

## Suicidal Drowning in South Florida

**REFERENCE:** Davis LG. Suicidal drowning in South Florida. *J Forensic Sci* 1999;44(5):902-905.

**ABSTRACT:** Autopsy protocols at the office of the Chief Medical Examiner were reviewed with respect to suicidal drowning. Between July 1, 1994 and June 30, 1998, there were 267 drownings and 873 people committed suicide in Broward County, Florida. Of those, 25 were suicidal drownings, representing 2.86% of all suicides, and overall the 8th leading cause of suicidal death.

When considering suicide in the age group of 65 years and older, ( $n = 239$ ), which accounts for 19.8% of the population and 27.4% of all suicides, drowning represents 6.7% of all suicidal deaths, and within females in this group represents the third most common form of suicidal death (13.8%).

The presence of alcohol or other drugs is less usual in elderly suicide victims than younger victims. Of the 25 drowning suicides, there was a preference for swimming pools, canals, and lakes as the locations of choice. Additional drowning and suicide related criteria were evaluated including marital status, mental health, clothing worn, previous attempts or threats, suicide notes, and personal effects at the scene; with the intention of establishing a profile for drowning by suicide.

Given the relative abundance of water, the suicidal drowning rate appears to be lower than what might otherwise be anticipated.

**KEYWORDS:** forensic science, suicide, drowning, age-related

Broward County, Florida has an estimated population in excess of 1,400,000. Approximately 20% of the population is aged 65 years and over (1). In addition to the ocean and beaches that attract tourists and residents alike, there is an intracoastal waterway, numerous man-made lakes, canals, and approximately 80,000 residential or community swimming pools.

This study was undertaken to determine the prevalence of drowning as a method of committing suicide within this jurisdiction, to develop a profile of the suicidal drowning victim, and to survey the recent literature to compare these findings to those of other communities. Obviously, access to water will impact on the number of drowning suicides within a community, but the question is whether this effect is qualitative or quantitative in a locale with not only a great abundance of water, but also a number of other ways in which suicide is commonly accomplished.

### Materials and Methods

The Office of the Chief Medical Examiner for Florida District 17 is responsible for determining the cause and manner of death and assisting the authorities in the investigation of all unattended, unexpected, or unnatural deaths that occur within Broward County. Complete autopsies are performed on more than 97% of all sui-

cides (100% of all suicidal drownings) and toxicological analyses are performed on more than 99% of all suicides (100% of all suicidal drownings). Death investigation narratives and completed autopsy reports are compiled and maintained at the central office for review.

Autopsy protocols of all drownings determined to be suicidal were reviewed for a four year period from July 1994 to June 1998 with respect to the age and sex of the victim, the presence or absence of ethanol or other drugs, the presence of mental illness, marital status, previous suicide threats, suicide notes, the location of the terminal event, clothing worn, and any personal effects left at the scene. Furthermore, all cases of suicide in victims age 65 years of age and older were reviewed with respect to the method of suicide chosen. The total number of suicides in the population during the study period was also determined.

Suicide as a manner of death was determined using the operational criteria of self infliction and intent similar to those outlined by Rosenberg et al. (2). In cases where there is insufficient information following the autopsy to determine the manner of death, the case is pended until additional investigation and toxicology results are received. At that time, the case is discussed with at least two other Medical Examiners to establish a consensus for determining the manner of death. This method removes some of the pressure associated with an unpopular finding from the attending pathologist, minimizes bias, and strengthens the final conclusion.

In performing a study of this type, access to the case files may be necessary. Although drowning may be the proximate cause of death, any delay between the incident and the death can result in intermediate causes such as anoxic encephalopathy, pneumonia, sepsis or ARDS obscuring the drowning and confusing the data.

### Results

During the study period, Broward County had a total of 873 suicides (29% of all unnatural deaths), with an average annual suicide rate for the county of 15.8 per 100,000 population. Of these, 652 were male and 221 were female. There were a total of 267 drownings for the period, 186 male and 79 female. Twenty-five of the drownings were determined to be suicides, 14 male and 11 female victims. This accounted for 2.86% of the total suicides and 9.36% of the total drownings. The calculated annual rate of suicidal drowning is 0.45/100,000.

The median age of the suicide drowning victims was 74 years with an age range of 25 to 91 years. Of all suicidal drownings, 64% were aged 65 years and above with, 44% being 80 years of age or greater. The median age of the non-suicide drowning victims was 38 years, with a range of 5 months to 94 years. Analysis of suicidal drownings with respect to age and sex is shown in Table 1.

Blood from 24 of the 25 suicide victims was analyzed for the presence of ethanol and other drugs. The victim not tested was in

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an advanced state of decomposition. Six of the victims (24%), four male and two female, tested positive for ethanol. Eight of the victims (32%), five male and three female, tested positive for drugs. All but one of those with ethanol tested positive for at least one other drug (Table 2). In 3 cases, drug levels were, either alone or in combination, beyond the therapeutic range. Two of these three were found in bathtubs and the other was in a residential swimming pool. Autopsy examination substantiated drowning as the immediate cause of death in each case with acute drug intoxication being a contributory cause.

*Place of Death*

With respect to the location of the terminal event, seven deaths occurred in residential swimming pools (28%), six in canals, five in lakes, three in the ocean, two in the intracoastal waterway, and two in bathtubs. This is compared with non-suicide drowning locations in Table 3. Five suicide victims drove to the location where they drowned, the oldest of these was 66 years old.

TABLE 1—Suicidal drowning by age and sex (percent of total).

Age Group	Male	Female	Total
<20	0	0	0
21–30	1 (4)	0	1 (4)
31–40	1 (4)	1 (4)	2 (8)
41–50	0	2 (8)	2 (8)
51–60	2 (8)	1 (4)	3 (12)
61–70	1 (4)	2 (8)	3 (12)
70–80	2 (8)	2 (8)	4 (16)
>80	7 (28)	3 (12)	10 (40)
Total	14 (56)	11 (44)	25 (100)

TABLE 2—Blood alcohol and drug concentrations in suicide victims.

Age	Sex	BAC*	Drug	Concentration
25	Male	0.12 g%	diazepam	trace
62	Male	0.35 g%	diazepam	trace
79	Male	0.13 g%	—	—
84	Male	—	propoxyphene	0.62 mg/L
			norpropoxyphene	2.6 mg/L
39	Male	0.05 g%	temazepam	1.22 mg/L
82	Male	—	fluoxetine	0.38 mg/L
67	Female	—	temazepam	>10 mg/L
			diphenhydramine	0.60 mg/L
			propoxyphene	6.0 mg/L
44	Female	0.09 g%	diphenhydramine	12.3 mg/L
54	Female	0.15 g%	diazepam	trace

\*BAC = blood alcohol concentration.

TABLE 3—Suicidal drowning by location, by percentage.

Location	Suicidal Drowning	Non-Suicidal Drowning
Residence pool	28.0%	37.8%
Canal	24.0%	23.8%
Ocean	12.0%	13.0%
Lake	20.0%	11.4%
Intracoastal waterway	8.0%	5.7%
River	0.0%	3.6%
Bathub or Jacuzzi	8.0%	3.1%
Fountain	0.0%	1.5%

TABLE 4—Suicidal drowning—clothing worn versus location.

Location	Street Clothes*	Underwear Only	Night Wear†	Swimsuit	Nude
Pool	1	0	4	1	1
Canal	5	1	0	0	0
Ocean	2	1	0	0	0
Lake	5	0	0	0	0
ICW‡	2	0	0	0	0
Tub	0	0	0	0	2

\*Street clothes—shirt or blouse; pants, dress, or shorts; underwear; and shoes.

†Night Wear—pajamas, robe, night gown.

‡ICW = Intracoastal Waterway.

*Clothing*

Sixty percent (15/25) of suicide drowning victims were found fully clothed: usually wearing a shirt, pants or shorts, underwear, and shoes. Two people who were dressed in underwear only were found beyond the confines of their residences, one in a canal and one in the ocean. Both apparently undressed and left their clothing nearby. No one in night apparel (pajamas, robe, nightgown, etc.) was found beyond the confines of their residence. Only one person wearing outdoor clothing was found within the confines of the residence and this person used a wheelchair for mobilization (Table 4).

*Mental Status*

Evidence of acute clinical or reactive depression was exhibited by 19 victims (76%). Reasons for depression included the death of a spouse, a turbulent or broken relationship, poor health, “betrayal” by relatives, inability to overcome drug or alcohol addiction, and social isolation. In addition, five victims (20%) had a history of more severe mental illness consisting of psychosis (1 case), bipolar disorder (1 case), delusions (1 case), or schizophrenia (2 cases); three were over age 65. Only one of these five cases was above the median age of 74 years. Only one had no known mental disorder, although her history was incomplete.

*Warnings*

Two cases had made known previous suicide attempts, although seven had recently threatened to commit suicide. A total of 8 persons (32%) left suicide notes detailing their intentions. None of these had made previous attempts or threats. One kept a diary recording her feelings and wrote a check to her sister for the balance of her account. Another woman, whose husband had recently died, left gifts for their health care workers.

*Marital Status*

Eleven victims (44%) were currently married, three were single (the oldest being age 44), and six were previously married. Marital status could not be determined on the remaining five victims.

*Personal Effects*

Personal items left at or near the scene included articles of clothing removed or folded, watches and hearing aids removed, glasses and shoes taken off, and a pill container removed from a pocket.

Also, two of three persons who drowned in the ocean drove their cars into the water, the third left hers nearby. In two other drownings, cars were found by a lake and a canal.

### Elderly Victims

Of the 863 suicides that occurred during the study period, 239 (27.5%) occurred in individuals aged 65 years and older (174 males and 65 females). Sixteen (64%) of the drowning victims in this study were older than 65, with equivalent percentages for male and female. Suicidal drowning accounted for 6.7% of all suicides within this age group, and represented 4.0% of male, and 13.8% of female suicides (Table 5). Only one of six testing positive for ethanol was elderly, but three of eight with positive drug levels were elderly, including two of the three cases in which the drug levels were contributory causes of death. All of those found in night apparel were elderly, the youngest being 83 years old. The location distribution was virtually unchanged for the elderly. Of those who left suicide notes, six of eight were over 65 (four men and two women).

During the study period there were 10 drowning victims whose manner of death could not be determined with confidence, eight male and two female. The median age of 42 years was similar to other non-suicidal drownings. One was a child, two men were unidentified and had no available history, one man had head trauma although there was no known history of assault, and six people had histories only suggestive of suicide.

### Discussion

Florida has the highest state suicide rate (14.9/100,000 population per year) east of the Mississippi River and the eleventh highest rate in the United States. Part of this is attributable to Florida's large elderly population (55% above the national average) who statistically have a suicide rate 50% greater than the national average (McIntosh, JL. USA Suicide:1994 Official Final Statistics [internet]). Broward County's suicide rate of 15.8/100,000 is higher than the state average. The county death rate for drowning is 4.7/100,000. The suicide drowning rate was 0.45/100,000 which ranks below the rates of 0.77/100,000 for Newfoundland (3) and 0.82/100,000 for Miami (4). Pinellas County, Florida reported their rates by ages: 0.45/100,000 for those 21–60 and 1.45/100,000 for those 61–80 (5). That was comparable to findings in this study for the overall suicide drowning and for those 65 and over which was 1.46/100,000. These comparison studies were from the 1980's as no published studies from the current decade were found. As with other forms of suicide, the victims were white and mostly male (56%).

Drowning made up 2.8% of all suicides, making it the 8th most common method of suicide for this county. CDC figures show

drowning to be the 4th most common method of suicide in the state of Florida. In other states, drowning suicides rank from 4th to 9th as the chosen method of suicide. There appears to be some relationship to abundance of water but not a firm correlation. Beside Florida, Maine, and Louisiana rank drowning 4th but so does North Dakota. New Mexico and Nevada rank drowning 9th but California ranks 8th. (National Center for Injury Prevention and Control [internet]) It is therefore apparent that other factors beside the availability of water are involved in the determination of method of suicide.

When considering suicide in the age group of 65 years and older, which accounts for 19.8% of Broward's population (1) and 27.4% of its suicides, drowning represents 6.7% of all suicidal deaths, and for elderly females, suicidal drowning represents the 3rd most common form of suicidal death. Avis (3) reported that drowning was the most common type of suicide in women over 50 at 45.5%. Gowitt and Hanzlick (6) found that drowning in women over 65 was the fourth most common form of suicidal death in Atlanta at 7.9%.

Ethanol and/or drugs were present in only a minority of cases (24%) and then more commonly in the younger victims than the elderly. Various studies have found alcohol intoxication in suicide victims in between 9.1% (3) and 41.4% (4) of cases. Drug and alcohol intoxication is much more common in bathtub drownings than other suicidal drowning locations (7).

The location chosen for the drowning is determined by the availability of options, the mobility of the person, and their mental state. The choice of fewer residence pools but more lakes (secluded) and bathtubs (either private or behind locked doors) than seen in accidental drowning would seem to indicate an attempt to avoid or delay discovery by friends or family until death should have occurred. Age itself was not a limiting factor for location.

Giertsen stated, "In suicidal drownings, the person is usually more or less fully clothed" (8). It appears uncommon, from this study, for a person to commit suicide by drowning at their residence fully clothed or in a public place in a state of undress. The two cases found in their underwear in a public place had undressed just before entering the water.

Previous threats of suicide, previous suicide attempts, or suicide notes were present in only a minority of cases each, but cumulatively, at least one of those was present in 76% of cases in this study.

Suicides occur in married as well as single persons. In interviews, the spouse usually denies any prior knowledge or warning of the suicide.

Personal effects (glasses, hearing aids, walkers, etc.) left at the scene, on a bank or beside a pool, may indicate premeditation and suicidal intent of the person, whereas finding them in the water is more suggestive of a non-suicidal drowning.

There may be other circumstantial evidence at the scene of a suspected suicide drowning which requires an observant investigator. Doors left open between an air-conditioned house and the pool area, obstructions to passage around the pool, or small jobs (planting, knitting, puzzles, etc.) left partially done may indicate lack of suicidal intent. In cases of drowning, suicidal or otherwise, a thorough investigation of the scene may be as important as the autopsy examination, itself (9).

Suicide, for the most part, is a private act. For that reason, it is likely that suicides in general may be underreported because the demonstration of intent or history necessary for a determination of suicide, as indicated by Rosenberg (2), has been concealed either by the deceased or family members.

TABLE 5—Methods of suicide in individuals 65 years of age and older.

Male	Percent %	Female	Percent %
Gunshot wound	60.3	Drug overdose	26.1
Drug overdose	8.0	Jumping	20.0
Jumping	5.7	Drowning	13.8
Asphyxia (plastic bag)	5.7	Gunshot wound	12.3
Hanging	4.6	Asphyxia (plastic bag)	12.3
Asphyxia (CO)	4.6		
Drowning	4.0		

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