

Original Research

A Comparison of Suicide Characteristics and Precipitating Circumstances by Age Group Among Maryland Residents: Data from the Maryland Violent Death Reporting System, 2003-2009

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Submitted to SOL: 27th July 2012; accepted: 29th November 2012; published: 15th December 2012

Abstract: This paper analyzes the characteristics and precipitating circumstances of Maryland resident suicide deaths between 2003 and 2009. All variables are compared across four age groups: 19 and younger, 20-34, 35-64, and 65 and older. Multiple significant differences were observed between the age groups, including cause of death and post-mortem toxicology. Most notable, however, were the differences in precipitating circumstances. Suicides in the youngest age group were most likely to be attributed to a school problem or a non-intimate partner interpersonal problem. Conversely, suicides in the 20-34 and 35-64 age groups were primarily due to occupational or financial issues. Finally, physical health issues and the recent death of a friend or family member seemed to contribute most to elder suicides. These age discrepancies illustrate the need to target suicide prevention to different ages, rather than assessing suicide victims as a singular homogenous group. More focused research and targeted prevention measures would make more efficient use of the limited resources available in this field.

Keywords: Suicide, Violent Death Reporting System, Maryland, Epidemiology

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According to the Centers for Disease Control and Prevention (2012), nearly 37,000 individuals took their lives in the United States in 2009, which translates to more than 100 suicides per day. The national suicide rate is approximately 12 per 100,000 population. Suicide is a significant public health problem that needs to be addressed, but the characteristics and precipitating circumstances of these deaths vary to a great extent when the victims are evaluated as one homogenous group. Therefore, prevention experts often encounter problems identifying strategies that make the best use of the limited resources available in this field. The current study analyzes suicide data in the state of Maryland

based on the age of the victim, checking for factors that differ significantly between age groups. The aim is to promote effective suicide prevention strategies that can be tailored to different age groups, while still making efficient use of resources.

Public health research has assessed age factors in suicide in the past, but rarely goes beyond basic trend analyses. One such paper by McKeown et. al. (2006) looked at suicides from 1970 through 2002 and showed that suicide risk generally increases with age. In 2002, adolescents and young adults age 15-24 had a suicide rate of 9.9 per 100,000, the lowest among the four age groups that were assessed. The highest rate, 15.6 per 100,000, was observed in the oldest age group, age 65 and above. While suicide rates have fluctuated over time, this trend has held since the early 1970s. McKeown and colleagues identified these differences in victim age, they recommended that further research be done to assess what contextual factors contributed to these deaths in order to better guide prevention efforts.

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In response to higher rates of suicide among older individuals, some key studies on elderly suicide have been conducted in recent years. For example, Wanta et. al. (2009) analyzed Wisconsin suicide data in elderly individuals age 65 and older between 2001 and 2006. They mentioned that, among all ages, individuals who are widowed, divorced or never married were at significantly higher risk for suicide than married individuals, and that risk was even higher as the victim's age increased. This could be due to the fact that elderly individuals are more likely than other groups to be widowed. Another important observation was that risk was even higher when the victim was male. The study also discussed toxicology testing in elderly suicide victims, observing that, of the 42% of victims with documented postmortem toxicology results, 16% of them tested positive for alcohol at the time of death. As opposed to a trend analysis, these observations provide more insight into precipitating circumstantial factors that affect suicide risk in elderly individuals, but they still do not provide the full picture.

It should be noted that using age to assess suicide risk should not be construed to mean that prevention resources should focus on certain age groups at the expense of others. Even though adolescents and young adults consistently have the lowest rates of suicide, Minino (2010) reported that between 1999 and 2006, suicide was the third leading cause of death among teenagers age 12 to 19. Suicide is a significant public health problem, and prevention strategies need to be implemented across all age groups.

Method

All data were obtained through the Maryland Violent Death Reporting System (MVDRS), which is a statelevel program funded as part of the National Violent Death Reporting System (NVDRS). The NVDRS is population based surveillance system housed within the Centers for Disease Control and Prevention (CDC) that provides detailed information on violent deaths that occur in each of the 18 funded states. The system defines a violent death as resulting from "the intentional use of physical force or power against oneself, another person or against a group or community," which is the World Health Organization (WHO) definition of violence. Legal executions and deaths due to acts of war are excluded from the system, as they are beyond the scope of public health. There is no sampling involved, and thus all violent deaths that meet the above criteria are included. Information is collected through multiple source documents including Medical Examiner reports, law enforcement reports and death certificates.

Table 1. Maryland Suicide Counts and Rates by Year. 2003-2009

	Rate per 100,000		
Year	Suicides	Population	Population
2003	484	5,495,009	8.8
2004	473	5,538,989	8.5
2005	442	5,575,552	7.9
2006	477	5,602,258	8.5
2007	480	5,618,899	8.5
2008	463	5,633,597	8.2
2009	531	5,699,478	9.3
2003 - 2009	3,350	39,163,782	8.6

In addition to collecting demographic data and incident details, the NVDRS is the only surveillance system in the nation which also records in-depth circumstantial and narrative data for all violent deaths occurring in funded states.

For the purpose of this research, all suicide deaths that occurred in the state of Maryland between January 1, 2003 and December 31, 2009 were identified for analysis. **Precipitating** circumstances, incident characteristics, demographics and victim toxicology were compared across four age groups (<=19, 20-34, 35-64, and >=65) and all data were analyzed using either the Cochran-Armitage trend test or the Mantel-Haenszel Chi-Square test.

Results

Between 2003 and 2009, 3,350 suicides occurred in the state of Maryland. The overall suicide rate for the state was 8.6 per 100,000 population. The rates for each individual year ranged from 7.9 per 100,000 in 2005 to 9.3 per 100,000 in 2009 (Table 1).

The suicide rate for males, calculated at 14.1 per 100,000, was four times higher than the female rate of 3.3 per 100,000. The rate for whites was 2.5 times higher than the rate for blacks (10.8 and 4.3 per 100,000 respectively). The rate for all other races was calculated at 5.9 per 100,000. The suicide rate for individuals older than 75 was nearly 15 per 100,000, the highest rate among all age groups. Two additional observations of interest were that 73.6% of suicide deaths occurred in the decedent's residence and 21.1% of all Maryland suicide victims were veterans. Finally, analysis showed that firearms were the most common method used in Maryland suicides with hanging/strangulation/suffocation being the second most common at 26.8%, and poisoning as the third most common at 14.9%.

Of the 3,350 suicides in Maryland between 2003 and 2009, 180 victims were age 19 or below, 786 were in the 20-34 age group, 1,811 were age 35-64, and 573 were age 65 or above.



Table 2. Overall Maryland Suicide Characteristics, 2003-2009

_	Population		_	Rate per 100,000
Characteristics	(2003-2009)	Number	Percent	Population
Total	39,163,782	3,350	100	8.6
Sex				
Male	18,942,446	2,678	79.9	14.1
Female	20,221,336	672	20.1	3.3
Age				
0 - <10	5,148,505	1	0.03	
10 - 14	2,708,202	29	0.9	1.1
15 - 19	2,799,419	150	4.5	5.4
20 - 24	2,578,196	282	8.4	10.9
25 - 29	2,541,481	245	7.3	9.6
30 - 34	2,561,388	259	7.7	10.1
35 - 44	6,024,485	641	19.1	10.6
45 - 54	5,969,718	739	22.1	12.4
55 - 64	4,240,102	431	12.9	10.2
65 - 74	2,437,139	255	7.6	10.5
75 - 84	1,565,353	232	6.9	14.8
>= 85	589,794	86	2.6	14.6
Race				
White	25,312,601	2,723	81.3	10.8
Black	11,664,418	499	14.9	4.3
Other	2,186,763	128	3.8	5.9
Education	, ,			
<= High School		2,036	62.2	
> High School		1,240	37.9	
Veteran Status				
Veteran		694	21.1	
Non-Veteran		2,594	78.9	
Marital Status		_,55 .	7 0.5	
Married		1,246	37.5	
Divorced		571	17.2	
Widowed		279	8.4	
Never Married		1,222	36.8	
		1,222	30.6	
Location of Injury		2.450	72.6	
Residence of Victim		2,459	73.6	
All other locations		884	26.4	
Method		4.607	10.2	
Firearm		1,607	48.2	
Poisoning		497	14.9	
Hanging, Strangulation, Suffocation		895	26.8	
Sharp Instrument		75	2.3	
Fall		101	3.0	
All Other Methods		159	4.8	

Note: Numbers may not be equal to total sum, for some variables, due to missing data.

significant Multiple differences in incident characteristics were noted across the four age groups. The majority of suicide decedents were white across all ages, however, this trend significantly increased with an increase in age. accounted for more than half of the suicide victims in the 65 and above age group (52.9%), followed by 18.1% of 35-64 year old victims and 9.2% of 20-34 year old victims. Veterans accounted for only 1.7% of suicide decedents age 19 and below, but this figure is likely lower due to the age requirement for military service in the United States. While the victim's residence was the most common location of injury

across all age groups, this trend was significantly more apparent in the youngest and oldest age groups, where fatal injuries occurred in the decedent's home in 77.1% and 85% of incidents, respectively. With regard to method of injury, firearms were significantly more common among victims age 65 and above than any other age group. Similarly, hanging/strangulation/suffocation was the most common method of injury among victims age 19 and below, and poisoning occurred significantly more often among 35-64 year old victims. Precipitating circumstances were known in 3,118 of Maryland suicide incidents, which translates to 93.1%.



Table 3. Maryland Suicide Characteristics by Victim Age Group, 2003-2009

Age Group <= 19	Age Group >19 - < 35	Age Group >=35 - < 65	Age Group >= 65	
(N = 180)	(N = 786)	(N = 1,811)	(N = 573)	p-value
144 (80.0)	668 (85 N)	1 302 (76 0)	171 (<u>82 7</u>)	0.18
144 (80.0)	008 (83.0)	1,392 (70.9)	474 (02.7)	0.10
126 (70.0)	553 (70.4)	1.534 (84.7)	510 (89.0)	<0.01
=== (, 5.5)	200 (. 0. 1)	_,55 . (5)	220 (00.0)	
13 (7.3)	259 (33.6)	777 (44.1)	191 (33.9)	<0.01
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3 (1.7)	71 (9.2)	321 (18.1)	299 (52.9)	<0.01
3 (1.7)	157 (20.1)	832 (46.6)	254 (44.6)	<0.01*
0 (0)	49 (6.3)	443 (24.8)	79 (13.9)	
1 (0.6)	6 (0.8)	72 (4.0)	200 (35.2)	
176 (97.8)	571 (72.9)	439 (24.6)	36 (6.3)	
138 (77.1)	548 (69.8)	1,287 (71.2)	486 (85.0)	<0.01
68 (38.0)	323 (41.4)	830 (46.0)	386 (67.7)	<0.01
10 (5.6)	79 (10.1)	348 (19.3)	60 (10.5)	<0.01
,	. ,	. ,	. ,	
86 (48.0)	303 (38.9)	437 (24.2)	69 (12.1)	<0.01
5 (2.8)	33 (4.2)	42 (2.3)	21 (3.7)	0.53
	<= 19 (N = 180) 144 (80.0) 126 (70.0) 13 (7.3) 3 (1.7) 0 (0) 1 (0.6) 176 (97.8) 138 (77.1) 68 (38.0) 10 (5.6)	<= 19	<= 19	<= 19

Data are presented as number (percent).

All tests are performed using the Cochran-Armitage trend test, unless noted otherwise.

Analysis of this particular subset of the data yielded several significant observations. Current diagnosis of a mental health condition was the most common contributing factor in Maryland suicides, but this did not vary significantly between age groups. with alcohol abuse contributed approximately one fourth of suicide deaths among victims age 20-34 as well as age 35-64, compared to the youngest and oldest age groups, in which alcohol was a contributing factor only 9.4% and 6.5% of the time, respectively. Abuse of other substances, such as prescription drugs, street drugs and over-thecounter medications was most prevalent in the 20-34 age group (28.7%), followed by the 19 and below age group at 18.9% and the 35-64 age group at 18.1%. Conversely, substance abuse only contributed to 1.9% of elderly suicides.

Also notable were differences in interpersonal factors across age groups. Intimate partner problems were cited as a contributing factor in nearly 40% of suicides of Marylanders age 20-34, which is significantly more than any other age group. Suicide victims age 19 and younger were significantly more likely to have a relationship problem with someone other than an intimate partner contribute to their death (23.3%). The elderly age group was significantly more likely

than any other group to attribute their suicide to the recent death of a friend or family member (12%). This group was significantly less likely to have a history of prior suicide attempts (10.8%), while the other three age groups were relatively similar to one another in this regard with percentages ranging between 18.9% and 22.8%.

There was also a great deal of variability among contributing life stressors between the four age groups. Elderly suicide victims were significantly more likely to have a physical health problem contribute to their death (55.8%), while the 19 and younger, 20-34, and 35-64 age groups only had physical health problems contribute to their deaths 1.9%, 5.5%, and 16.9% of the time, respectively. Job problems were much more common among the 20-34 and 35-64 age groups (11.7% and 13.3% respectively) than the other two groups, and financial problems contributed significantly more to the 35-64 age group than any of the other three (13.7%). Victims age 20-34 were more likely than any of the other groups to have a recent criminal legal problem contribute to their suicide (14.5%), while suicides in the youngest age group was statistically the most likely than the other groups to be attributed to a school problem (16.4%).

^{*}Mantel-Haenszel Chi-Square test



Table 4. Precipitating Circumstances in Maryland Suicides by Victim Age Group, 2003-2009

	Age Group	Age Group	Age Group	Age Group	
	<= 19	>19 - < 35	>=35 - < 65	>= 65	p-
	(N = 159)	(N = 726)	(N = 1,706)	(N = 527)	value
Known Circumstances (vs. unknown)	159 (88.3)	726 (92.4)	1,706 (94.2)	527 (92.0)	0.15
Of the with Known Circumstances:					
Mental Health and Substance Abuse					
Current Depressed Mood (vs. No)	49 (30.8)	206 (28.4)	491 (28.8)	183 (34.7)	0.09
Current Mental Health Problem (vs. No)	68 (42.8)	328 (45.2)	921 (54.0)	213 (40.4)	0.90
Current Mental Health Treatment (vs. No)	42 (26.4)	191 (26.3)	561 (32.9)	112 (21.3)	0.51
History of Mental Health Treatment (vs. No)	66 (41.5)	326 (44.9)	898 (52.6)	209 (40.0)	0.98
Alcohol Problem (vs. No)	15 (9.4)	180 (24.8)	426 (25.0)	34 (6.5)	<0.01
Other Substance Abuse Problem (vs. No)	30 (18.9)	208 (28.7)	309 (18.1)	10 (1.9)	<0.01
Interpersonal					
Intimate Partner Problem (vs. No)	38 (23.9)	287 (39.5)	416 (24.4)	31 (5.9)	<0.01
Other Relationship Problem (vs. No)	37 (23.3)	74 (10.2)	113 (6.6)	10 (1.9)	<0.01
Suicide of a friend of family in past 5 years (vs. No)	4 (2.5)	14 (1.9)	14 (0.8)	3 (0.6)	<0.01
Other death of friend or family (vs. No)	8 (5.0)	35 (4.8)	92 (5.4)	63 (12.0)	<0.01
Perpetr. of interpers. violence: past month (vs. No)	3 (1.9)	45 (6.2)	66 (3.9)	5 (1.0)	<0.01
Victim of interpers. violence: past month (vs. No)	1 (0.6)	4 (0.6)	5 (0.3)	0 (0)	0.07
Suicide Markers					
Person left a suicide note (vs. No)	55 (34.6)	222 (30.6)	620 (36.3)	215 (40.8)	<0.01
Disclosed intent to commit suicide (vs. No)	43 (27.0)	184 (25.3)	418 (24.5)	139 (26.4)	0.96
History of suicide attempts (vs. No)	30 (18.9)	154 (21.2)	389 (22.8)	57 (10.8)	<0.01
Life Stressors					
Crisis in the past two weeks (vs. No)	36 (22.6)	173 (23.8)	310 (18.2)	54 (10.3)	<0.01
Physical Health problem (vs. No)	3 (1.9)	40 (5.5)	288 (16.9)	294 (55.8)	<0.01
Job problem (vs. No)	4 (2.5)	85 (11.7)	226 (13.3)	11 (2.1)	0.03
School problem (vs. No)	26 (16.4)	10 (1.4)	1 (0.1)	0 (0)	<0.01
Financial problem (vs. No)	3 (1.9)	62 (8.5)	234 (13.7)	26 (4.9)	0.36
Recent criminal legal problem (vs. No)	16 (10.1)	105 (14.5)	159 (9.3)	10 (1.9)	<0.01
Other legal problems (vs. No)	5 (3.1)	27 (3.7)	63 (3.7)	0 (0)	<0.01
Eviction / loss of home (vs. No)	1 (0.6)	4 (0.6)	28 (1.6)	0(0)	0.90

Data are presented as number (percent).

All tests are performed using the Cochran-Armitage trend test, unless noted otherwise.

Toxicology results varied significantly by victim age in Maryland suicides. The 20-34 age group had the highest percentage of victims who tested positive for alcohol at the time of their death (40.3%), followed by the 35-64 age group at 37.8%. Conversely, only 14.2% and 15% of victims in the youngest and oldest age groups, respectively, tested positive for alcohol. The 35-64 age group was the most likely of all groups to test positive for antidepressants (23.9%), and also the most likely to test positive for opiates (17.3%) followed by the elderly age group at 16.2%. Victims age 20-34 were the most likely to test positive for cocaine in their postmortem toxicology (12%), while only 0.6% of elderly victims tested positive for this substance.

Discussion

In comparing suicide data from the Maryland Violent Death Reporting System (MVDRS) with national data, the first observation one might make is that Maryland suicide rates are consistently lower than the national rate. Why might this be? Maryland is one of the few states with a Chief Medical

Examiner for the entire state, meaning that all guidelines for ruling on cause and manner of death are consistently applied for all deaths statewide. Such is not the case for most other states, which have combinations of Medical Examiners and coroners, each with their own set of procedures, and each with only local jurisdiction. Policy differences on manner of death rulings become especially important here. For example, the Office of the Chief Medical Examiner for Maryland is fairly conservative in its manner of death rulings, particularly with respect to drug overdoses. Unless there is a substantial amount of evidence to indicate that a victim intentionally ingested a substance for the purpose of ending his or her life, the manner of death is ruled as "undetermined." Medical Examiners and coroners in other jurisdictions could be more liberal with their judgments, which may account for the suicide rate in Maryland being somewhat lower than the national average. It should be noted, however, that there was a sharp increase in the Maryland suicide rate in 2009. Since this was the most recent year available for

^{*}Mantel-Haenszel Chi-Square test



Table 5. Post-Mortem Toxicology of Maryland Suicide Victims by Age Group, 2003-2009

Presence of		Age Group <= 19	Age Group >19 - < 35	Age Group >=35 - < 65	Age Group >= 65	p-value
	Alcohol (vs. no)	25 (14.2)	264 (40.3)	566 (37.8)	63 (15.0)	<0.01
	Amphetamines (vs. no)	2 (1.2)	4 (0.7)	18 (1.3)	1 (0.3)	0.76
	Antidepressants (vs. no)	23 (13.4)	84 (14.0)	327 (23.9)	65 (18.1)	<0.01
	Cocaine (vs. no)	7 (4.1)	72 (12.0)	105 (7.7)	2 (0.6)	<0.01
	Opiate(s) (vs. no)	7 (4.1)	67 (11.2)	236 (17.3)	58 (16.2)	<0.01
	other substances (vs.)	36 (20.9)	204 (34.1)	561 (40.9)	170 (47.2)	<0.01

Data are presented as number (percent).

All tests are performed using the Cochran-Armitage trend test.

analysis, it is impossible at this time to determine whether this was merely a single year anomaly, or if it is indicative of an upward trend in Maryland suicide rates. Further research needs to be done once additional years become available for analysis, and if 2009 was the beginning of an increase in the Maryland suicide rate, then promoting adequate prevention and intervention strategies becomes even more imperative for the state.

While Maryland data remains consistently lower than national data across nearly all variables assessed, the observed trends were quite similar. Suicide victims were predominantly middle-aged and elderly white males, and the majority of suicides occurred in the victim's residence. Veterans accounted for around 20% of suicide victims, and approximately one half of suicides were the result of a firearm. These figures are consistent with what has been observed nationally during the same time period according to data from the Centers for Disease Control and Prevention (2012).

Current diagnosis of one or more mental health disorders was the most commonly observed contributing factor across all suicide victims, but when suicide characteristics and precipitating circumstances were compared across age groups, a clearer picture began to form regarding what specifically is most likely to prompt individuals of certain ages to end their lives. MVDRS data shows that suicide victims age 19 and below were most likely to die by hanging/strangulation/suffocation, and were most likely experiencing non-intimate partner relationship problems and school problems at the time of their death. A significant percentage also lost a friend or family member to suicide at some point in the 5 years preceding their own death, indicating the impressionable nature of individuals of that age. This also highlights the need to implement prevention measures geared toward young people who have lost someone close to them to suicide.

Maryland suicide victims age 20-34 and 35-64 had several characteristics in common. Both were most likely to be experiencing job problems and issues with substance abuse at the time of their death. The differences were that the younger of the two groups was most likely to have intimate partner problems and criminal legal problems as precipitating circumstances, while financial struggles contributed to the suicides of the older group.

The elderly age group, victims age 65 and older, was very different from the other three. These victims did not tend to suffer from any interpersonal conflicts or substance abuse, nor did they tend to have a history of previous suicide attempts. Rather, their deaths were primarily attributed to physical health problems and the recent death of a friend or family member. This group was also by far the most likely to end their life by use of a firearm.

Demographic data and incident characteristics are incredibly useful in identifying trends in suicide at local, state and national levels. However, the circumstantial data presented here is particularly important in guiding prevention efforts in the state of Maryland. Every suicide death has a story behind it, and the MVDRS is the only system in the state that is able to turn these stories into usable, scientific data through circumstantial variables. This is the most beneficial data that can be collected with regard to guiding and implementing suicide prevention strategies because if it is known why an individual made the decision to end his or her life, then there is an avenue for intervention. Given the large degree of observed variability by age, it is clear that suicide victims cannot be accurately assessed as a single, homogenous group.

There are three potential limitations of this study. First, since the data was divided into only four groups based on age, more detailed trend information may be found if the data were divided into additional age groups. Second, it may be



beneficial to assess differences in suicide characteristics and circumstances between age as well as another demographic variable such as gender or race. Third, there may be some variability in data collection due to individual abstractors' experience in the collection of data from the Medical Examiners and Police reports.

In conclusion, it is evident from this study that a number of demographics, characteristics, and precipitating circumstances vary by different age groups. Therefore, suicide prevention and intervention programs should be tailored to suit the needs of specific age groups, and then targeted to those groups. Additional research needs to be done in this area to identify which types of prevention programs would be most suitable and most effective for each individual age group.

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ISSN 2078-5488

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