of Revenue, 2006). Each property appraiser's office was contacted individually by electronic mail in June 2006,

explaining the reason for contacting the office and requesting the following information: the total number of private residential swimming pools most recently appraised in that county, and the proportion of these pools that had been appraised since October 1, 2000, when the state's Residential Swimming Pool Safety Act (2000) went into effect, requiring the installation of at least one of the following pool safety features — an enclosed pool barrier, an approved pool cover, exit alarms on all doors and windows leading to the pool area, and/or self-closing latches on all doors leading to the pool area — for all new residential swimming pools built in Florida after that date. One month later, in July 2006, a letter was mailed to those offices that had not responded to the initial electronic mail, and another month later, in August 2006, a telephone call was made to those offices that still had not responded. Information received from the property appraisers' offices was entered into a Microsoft Excel 2003 spreadsheet.

Pool Drowning Deaths. Information on pool drowning deaths was abstracted from a statewide data file of death certificate records maintained by the Department of Health's Office of Vital Statistics (*Florida vital statistics: Death certificate file, 2005–2007*). Cases making up the study population were defined as follows: all deaths with an *International Classification of Diseases, Tenth Edition* (*ICD-10;* World Health Organization, 2006) diagnosis code for underlying cause of death of W67 ("drowning and submersion while in swimming pool"), W68 ("drowning and submersion following fall into swimming pool"), W73 ("other specified drowning and submersion"), or W74 ("unspecified drowning and submersion"), resulting from a drowning or submersion incident that had occurred in a swimming pool located at a private, single-family residence within Florida from 2005 through 2007.

Data Analysis Procedures

Using the SAS statistical software package, version 8.2 (SAS Institute, Cary, NC), a series of filters was applied to the records in the statewide death certificate database to obtain the study population, as described below. First, all deaths resulting from a drowning or submersion incident that had occurred in Florida from 2005 through 2007 with an *ICD-10* underlying cause of death code mentioned above were selected. Second, using the INDEX function in SAS in the manner described by Shelton (2009, June), the free-text fields "INJURY_HOW_OCCUR" and "INJURY_PLACE" were searched for any mention of the word "POOL" in records with an *ICD-10* underlying cause of death code of W73 or W74. Those records in which "POOL" was mentioned were selected and added to the records with an *ICD-10* underlying cause of death code of W67 or W68 for further filtering to obtain the study population. Third, all records were searched in the "INJURY_PLACE," "INJURY_HOW_OCCUR," and "PLACE_DEATH" free-text fields for any mention that the drowning had occurred in a pool at a private residence, using the INDEX function to select records with the following keywords, which were determined by running a FREQ procedure on those fields: "RESID," "HOME," "HOUSE," "YARD," "BACKYARD," "PROPERTY," "DECEDENT'S HOME," "DECEDENT'S POOL," "POOL AT DECEDENT'S HOME," "NEIGHBOR'S POOL," "GRANDPARENT'S POOL," and "BABY SITTERS." Fourth, the "INJURY_HOW_OCCUR" free-text field was searched for any mention that the

drowning had occurred in an above-ground pool, and those records that mentioned this type of pool were excluded from the study population.

The cities indicated in the remaining death certificate records to be where the drowning incidents had occurred were matched to their corresponding counties using a city-county correspondence table on the Florida Department of State website (Florida Department of State, 2008). Finally, a property search was conducted on each of the street addresses in the "INJURY_LOCAT" free-text field in the remaining death records, using the respective county property appraiser's website (Florida Department of Revenue, 2006) of each address and/or Google Maps (Google Inc., Mountain View, CA), to confirm that both a single-family residence and an appraised residential swimming pool existed at each address. Those pool drowning death records with street addresses at which both a single-family residence and a residential swimming pool were confirmed to exist, constituted the cases that made up the final study population.

Data on the number of residential pools in each county, and the number of drowning deaths in confirmed, single-family residential pools in each county, were input into SAS. The REG procedure was then performed to correlate the data using a linear regression model, with the number of residential pool drowning deaths as the dependent variable, and the number of residential pools (expressed in units of 10,000) as the independent variable. These data were plotted in a scatter plot using the Chart Wizard in Microsoft Excel. The rate of residential pool drowning deaths per 10,000 residential pools in each county was calculated and also plotted as a function of the number of residential pools in each county.

Results

Number of Appraised Pools

During the two-month data collection period in summer 2006, 61 of Florida's 67 county property appraisers' offices responded to the residential swimming pool survey, for a response rate of 91%. Sixty counties reported a statewide total of approximately 1.1 million residential pools that had been most recently appraised (Table 1). One county responded that it did not have such data available to report. Approximately 226,000 new pools reported from 49 of the 61 counties that responded, or roughly one-fifth of all residential pools statewide, had been appraised since October 1, 2000 and thus were subject to the pool safety requirements of the state's Residential Swimming Pool Safety Act. Six counties were unable to report the number of new pools that had been appraised since October 1, 2000, and another six counties did not respond at all to the survey. Because property appraisers assess value most often on permanent, in-ground pools and pool/spa installations, the reported data excluded most types of portable, above-ground pools, spas, and hot tubs, that typically are purchased from retail stores and are therefore not subject to real property appraisal.

Number of Reported Drowning Deaths

A total of 262 death records were found in the statewide vital statistics data file that met the inclusion criteria for the study population. These deaths occurred

Table 1 Residential Swimming Pools Appraised, 2006, and Unintentional Drowning Deaths in Confirmed, Single-Family Residential Swimming Pools, 2005–2007, by County in Florida

County	Pools Appraised (× 10,000)	Unintentional Pool Drowning Deaths	Drowning Death Rate Per 10,000 Pools
Alachua	0.70	2	2.86
Baker	0.04	1	24.51
Bay	0.79	0	0.00
Bradford	0.04	0	0.00
Brevard	4.32	12	2.78
Broward	11.32	31	2.74
Calhoun	0.02	0	0.00
Charlotte	2.53	8	3.16
Citrus	1.28	3	2.35
Clay	0.82	0	0.00
Collier	3.49	5	1.43
Columbia	0.11	1	9.12
DeSoto	0.08	0	0.00
Dixie	–	0	–
Duval	2.32	4	1.72
Escambia	0.91	4	4.40
Flagler	0.91	3	3.29
Franklin	0.04	0	0.00
Gadsden	0.05	0	0.00
Gilchrist	0.02	0	0.00
Glades	0.01	0	0.00
Gulf	0.02	0	0.00
Hamilton	–	0	–
Hardee	0.03	0	0.00
Hendry	0.06	0	0.00
Hernando	1.89	6	3.17
Highlands	–	1	–
Hillsborough	7.20	12	1.67
Holmes	0.02	0	0.00
Indian River	1.20	5	4.16
Jackson	0.08	0	0.00
Jefferson	0.03	0	0.00
Lafayette	0.01	0	0.00
Lake	1.41	2	1.42
Lee	6.25	9	1.44
Leon	0.77	1	1.30
Levy	0.08	0	0.00
Liberty	0.01	0	0.00
Madison	0.02	0	0.00
Manatee	2.62	0	0.00
Marion	1.31	4	3.06
Martin	1.65	2	1.21
Miami-Dade	7.65	20	2.62

(continued)

Table 1 *(continued)*

County	Pools Appraised (× 10,000)	Unintentional Pool Drowning Deaths	Drowning Death Rate Per 10,000 Pools
Monroe	0.47	2	4.28
Nassau	0.29	1	3.47
Okaloosa	1.10	3	2.73
Okeechobee	0.07	0	0.00
Orange	6.11	18	2.95
Osceola	1.89	8	4.22
Palm Beach	10.15	27	2.66
Pasco	2.98	9	3.02
Pinellas	6.55	15	2.29
Polk	2.93	9	3.07
Putnam	0.12	0	0.00
Santa Rosa	0.65	3	4.61
Sarasota	4.50	14	3.11
Seminole	3.81	3	0.79
St. Johns	1.00	3	3.01
St. Lucie	1.83	4	2.19
Sumter	0.17	2	11.82
Suwannee	–	0	–
Taylor	–	0	–
Union	–	0	–
Volusia	2.76	5	1.81
Wakulla	0.04	0	0.00
Walton	–	0	–
Washington	0.03	0	0.00
Florida	109.56	262	2.39

Note. Counties that did not report the number of residential swimming pools appraised are indicated by a dash (—).

throughout the year, but were highest in July and August over the three-year period examined in this study (Table 2). The 55% increase in the number of these deaths, from 67 in 2005 to 104 in 2007, appears to be real and not an artifact of improved reporting since the Florida death certificate was expanded in 2005 to capture additional circumstantial information, as all drowning deaths coded W67 or W68 had increased 72% during this time period as well. Approximately 10% of these records (27) were miscoded with an *ICD-10* underlying cause of death code of W73 or W74, when the free-text fields indicate that these deaths had in fact resulted from a drowning or submersion incident in a pool and thus should have been coded W67 or W68. Males accounted for 65.6% of these deaths; non-Hispanic Whites, 65.6%; and young children ages one to four, 45.8% (Table 3[ID]TBL3[/ID]). The higher proportions of these strata relative to other demographic groups are consistent with those described as being at higher risk in previous studies of swimming pool drowning deaths in Florida (Calder & Clay, 1990; Liller et al., 1993; Nichter & Everett, 1989; Pryor, 1999; Rowe, Arango, & Allington, 1977).

Table 2 Unintentional Drowning Deaths in Confirmed, Single-Family Residential Swimming Pools in Florida, 2005–2007, by Month and Year

Month	2005	2006	2007	Total
January	4	5	9	18
February	2	7	6	15
March	5	7	7	19
April	7	9	6	22
May	4	8	15	27
June	5	12	9	26
July	12	11	10	33
August	8	11	16	35
September	6	7	10	23
October	4	8	7	19
November	7	2	4	13
December	3	4	5	12
Total	67	91	104	262

Table 3 Demographic Profile of Unintentional Drowning Decedents of Confirmed, Single-Family Residential Swimming Pools in Florida, 2005–2007

Group	No.	%
Sex		
Male	172	65.6
Female	90	34.4
Race and Hispanic Origin		
White, Non-Hispanic	172	65.6
Black, Non-Hispanic	32	12.2
Hispanic, All Races	50	19.1
Other	8	3.1
Age		
<1 year	6	2.3
1–4 years	120	45.8
5–14 years	16	6.1
15–24 years	11	4.2
25–44 years	16	6.1
45–64 years	44	16.8
≥ 65 years	49	18.7

Of the 120 young children ages one to four who drowned in confirmed, single-family residential swimming pools, 82 (68.3%) drowned in a pool at their own home; nine (7.5%) drowned in a pool at a grandparent, uncle, or other relative's home; five (4.2%) drowned in a pool at a friend's home; five (4.2%) drowned in a pool at a neighbor's home; and one (0.8%) each drowned in a pool at a babysitter's home, a summer home, or a vacation rental house. Sixteen (13.3%) drowned in a pool at a home of another or an unspecified individual.

Relationship Between Number of Pools and Drowning Deaths

A statistically significant linear regression model, $F(1, 58) = 519.61$, $p < .01$, was generated with a high positive correlation ($r^2 = 0.90$) between the number of residential pools appraised in each county and the number of drowning deaths that occurred in confirmed, single-family residential pools in each county. According to this model, which is plotted in Figure 2, for every 10,000 residential pools that a county has, 2.4 additional pool drowning deaths ($\beta = 2.43$) can be expected to occur over a three-year period, which was statistically significant: $t(1) = 22.79$, $p < .01$. In the counties where these pool drowning deaths had occurred, however, the rate of pool drowning deaths per 10,000 pools appears to decrease exponentially as the number of residential pools increases, asymptotically approaching zero along both axes (Figure 3).

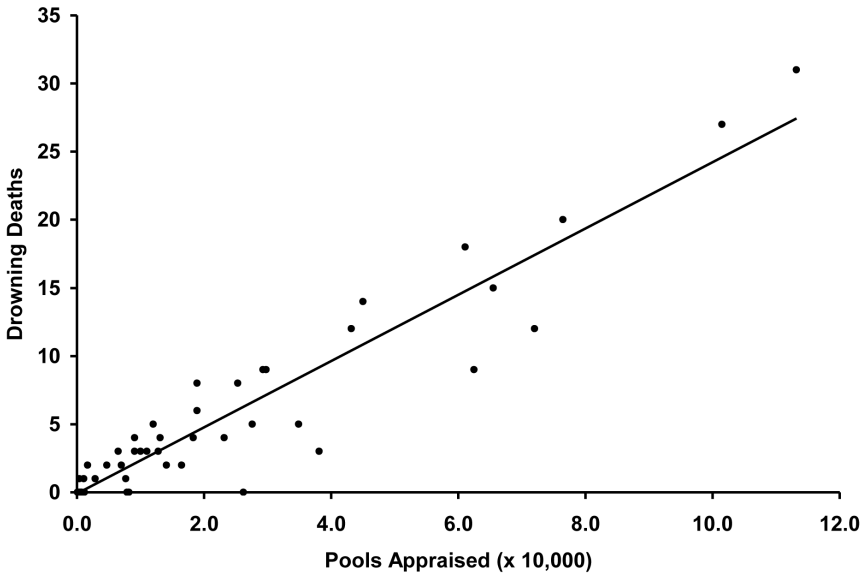

Figure 2 — Unintentional drowning deaths in confirmed, single-family residential swimming pools, 2005–2007, by residential swimming pools appraised, 2006, by county in Florida.

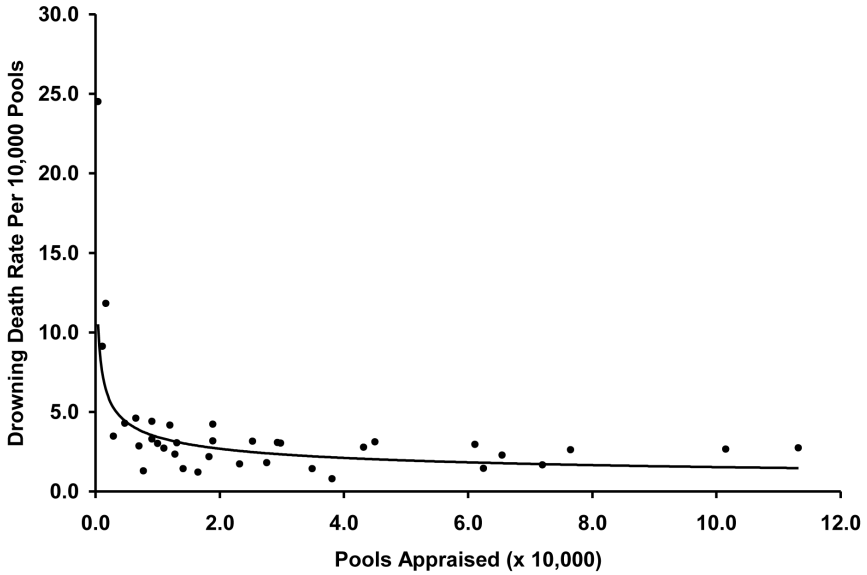

Figure 3 — Unintentional drowning death rate per 10,000 residential swimming pools, 2005–2007, by residential swimming pools appraised, 2006, by county in Florida. Note. Only counties in which drowning deaths in confirmed, single-family residential swimming pools had occurred are shown.

Discussion

The purpose of this study was to determine the relationship, if any, between the number of residential pools and the number of residential pool drowning deaths within a defined geographic area and time period. While one would intuitively expect that the total number of pool drowning deaths would be directly proportional to the total number of pools within a defined area (T. Lachocki, personal communication, January 30, 2006), pool industry professionals have observed that the rate of drowning deaths per pool actually appears to be inversely proportional to the total number of pools, at least on a national level (T. Lachocki, personal communication, January 30, 2006; Muñoz, 22 May 2008). They note that since the number of pools and hot tubs in the U.S. increased from approximately 12.5 million in 2002 to over 15 million in 2007, the number of pool drowning deaths of children under age five, which rose from an annual average of 267 during 2002–2004 to 283 during 2003–2005, according to the Consumer Product Safety Commission (as cited in Muñoz, 22 May 2008), has actually decreased per pool.

To determine this relationship using Florida data, a survey of Florida county property appraisers' offices was conducted in the first known statewide census of private residential swimming pools by county in the state of Florida. Correlated with data on the number of residential pool drowning deaths abstracted from a statewide data file of death certificate records, a linear regression model was generated that predicts the number of unintentional drowning deaths in residential pools

that can be expected to occur in a given county over a three-year period, for every 10,000 residential pools that a given county has. A scatter plot of the data visually confirms that as the total number of residential pools per county increases, the total number of residential pool drowning deaths per county also increases in a direct linear correlation. When the total number of residential pool drowning deaths in each county is divided by and plotted against the total number of residential pools in each county, there is evidence that counties with a smaller number of pools have a higher rate of drowning deaths per pool, thus confirming the observation made by the pool industry (T. Lachocki, personal communication, January 30, 2006; Muñoz, 22 May 2008).

Several implications of this study for public health efforts to prevent unintentional pool drowning should be noted. This study presents a novel epidemiologic rate, drowning deaths per unit pools, for measuring the incidence of unintentional pool drowning deaths within a defined geographic area over a given period of time. The advantage of using this rate is that it expresses the incidence of pool drowning deaths in terms of the number of swimming pools within a given area at the midpoint of the time period studied, rather than in terms of the resident population within the area at risk for unintentional pool drowning, as the denominator in a cumulative incidence rate is usually expressed (Friedman, 1994; Friis & Sellers, 1996; Hennekens & Buring, 1987). Since incidence is expressed in terms of the number of pools rather than the number of residents at risk, pool drowning deaths that occur to visitors to a given area, who are not part of the resident population, can be included in this rate, whereas they would be excluded from a cumulative incidence rate (Johnson & Sarmiento, 2006). Only 35 (13.4%) of the 262 pool drowning deaths examined in this study had occurred to visitors who were not residents of the counties in which they drowned, 11 of whom were young children ages one to four. These children had drowned while visiting the home of a friend, grandparent, other relative, or other unspecified person who owned a pool, or while on vacation at a summer home or vacation rental house with a pool.

While there is evidence that the rate of drowning deaths per pool is higher in some counties with fewer pools, the small number of pools in these counties, which tend to be more rural and less populated, makes this rate statistically unstable, such that the occurrence of one or two drowning deaths would result in a sharp upward fluctuation of this rate. Greater public health impact on reducing the state's drowning death rates per unit population may be achieved, therefore, by focusing drowning prevention efforts, especially among young children ages one to four, in areas where there are larger populations and more pools, and thus more people at greater risk of drowning from exposure to these pools. For this reason, the Office of Injury Prevention has chosen to focus its annual "Keep Your Eyes on the Kids" drowning prevention awareness campaign in the top 10–15 counties in Florida with the most unintentional, early childhood drowning deaths. These counties not surprisingly happen to be the state's most populous counties.

This study is the first known that attempts to correlate the number of residential pool drowning deaths in Florida with the number of residential pools at the county level. This study is also the first known to evaluate the relative accuracy of *ICD-10* underlying cause of death coding of unintentional pool drowning deaths in Florida, using free-text fields that were not available in the statewide death certificate data file before 2005 to validate the *ICD-10* codes. To minimize misclassification error,

each drowning location address was checked against county property appraisers' records to confirm the existence of an appraised (usually in-ground) residential swimming pool at that address. Because of this extra step of validating each pool drowning location address, estimates of the incidence of drowning deaths in single-family residential swimming pools in Florida that are presented here may be more conservative than the number of such deaths that death certificate records alone would indicate. In addition, it was assumed that the vast majority of the appraised pools reported by the county property appraisers' offices were located at private, single-family residences.

One limitation of this study was that it did not examine the circumstances of each pool drowning death that was investigated by the district medical examiner's office and are available in the death investigation report (V. Pryor, personal communication, April 10, 2009). Ragan et al. (2007, November) had obtained redacted Florida medical examiner reports from the Consumer Product Safety Commission on 58 unintentional pool drowning deaths of young children ages one to four occurring from 2003 through 2006 and found that in almost three-quarters of these cases, the child had accessed the pool area through a door from the home. Data on unintentional pool drowning morbidity derived from statewide emergency department and hospital inpatient discharge records available from the Florida Agency for Health Care Administration (2008, May 27; 2008, September 19a; 2008, September 19b) were also not used in this study due to the lack of a specific *ICD-9-CM* E-code for unintentional drowning in swimming pools (Hart & Hopkins, 2004) and the lack of information on the county in which the drowning incident had occurred (Florida Agency for Health Care Administration, 2008, May 27; 2008, September 19a; 2008, September 19b).

This study did not include drowning deaths in temporary, above-ground swimming or wading pools, spas, and hot tubs, as well as ornamental ponds and fountains that have become increasingly popular around the home in recent years (C. Thomas, personal communication, November 16, 2004). Systematic public health surveillance and prevention of drowning incidents in these emerging drowning hazards, which have been known to occur (Consumer Product Safety Commission, 2005, 2007, 2008; C. Thomas, personal communication, November 16, 2004), are therefore needed, especially for young children, who often drown unnoticed during a momentary lapse in adult supervision (Liller et al., 1993; Nichter & Everett, 1989; Ragan et al., 2007, November; Rowe, Arango, & Allington, 1977). Given the perennial risk of unintentional drowning in Florida, especially to young children, a minimum level of public awareness to be vigilant around all drowning hazards, particularly residential swimming pools, should be sustained year-round if possible (Calder & Clay, 1990; Liller et al., 1993; Mulligan et al., 2007; Nichter & Everett, 1989; Ragan et al., 2007, November; Rowe, Arango, & Allington, 1977). The passive use of pool safety features, such as those required by Florida's Residential Swimming Pool Safety Act, should also be promoted as part of an overall residential pool safety strategy consisting of multiple layers of protection (National Drowning Prevention Alliance, 2005). These safety features should never substitute for active adult supervision of young children and other vulnerable individuals in and around residential swimming pools or any other body of water that poses a drowning hazard.

Acknowledgments

This study was partially supported by grant/cooperative agreement U17/CCU424766-01 from the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the CDC. The authors thank the Florida county property appraisers' offices that participated in this study, and Kyla Shelton, Office of Injury Prevention, Florida Department of Health, for technical assistance in analyzing the free-text fields in the death certificate database.

References

Calder, R.A., & Clay, C.Y. (1990). Drownings in Florida 1977-1986. *The Journal of the Florida Medical Association, 77*(7), 679–682.

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. (1999-2006). *Web-based Injury Statistics Query and Reporting System (WISQARS)* [Online interactive database]. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control Web site: http://www.cdc.gov/injury/wisqars/index.html. Retrieved September 23, 2009.

Consumer Product Safety Commission. (2005, 2007, 2008). *National Electronic Injury Surveillance System (NEISS) On-line* [Online interactive database]. Consumer Product Safety Commission Web site: http://www.cpsc.gov/LIBRARY/neiss.html. Retrieved September 25, 2009.

Florida Agency for Health Care Administration. (2008, May 27). *Emergency department (ED) data public data file layout, effective January 2005*. Available at: http://www.floridahealthfinder.gov/Researchers/OrderData/order-data.shtml. Retrieved December 15, 2008.

Florida Agency for Health Care Administration. (2008, September 19a). *Hospital inpatient data file (includes psychiatric hospitals-beginning 1997) file description form and public data file layout, valid thru December 31, 2005*. Available at: http://www.floridahealthfinder.gov/Researchers/OrderData/order-data.shtml. Retrieved December 15, 2008.

Florida Agency for Health Care Administration. (2008, September 19b). *Hospital inpatient data file (includes psychiatric hospitals) file description form and public data file layout, effective January 2006*. Available at: http://www.floridahealthfinder.gov/Researchers/OrderData/order-data.shtml. Retrieved December 15, 2008.

Florida Department of Health, Division of Environmental Health, Bureau of Facility Programs. (1999-2003). [Permitted swimming pools and spas in Florida, by county]. Unpublished raw data.

Florida Department of Revenue. (2006). *Contact list for property appraisers in Florida*. Available at: http://www.myflorida.com/dor/property/appraisers.html. Retrieved June 19, 2006.

Florida Department of State. (2008). *Florida Cities - U.S. Census*. Available at: http://dlis.dos.state.fl.us/library/FLCollection/FLcities.cfm. Retrieved November 30, 2008.

Florida vital statistics: Death certificate file, 2005-2007 [Data file]. Jacksonville, FL: Florida Department of Health, Office of Vital Statistics.

Friedman, G.D. (1994). *Primer of epidemiology*. New York: McGraw-Hill.

Friis, R.H., & Sellers, T.A. (1996). *Epidemiology for public health practice*. Gaithersburg, MD: Aspen.

Hart, A.C., & Hopkins, C.A. (Eds.) (2004). *2005 ICD-9-CM expert for hospitals, volumes 1, 2 & 3*. Salt Lake City, UT: Ingenix.

Hennekens, C.H., & Buring, J.E. (1987). *Epidemiology in medicine*. Boston: Little, Brown.

Johnson, R.L., & Sarmiento, K. (2006). *State injury indicators: Instructions for preparing 2004 data*. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.

Liller, K.D., Kent, E.B., Arcari, C., & McDermott, R.J. (1993). Risk factors for drowning and near-drowning among children in Hillsborough County, Florida. *Public Health Reports, 108*(3), 346–353.

Mulligan, D.A., Wang, C.A., Doldren, M.A., & Ham, L.S. (2007, June). *Broward County and Miami-Dade County, Florida drowning prevention practices pilot study*. Available at: Nova Southeastern University, Institute for Child Health Policy Web site: http://www.nova.edu/ichp/research/forms/drowning_prevention_study.pdf. Retrieved January 1, 2009.

Muñoz, S.S. (2008, May 22). Child drownings rise, spark safety concerns. *The Wall Street Journal*. Available at: http://online.wsj.com/article/SB121141083022412295.html. Retrieved December 13, 2008.

National Drowning Prevention Alliance. (2005). *National Drowning Prevention Alliance: Our core beliefs*. Available at: http://www.ndpa.org/home/index.htm. Retrieved January 19, 2009.

Nichter, M.A., & Everett, P.B. (1989). Profile of drowning victims in a coastal community. *The Journal of the Florida Medical Association, 76*(2), 253–256.

Pryor, V.L. (1999). *Florida drowning deaths 1992-1998: An in-depth study of non-intentional drowning utilizing death certificate data*. Tallahassee: Florida Department of Health, Office of Injury Prevention.

Ragan, P., Schulte, J., Lo, M., & VanderWerf-Hourigan, L. (2007, November). *Analysis of Florida pool drowning deaths in young children*. Poster session presented at the annual meeting of the American Public Health Association, Washington, DC.

Residential Swimming Pool Safety Act, 23 Fla. Stat. Ch. 515 (2000).

Rowe, M.I., Arango, A., & Allington, G. (1977). Profile of pediatric drowning victims in a water-oriented society. *The Journal of Trauma, 17*(8), 587–591.

Shelton, K. (2009, June). *Beyond the ICD code: Identifying and describing unintentional swimming pool drownings in Florida using death certificate text fields*. Paper presented at the annual conference of the Council of State and Territorial Epidemiologists, Buffalo, NY.

World Health Organization. (2006). *International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Version for 2007*. Available at: http://www.who.int/classifications/apps/icd/icd10online/. Retrieved July 5, 2008.