

# Child and Adolescent Drownings in Harris County, Texas, 1983 through 1990

## ABSTRACT

**Objectives.** This study described childhood drowning rates and circumstances in Harris County, a large metropolitan area in Texas, and compared case ascertainment between data sources.

**Methods.** Drowning rates among Harris County residents newborn through 19 years of age were calculated from death certificate data (1983 through 1989), and local childhood drowning hazards were described on the basis of medical examiner data (1983 through 1990). Cases from both sources were compared to determine sensitivity of sources.

**Results.** The drowning rate among Harris County residents newborn through 19 years of age was 3.8 per 100 000 person-years. The drowning rates among Blacks and Hispanics exceeded that of Whites by 56% and 19%, respectively. The majority of the 196 unintentional drownings occurred in swimming pools. Half of the pool drownings occurred in apartment pools and 33% in private home pools. The medical examiner logbook identified a slightly higher number of drownings than did death certificates. *International Classification of Diseases* external cause of death codes were of limited use in describing drowning circumstances.

**Conclusions.** Childhood drowning hazards not previously reported were identified, specifically hazards in apartment pools and those among Hispanic children. (*Am J Public Health*. 1994;84:593-598)

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### Introduction

Drowning is the second leading cause of unintentional injury fatalities among persons newborn through 19 years of age.<sup>1</sup> Drowning patterns vary by geographic area, depending on the local physical and social environment<sup>2</sup>; therefore, community drowning site and victim profiles are necessary to tailor prevention programs appropriate for that community.<sup>3</sup> The three objectives of this study were to determine rates of drowning among Harris County, Texas, residents newborn through 19 years of age, to describe victims and circumstances for child and adolescent drownings occurring in Harris County, and to compare case ascertainment of death certificates and medical examiner files.

### Methods

The two data sources used for this study were the Texas Department of Health computerized death certificate file and the Harris County medical examiner files. Data from the death certificates were used to calculate drowning rates for Harris County residents, and data from the medical examiner files were used to describe victims and circumstances for drownings occurring in Harris County. Data from both sources were used to determine the sensitivity of each source for case ascertainment.

Texas computerized death certificate data were available for the years 1983 through 1989. Records for Harris County residents were abstracted from the death certificate file if the person was younger than 20 years of age and the cause of death was drowning. Drowning was defined according to the *International Classification of Diseases* ninth revision (ICD-9) external cause of death

codes E830 (accident to water craft causing submersion), E832 (other accidental submersion or drowning in water transport accident), E910 (accidental drowning and submersion), E954 (suicide and self-inflicted injury by submersion), E964 (assault by submersion), and E984 (submersion undetermined whether accidentally or purposefully inflicted).<sup>4</sup>

Injury rates were calculated per 100 000 person-years. The numerators for Harris County rate calculations included only residents of Harris County. Harris County population estimates by age, sex, and race/ethnic group for each of the years 1983 through 1989 were obtained from the Texas Department of Health, Bureau of State Health Data and Policy Analysis.<sup>5</sup> For deaths coded E910 (unintentional drownings excluding boating-related drownings), Harris County resident drowning rates were compared with drowning rates from Texas and the United States. Texas drowning frequencies and annual population estimates were obtained from the Texas Department of Health, Bureau of State Health Data and Policy Analysis,<sup>5</sup> and US drowning frequencies and annual population estimates were obtained from the National Center for Health Statistics.<sup>6</sup> Age- and sex-adjusted rates were calculated with the 1980 US popu-

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**Editor's Note.** See related editorials by Pless (p 537) and Kaufer Christoffel (p 539) in this issue.

**TABLE 1—Age and Sex-Specific Drowning Rates per 100 000 Person-Years for Harris County, Texas, Residents Newborn through 19 Years of Age, 1983 through 1989, and Male to Female Drowning Rate Ratios (RRs)**

	Males			Females			Male: Female RR	Total			
	No. Cases <sup>a</sup>	Rate <sup>b</sup>	95% CI	No. Cases <sup>a</sup>	Rate <sup>b</sup>	95% CI		No. Cases <sup>a</sup>	Population	Rate <sup>b</sup>	95% CI
Age group											
<1 y	6	3.52	1.29, 7.68	17	10.62	6.19, 16.98	0.3	23	330 491	6.96	4.41, 10.44
1–4 y	58	7.98	6.10, 10.41	29	4.17	2.79, 6.01	1.9	87	1 421 914	6.12	4.93, 7.60
5–9 y	24	2.74	1.76, 4.09	8	0.95	0.41, 1.88	2.9	32	1 715 245	1.86	1.28, 2.64
10–14 y	33	4.33	2.98, 6.09	8	1.10	0.47, 2.17	3.9	41	1 488 570	2.75	1.97, 3.73
15–19 y	56	7.48	5.70, 9.79	4	0.54	0.15, 1.39	13.8	60	1 484 415	4.04	3.11, 5.26
Crude rates	177	5.39	4.64, 6.26	66	2.09	1.63, 2.68	2.6	243	6 440 635	3.77	3.32, 4.29
Age-adjusted rates <sup>c</sup>	...	5.49	4.73, 6.38	...	1.91	1.49, 2.45	2.9	...	...	3.74	3.29, 4.24

Note. CI = confidence interval.

<sup>a</sup>Drowning deaths were identified by death certificates coded with the *International Classification of Diseases* (ninth revision) external cause of death code E830, E832, E910, E954, E964, or E984.<sup>4</sup>

<sup>b</sup>Rate per 100 000 person-years; Harris County annual population estimates for 1983 through 1989 were used to calculate rates.<sup>5</sup>

<sup>c</sup>The 1980 US population newborn through 19 years was used as the standard.

lation younger than 20 years of age as the standard. In calculating 95% confidence intervals (CIs), a Poisson distribution was assumed.<sup>7</sup> For rate calculations, race/ethnic group was classified as Anglo (White), Black, or Hispanic. The Texas Department of Health used a computer program to identify Spanish surnames. All Whites with Spanish surnames were classified as Hispanics, and all Whites with non-Spanish surnames were classified as Anglos.

Drownings among persons younger than 20 years were ascertained through the Harris County medical examiner logbook for the years 1983 through 1990. Information concerning victim, site, and circumstance was recorded if the submersion injury occurred in Harris County. Drug screens consisted of the urine enzyme-multiplied immunoassay technique (EMIT) screen; positive results were confirmed by ultraviolet spectrometry, mass spectrometry, thin-layer or gas chromatography, or a combination of these. Blood alcohol concentrations were recorded in percentage weight of alcohol per 100 mL of blood. Blood alcohol determinations were considered valid estimates of blood alcohol at time of injury if the individual survived less than 6 hours after submersion and was tested within 24 hours of death.<sup>8</sup>

The computerized death certificate file does not indicate county of submersion injury, but it does list county of death. Therefore, to determine case ascertainment of each data source, drownings among persons newborn through 19 years of age for whom the

county of death was Harris County were ascertained from death certificates and from the medical examiner logbooks for the years 1983 through 1989.

The cases from each source were matched on the decedent's date of death, date of birth, age, sex, and residence. Sensitivity was computed for each method of case ascertainment as [cases identified/(cases identified + cases missed) × 100].<sup>9</sup> Death certificate records for cases identified only through the medical examiner logbook were sought by searching the computerized death certificates for a case in which the decedent had the same age, race, sex, residence, date of birth, and date of death as the decedent in the case from the medical examiner file. The medical examiner logs were reexamined in an attempt to locate cases ascertained only by the death certificate file.

## Results

Death certificates identified 243 drownings during the years 1983 through 1989 among Harris County residents newborn through 19 years. The county of death was Harris County for 72% of the residents. The remainder died out of state (2%) or in 17 other Texas counties (26%). The crude drowning rate for Harris County residents younger than 20 years was 3.8 per 100 000 person-years (95% CI = 3.3, 4.3), and the age- and sex-adjusted drowning rate was 3.7 per 100 000 person-years (95% CI = 3.3, 4.2).

Drowning rates varied between age groups. Rates were highest among children younger than 5 years (Table 1). The age-adjusted drowning rate for males was 2.9 times higher than the rate for females. The highest drowning rate was for females younger than 1 year. For all other age groups, the rate of drowning for males exceeded the rate for females. Drowning rates varied by race/ethnic group: the age- and sex-adjusted rate per 100 000 person-years for Blacks (5.0; 95% CI = 3.8, 6.4) was 56% higher than that for Whites (3.2; 95% CI = 2.7, 3.9), and the rate for Hispanics (3.8; 95% CI = 2.9, 4.9) was 19% higher than that for Whites. The age-adjusted drowning rate for each sex was highest for Blacks (Table 2).

For drownings coded E910 (unintentional drownings excluding boating-related drownings), age- and sex-adjusted rates per 100 000 person-years in Harris County (3.5; 95% CI = 3.1, 4.0) exceeded the rates for Texas (3.3; 95% CI = 3.1, 3.5) and the nation (2.5; 95% CI = 2.5, 2.6).

For the years 1983 through 1990, the medical examiner logbook identified 214 drownings among persons newborn through 19 years for whom the site of submersion was Harris County. The county of residence in 92% of the cases was Harris County. The nonresidents were from nine other Texas counties (n = 10) and out of state (n = 8). One third of the drowning victims were declared dead at the site of injury.

Files for all cases were retrieved with the exception of one case that had

apparently been misfiled. Limited information available from the medical examiner logbook was used for this case. Deaths were unintentional in 96% (n = 196) of the cases, homicidal in 2% (n = 4), and of undetermined intent in 2% (n = 5). In addition, there were nine newborns who drowned as a result of being delivered into the toilet or bathtub. These birth-related drownings are discussed separately.

### Unintentional Drownings

Medical examiner logs identified 196 unintentional drownings. The annual number of unintentional drownings varied from a high of 31 in 1983 to a low of 19 in 1989; however, this variation does not represent a consistent decline in the number of drownings over the 8-year study period. Of the 187 drownings for which the month of injury was known, 81% occurred in the months April through September. Of the 180 cases for which the day of injury was known, drownings occurred most frequently on Sunday (n = 41) and Monday (n = 36).

The age groups with the highest frequency of drownings were children younger than 5 years of age (n = 108) and teenagers 15 through 19 years of age (n = 42). Seventy-four percent of unintentional drowning victims were male. Forty-seven percent of unintentional drowning victims were White, 28% were Black, and 25% were Hispanic. Of the 162 cases in which information on witnesses was reported, 63% of the submersions were not witnessed. The site of submersion was recorded for 192 of the unintentional drownings; 55% occurred in swimming pools or hot tubs, 13% occurred in bathtubs, 3% occurred in buckets or toilets, and 29% occurred in other bodies of water. Drownings in other bodies of water were most frequently witnessed (73%).

**Swimming pools and hot tubs.** There were 102 drownings in swimming pools and 4 drownings in hot tubs. The children who drowned in hot tubs were aged 16 to 34 months. The children who drowned in pools were most frequently 1- or 2-year-olds.

Swimming pools were the site of the highest percentage of drownings for all age groups under 15 years (Figure 1) and for all race/ethnic groups. Pool drownings occurred in apartment pools (50%), private home pools (33%), public/school pools (11%) and motel/hotel pools (5%). The type of pool in which the

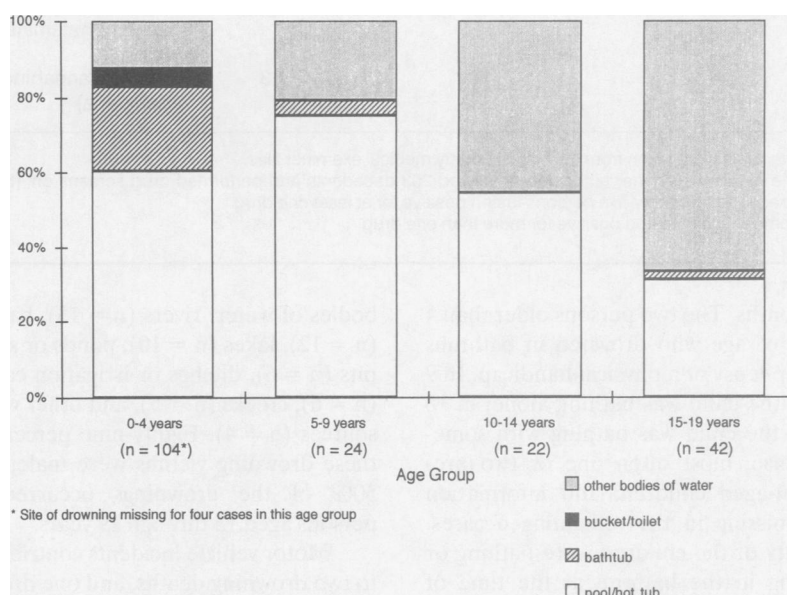
**TABLE 2—Race- and Sex-Specific Drowning Rates per 100 000 Person-Years for Harris County, Texas, Residents Newborn through 19 Years of Age, 1983 through 1989**

	White		Black		Hispanic	
	Females	Males	Females	Males	Females	Males
No. cases <sup>a</sup>	33	83	17	48	16	46
Crude rate <sup>b</sup>	1.97	4.76	2.45	6.87	2.03	5.48
Age-adjusted rate <sup>c</sup>	1.77	4.62	2.39	7.42	1.78	5.76
95% confidence interval	1.22, 2.48	3.70, 5.76	1.39, 3.83	5.47, 9.85	1.02, 2.88	4.21, 7.69

<sup>a</sup>Drowning deaths were identified by death certificates coded with the *International Classification of Diseases* (ninth revision) external cause of death code E830, E832, E910, E954, E964, or E984.<sup>4</sup>

<sup>b</sup>Rate per 100 000 person-years; Harris County annual population estimates for 1983 through 1989 were used to calculate rates.<sup>5</sup>

<sup>c</sup>The 1980 US population newborn through 19 years was used as the standard.



**FIGURE 1—Percentage distribution for location of submersion, by age group, for unintentional drownings that, according to medical examiner files, occurred in Harris County, Texas, 1983 through 1990, among persons newborn through 19 years.**

drowning occurred varied by race/ethnic group. Drownings among Whites most frequently occurred in private home pools, and drownings among Blacks and Hispanics most frequently occurred in apartment pools.

Together, private home pools and apartment pools represented 91% of pool drownings among preschoolers (children younger than 5 years of age). Among preschoolers, 68% of private home and apartment pool drownings occurred at the home of the decedent, and the remaining 32% occurred at the

home of a relative, friend, or neighbor or at a vacant home. Information regarding fencing was seldom recorded and was often incomplete.

**Bathtubs.** Twenty-five unintentional drownings occurred in the bathtub. Bathtubs were the site of drowning for 33% (n = 17) of the females, compared with 6% (n = 8) of the males. Hispanics (n = 14) drowned in bathtubs at a frequency more than twice that of Whites (n = 6) or Blacks (n = 5). Forty-eight percent of the children who drowned in the bathtub were aged 6 to

**TABLE 3—Drugs Detected at Autopsy<sup>a</sup> in Persons Newborn through 19 Years of Age Who Drowned in Harris County, Texas, 1983 through 1990**

Drug Category	No. Persons <sup>b</sup>	% of Persons Testing Positive	Drug Detected	
			Frequency	Name
Not likely to be a causal factor in drowning	10	40	2	Acetaminophen (Tylenol)
			3	Caffeine
			1	Ibuprofen
			12	Nicotine
Likely to have been hospital administered	9	36	4	Lidocaine
			3	Phenobarbital
			2	Phenytoin
			1	Thiopental sodium (Pentothal sodium)
			1	Amitriptyline (Elavil)
Could alter functions needed to prevent injury	6	24	1	Cocaine
			1	Codeine
			2	Diazepam (Valium)
			1	Inhalants
			1	Methylene-dioxy-methamphetamine (ecstasy)
			3	Tetrahydrocannabinol (marijuana)

Note. Data were taken from the Harris County medical examiner files.

<sup>a</sup>The medical examiner autopsied or viewed 203 decedents and performed drug screens on 153 decedents. Twenty-five persons tested positive for at least one drug.

<sup>b</sup>Some persons tested positive for more than one drug.

11 months. The two persons older than 4 years of age who drowned in bathtubs had epilepsy or a physical handicap. In 9 cases the child was bathing alone; in 10 cases the child was bathing with someone else, most often one or two preschool-aged children; and information was missing in the remaining 6 cases. Twenty of the children were bathing or playing in the bathtub at the time of injury, three children fell into water left standing in the bathtub, and the activity of two children prior to drowning was not mentioned.

In all cases in which information on supervision was available ( $n = 23$ ), a lapse in supervision was reported. The length of the lapse was mentioned in 15 cases and ranged from "a few seconds" to 15 minutes, usually 5 minutes or less. The reasons for the lapse were most commonly answering the telephone, performing household chores, or dressing.

**Small containers.** Four unintentional drownings occurred in buckets, and one drowning occurred in a toilet. All five children were aged 9 to 16 months. The buckets were typically 5-gallon buckets containing water with cleaners used for mopping.

**Other bodies of water.** Fifty-six unintentional drownings occurred in other

bodies of water: rivers ( $n = 13$ ), bayous ( $n = 12$ ), lakes ( $n = 10$ ), ponds or sandpits ( $n = 6$ ), ditches or irrigation canals ( $n = 6$ ), creeks ( $n = 5$ ), and other water sources ( $n = 4$ ). Eighty-nine percent of these drowning victims were male, and 50% of the drownings occurred to persons aged 15 through 19 years.

Motor vehicle incidents contributed to two drowning deaths, and one drowning resulted from a boating incident. Of the 45 cases in which activity prior to submersion was reported, 42% of the persons were intentionally in the water at the time of injury, 2% drowned during an attempt to rescue another drowning person, 9% were boating or rafting, and 47% did not intend to enter the water. In half of the cases depth of the water (from 5 inches to 25 feet) was mentioned. Information on personal flotation devices was seldom recorded.

#### *Birth-Related Drownings*

Medical examiner files identified nine newborn drownings resulting from delivery into the toilet or bathtub. Five of these drownings were unintentional, two were intentional, and two were of undetermined intent. Seven of the nine newborns were Black, one was White, and one was Hispanic. Two of the

newborns were premature, and in six cases the mother reported that she did not know she was pregnant before delivery. In three of these cases the mother was living at home with her parents, who also stated that they were unaware of their daughter's pregnancy.

#### *All Drownings*

**Alcohol and other drugs.** Of the 214 cases identified from the medical examiner files, 203 drowning victims were autopsied or viewed, and 84% of these were tested for alcohol, drugs, or both. A blood alcohol analysis was performed on 165 victims, 112 of which met the specified criteria for results representative of blood alcohol concentration at the time of injury. Five of the 112 tested positive, with blood alcohol concentration levels 0.03, 0.04, 0.13, 0.18, and 0.25 g/mL. All positive determinations were for males aged 18 or 19 years. Seventeen other victims tested positive for alcohol; however, in these cases, the representativeness of blood alcohol concentration at time of death either could not be determined or was invalid.

Drug screens were performed on 153 victims, 16% of whom tested positive for at least one drug. When drug screens positive only for drugs that were unlikely to contribute to drowning or drugs that were most likely administered by hospital personnel were eliminated, six persons tested positive for a drug that could have contributed to drowning (one person was also positive for alcohol) (Table 3). With the exception of a newborn who tested positive for diazepam, all persons testing positive for drugs that could have contributed to their deaths were males aged 17 through 19 years. Thirty-five percent ( $n = 9$ ) of all drownings among 17- through 19-year-old males ( $n = 26$ ) were drug or alcohol related.

**Antecedent medical problems.** In 16 cases, antecedent medical problems other than substance use were noted. Three persons experienced acute head injury immediately prior to drowning. One injury resulted from a motor vehicle incident, and two resulted from the individual's hitting his head on the pool while diving or swimming. Eight persons had a history of epilepsy or seizure disorder; four of these were also mentally handicapped. A total of six drownings involved the mentally handicapped. Three drowning victims had other physical handicaps (one was blind, one was

deaf, and one was a quadriplegic as a result of cerebral palsy).

### Data Source Comparisons

For the years 1983 through 1989, drowning deaths that occurred in Harris County, regardless of county of submersion, were ascertained from both the medical examiner records and the computerized death certificates. Together, the data sources identified 222 cases. The medical examiner logbook search ascertained 213 cases for a sensitivity of 96%, and the computerized death certificate search ascertained 208 cases for a sensitivity of 94%.

Of the 14 cases identified only by the medical examiner logbook, no death certificate could be identified for 3 (2 homicides and 1 undetermined intent), and 11 were assigned a death certificate ICD-9 code for a cause of death other than drowning: E908.0, weather-related death (n = 3); 345.9, epilepsy (n = 2); E815.0 and E816.0, motor vehicle accident (n = 2); E901.8, accident due to excessive cold (n = 1); 335.0, Werdnig-Hoffman disease, or infantile spinal muscular atrophy (n = 1); 348.1, anoxic brain damage (n = 1); and 348.5, cerebral edema (n = 1). The nine cases identified only by the death certificate file had cause of death codes E830, accident to watercraft causing submersion (n = 1); E910, unintentional drowning (n = 7); and E964, homicide (n = 1).

E-codes were of limited use for determining the circumstances of the drowning. E-codes agreed with the medical examiner data concerning intent of injury in all but one case; however, analysis of E-codes did not describe location or activity of the victim at the time of submersion (Table 4).

### Discussion

Among persons younger than 20 years, risk groups for drowning in Harris County, Texas, were similar to those reported in other studies on drowning.<sup>2,10,11</sup> However, a unique finding of this study was that 50% of pool drownings occurred in apartment pools and 33% occurred in private home pools. Most studies have reported that the majority of drownings in pools occurred in private home pools and have not specifically addressed apartment pools.<sup>2,12-14</sup> An exception is a study in King County, Washington, that reported that 22% of the drownings in pools occurred in apartment pools and 37% occurred in

**TABLE 4—E-Codes Assigned to Death Certificates Compared with Site of Drowning Recorded by Harris County Medical Examiner for Unintentional Drownings of Persons Newborn through 19 Years of Age Who Died in Harris County, Texas, 1983 through 1989**

Death Certificate File <sup>a</sup>		Medical Examiner File						Total
		Boating	Bath	Hot Tub	Pool	Other	Bucket	
E830	Accident to watercraft causing submersion	1	...	...	...	...	...	1
E910.4	Accidental drowning or submersion in bathtub	...	1	2	...	...	...	3
E910.8	Other accidental drowning or submersion including drowning in quenching tank or swimming pool <sup>b</sup>	...	26	2	91	50	7	176
E910.9	Unspecified accidental drowning or submersion including fall into water not otherwise specified and drowning not otherwise specified	...	...	...	4	2	...	6
Total		1	27	4	95	52	7	186

Note. Table excludes five cases for which place of injury was unspecified in the medical examiner file.

<sup>a</sup>E-codes are *International Classification of Diseases* (ninth revision) external cause of death codes.<sup>4</sup>

<sup>b</sup>There were no drownings coded E910.0, accidental drowning or submersion while water skiing; E910.1, accidental drowning while engaged in other sport or recreational activity with diving equipment; E910.2, accidental drowning or submersion while engaged in other sport or recreational activity without diving equipment; or E910.3, accidental drowning or submersion while swimming or diving for purposes other than recreation or sport.

private home pools.<sup>3</sup> Further study is needed to determine whether the large percentage of drownings in Harris County apartment pools is explained by the high prevalence of apartment pools in Harris County or by some other factor affecting the safety of the apartment pools.

Drowning prevention is the most effective method for reducing the number of drownings. Although postsubmersion interventions are crucial, one third of the persons who drowned in Harris County never reached the hospital for treatment. Furthermore, survivors of a submersion injury can suffer serious neurologic damage, which can be physically, psychologically, and financially devastating to the child and the child's family.<sup>15</sup>

Individual and societal interventions are two approaches to drowning prevention. Individual interventions include education of the child and the child's supervisor. A national survey of parental knowledge of injury prevention indicated that parents consistently underestimated the risk of drowning to chil-

dren and that they lacked knowledge about risk reduction beyond "being careful."<sup>16</sup> A survey of pool owners in California found that the proportion of the population endorsing risk reduction measures, such as four-sided fencing of pools, greatly exceeded the proportion who adopted safety measures.<sup>17</sup> This gap between knowledge and practice supports the utilization of social interventions such as legislation for effective pool drowning prevention programs, with health education as a useful adjunct. For each age group and drowning site in the present study, the events that led to drowning were diverse and would require different preventive approaches.

Ascertainment of drowning deaths was similar for both data sources. The medical examiner logs were slightly more sensitive than the death certificate file for identifying drownings, but analysis of medical examiner data, which are not computerized in Harris County, is more time-consuming than analysis of the computerized death certificates. It is possible that both methods of ascertainment missed cases, especially cases in

which persons survived for a period of time to die later of secondary complications. Severely brain-damaged victims have an average life span of 12 to 18 months.<sup>15</sup> If the date of death was more than 1 year from the time of injury, the cause of death should be coded on the death certificate as E929.8, late effects of accidental injury;<sup>4</sup> therefore, such a case would not be included in the death certificate analysis of drownings.

The computerized death certificates were of limited use because of their brevity as well as coding methods. Analysis of the effect of interventions such as mandatory four-sided fencing for pools would not be possible with E-codes, because no specific code exists for pool drownings. Although the medical examiner files were more useful than the computerized death certificates for collecting detailed information on drowning, much of the information needed to evaluate current prevention efforts was missing or included only sporadically. A more systematic data collection method is needed to provide the information necessary to accurately evaluate the effectiveness of established and proposed prevention efforts.

Both data sources ascertained deaths, which represent only a portion of submersion injuries. Studies have estimated that there are from 4 to 18 near-drownings per drowning<sup>3,11,18</sup> and that 6% to 16% of near-drowning survivors suffer from brain damage.<sup>3,18,19</sup> Without information on near-drownings, it is not possible to identify causes of trends in drowning. A decrease in the number of drownings could reflect a real decrease in the number of submersion events, or it may mean that improvements in medical technology or emergency medical services have enabled more of those with submersion injuries to recover intact or with neurologic damage. Surveillance of injury incidence and outcome is needed to monitor current prevention efforts and to assess both individual and societal costs of submersion injury.

Although this study provided potentially useful data concerning victims and circumstances of drowning in Harris County, the study was limited by factors inherent to a descriptive study design. An analytic study design is required to test hypotheses concerning drowning determinants and drowning prevention. Areas needing further investigation are many and include drownings in apartment pools, drownings among Blacks and Hispanics, the effects of swimming lessons on drowning rates, the reduction of alcohol use in aquatic settings among teenaged males, factors influencing adolescents' voluntary use of life vests, the relationship between socioeconomic status and drowning, and the risk of drowning among children with disabilities. In addition, data on the outcome of near-drowning incidents are needed to fully describe the impact of submersion injuries and to evaluate prevention efforts. □

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