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Methods of Committing Suicide Among 2,347 People in Ohio

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Abstract

The present study explored gender differences in suicidal methods, aiming to identify ways to improve our identification of individuals at risk for suicide. Preferred suicide methods vary by demographics; however, method-specific risk factors have not been consistently identified. All suicidal deaths ($N = 2,347$) in a large urban county were identified over a 15-year period (1994-2008). The majority of men used shooting and hanging. In contrast, women relied on a variety of methods, including self-poisoning, shooting, hanging, and carbon monoxide poisoning. Significant demographic differences are evident among individuals who die by shooting and self-poisoning.

In 2009, suicide was ranked the 10th leading cause of death in the US, taking the lives of 12.0 of every 100,000 individuals in the US (Kochanek, Xu, Murphy, Miniño, & Kung, 2011). Despite persistently high rates of suicide, research, treatment, and prevention strategies might reduce deaths. Prevention efforts include educational programs, screening for known risk factors, improving access to mental health treatment, and restricting access to lethal means of suicide (Mann et al., 2005). Although means restriction and educational efforts have shown promise in reducing suicide rates (Mann et al., 2005), suicide prevention needs to be more effective. Nearly 45% of individuals who complete suicide contacted their primary care physicians in the month before the suicide (Luoma, Martin, & Pearson, 2002), which highlights the need to improve the identification of individuals at risk for suicide.

Risk factors for specific methods of suicide vary by geographic location, gender, age, race and marital status. Firearms are the most prevalent method of suicide in the US (Ajdacic-Gross et al., 2008; Ojima, Nakamura, & Detels, 2004). However, suicide methods vary by demographic factors. Identification of method-specific risk factors could improve the effectiveness of suicide prevention efforts.

Several important gender differences are common in people who die by suicide. Men complete suicide at a much higher rate than women (Nock & Kessler, 2006) and are more likely to commit suicide by gunshot wound to a vital organ (Stack & Wasserman, 2009). Men are more likely to die by hanging and carbon monoxide poisoning, while women are more likely to commit suicide by self-poisoning and drowning (Hunt et al., 2010). Men tend to have greater intent to die (Nock & Kessler, 2006), while women use less violent methods to commit suicide (Denning, Conwell, King, & Cox, 2000).

The relationship between age and suicide risk is complicated when considering method of suicide and gender. In the US, hanging is the most common method of suicide among individuals age 10 to 19 (Ojima et al., 2004). Older suicide victims are less likely than younger victims to use violent methods to complete suicide (Conwell et al., 1998).

Marriage is generally thought to be a protective factor against suicide, but gender plays a prominent role here. Single individuals are at greater risk for suicide than individuals who are married or cohabitating (Qin, Agerbo, & Mortensen, 2003). Widowed men are three times more likely than married men to complete suicide; differences in suicide rates between married and widowed women are non-significant (Li, 1995). Similarly, divorced or separated men are more than two times as likely to complete suicide as married men, but no differences in suicide risk exist between divorced and married women (Kposowa, 2000).

When examining the influence of race on suicide method, results have shown that White individuals are at greater risk for suicide than other ethnic groups (Kposowa & D'Auria, 2010; Nock et al., 2008). African Americans complete suicide at a much younger age than whites (Garlow, Purselle, & Heninger, 2005). In one study, the most common methods of suicide in the US were consistent across gender and race, with the exception of Asians who chose hanging more often than firearms (Ojima et al., 2004).

Many suicide completers were legally intoxicated at the time of their death (Kaplan et al., 2013). Men are more likely than women to use alcohol prior to suicide (Kaplan, MacFarland, & Huguet, 2009). Compared to those who use other methods, men and women who die by shooting or hanging are more likely to be intoxicated at time of death (Kaplan et al., 2013). Further, alcohol intoxication is associated with violent suicide methods and declines significantly with increased age (Kaplan et al., 2013).

The present study explored gender differences in suicidal methods, aiming to improve identification of individuals at risk for suicide. The present study examines gender differences in completed suicide, going beyond the more common research that has examined gender differences in suicidal ideation and suicide attempts. Although prior research studies on completed suicide examined gender differences in suicidal methods, many previous studies examined psychiatric inpatients tracked for subsequent suicidal acts. These studies are limited by their reliance on psychiatric patients without any community samples. Alternatively, other studies examined data from nationwide community registers of death certificates. Although very informative, these national studies merge data from many different jurisdictions. Differences between different coroner's offices may ignore some qualities that enter into a coroner's decision to classify a death as suicidal in nature (Kaplan,

McFarland, & Huguet, 2009). Very few studies (e.g., Stack & Wasserman, 2009) examine a large number of suicidal deaths, all collected within the same coroner's office. We hypothesized that gender differences would vary according to suicide method and that men and women would demonstrate different rates of suicide by method depending on age, race, marital status, and alcohol use at time of suicide. Significant findings will allow means restriction efforts to be tailored towards groups at highest risk of suicide.

Method

Participants

The present study examined all suicidal deaths in an Ohio county over a 15-year span (1994–2008) during which 1,829 men and 518 women committed suicide. Data were obtained from the county Medical Examiner's office and included medical autopsy findings, police reports, and toxicology results. Cases of suicide were included in the study if gender and method of suicide were determined. Children younger than 15 who died by suicide were excluded from the study. Racial categories of the suicides were: White, Black, Hispanic, or Asian. The majority of individuals were White ($n = 1883$) or Black ($n = 435$), with only 11 Hispanics and 18 Asians.

Measures

We classified suicide methods into 11 groups: shooting, hanging, carbon monoxide (CO) poisoning, drug poisoning, jumping, stabbing, drowning, asphyxia by plastic bag, struck by vehicle, burning/fire/explosion, or other. The "other" category ($n = 21$) includes methods of suicide that account for less than 1% of the overall number of suicides, including: electrocution, strangulation, miscellaneous means of asphyxiation, and combinations of more than one method.

Each case was coded for gender, age, race, marital status, suicide method, and blood alcohol levels at death. Blood alcohol level (BAL) test results were available for 96% of the sample, including 1,751 men and 501 women. Results were coded as negative, .01 to .04, .05 to .09, or $> .09$ which is above the legal limit of intoxication.

Procedure

We examined demographic and suicide method differences using the total sample and by sub-samples based on suicide method.

Results

There were significant gender differences in suicide method, $\chi^2(10) = 274.03, p < .001$ (See table 1). Most men used shooting to a vital organ (52.9%) and hanging (20.7%). In contrast, women relied on a more diverse pattern of methods, including self-poisoning (31.9%), shooting (29.7%), hanging (14.7%), and CO poisoning (8.3%). Men were significantly more likely than women to be single ($\chi^2(3) = 32.79, p < .001$) and to be intoxicated at death ($\chi^2(3) = 13.28, p < .01$).

Gender differences were examined for individual suicide methods. Within each suicide method, differences in age, race, marital status, and blood alcohol status at death were examined by gender (see Table 2). The majority of individuals who died by shooting were white (76.6%), male (86.3%), and middle-aged ($M = 47.23$ years, $SD = 19.67$). For a comparison reference point, individuals who died by the other common suicide methods (i.e., hanging, poison, jumping, or CO) were even more likely to be white (84%) ($\chi^2 (1) = 19.11, p < .01$), but less likely to be male (70.2% male) ($\chi^2 (1) = 82.65, p < .001$), and a bit younger ($Mean\ age = 43$ years, $SD = 17$), $t (2,178) = 4.44, p < .01$.

White men (78.3%) were more likely than white women (70.4%) to die by shooting, but black women (29.6%) were more likely than black men (21.7%) to die by shooting ($\chi^2 (1) = 4.27, p < .05$). Men who completed suicide by shooting were significantly older than women using this method ($t (1120) = 2.64, p < .01$). Most individuals who died by shooting were married (32.4%) or single (38.5%), and a small percentage tested positive for alcohol intoxication ($BAL > .09$) at death (17.3%).

Women who died by shooting ($n = 154$) were significantly younger (mean age = 43.36; $t (317) = 3.09, p < .01$) and more often single ($\chi^2 (3) = 13.98, p < .01$) than were women who died by self-poisoning ($n = 165$). There was a greater proportion of black women who completed suicide by shooting (29.6%) than black women who completed suicide by self-poisoning (14.5%; $\chi^2 (1) = 9.67, p < .01$).

Among individuals who died by hanging ($n=455$), the majority were white (82%), single (44%) and younger than individuals who completed suicide by other methods (average age = 40.31 years old). Intoxication ($BAL > .09$) at death was significantly more common in men (23%) than women (12%) ($\chi^2 (3) = 8.86, p < .05$) who died by hanging.

Compared to other methods of suicide, individuals who completed suicide by self-poisoning were most likely to be women (56.3%) and white (82.9%) with an average age of 45.88 years. Men who completed suicide by self-poisoning were significantly younger than women who died by self-poisoning ($t (291) = 4.70, p < .001$). Married women (34.4%) were more likely than married men (23.4%) to commit suicide by poisoning, single men (52.3%) were more likely than single women (23.9%) to self-poison, and widowed men (1.6%) were less likely than widowed women (14.1%) to choose this method ($\chi^2 (3) = 32.62, p < .001$). At death, 12.6% of individuals who died by self-poisoning tested positive for BALs above the legal limit of intoxication ($> .09$).

Among individuals who died by jumping ($n=136$), the majority were men (77.9%), white (83%), and often single (56%). Men who completed suicide by jumping were significantly younger than women who completed suicide by jumping ($M = 40.58$ years; $t (133) = 3.00, p < .01$). Alcohol intoxication ($BAL > .09$) at death was uncommon (9%) among individuals who died by jumping.

Individuals who died by CO poisoning were largely men (75%), white (91.9%), and often married (44.2%), with an average age of 49.42 years old. Approximately 23.5% of individuals who died by CO poisoning were legally intoxicated at death. There were no significant gender differences in CO poisoning.

A small number of individuals completed suicide by uncommon methods. Among individuals who died by self-stabbing ($n = 49$), the majority were men (73.5%) and white (83%) with an average age of 52 years. Suicide completers who chose stabbing were married (27%), divorced (33%), single (29%), and widowed (10%). Among individuals who died by plastic bag asphyxiation ($n = 38$), the majority were white (91.9%) and over age 35 (92%). Half of this group was women, many of whom were widowed (53%), over the age of 75 (53%) and all were white. Among individuals who died by drowning ($n = 31$), the majority were men (71%), single (52%), and white (61%), with an average age of 47 years. Among individuals who were struck by a vehicle ($n = 20$), the majority were single (65%) white (70%), men (75%) with an average age of 39.8 years. Among individuals who died by self-immolation ($n=10$), the majority were white (100%), men (90%), who were married (40%) or single (30%), with an average age of 46.0 years.

Discussion

The present study evaluated 2,347 individuals who died by suicide. Consistent with current trends in the U.S. (Ajdacic-Gross et al., 2008), the majority of suicides involved the use of firearms, accounting for 48% of all suicidal deaths. Similar to past studies (Hunt et al., 2010) men were more likely to die by shooting (53%) compared to women (30%), and, in contrast, self-poisoning was more common in women (32%) than men (7%). The five main suicide methods (shooting, overdose, hanging, CO poisoning, and jumping from an elevated location) accounted for the vast majority of suicidal deaths in men (93.5%) and women (90.3%).

Several key differences were observed between men and women suicide completers. Men were more likely than women to be single, to be intoxicated at the time of death, and to die by shooting or hanging. Women relied on a variety of suicide methods, but self-poisoning and shooting accounted for 62% of suicidal deaths among women. Significant gender differences were found among individuals who completed suicide by shooting and self-poisoning. Men who died by shooting were older than women who died by shooting. Women who died by shooting were younger and more often single than women who died by self-poisoning. Although white women are at much greater overall risk for suicide than black women, black women are at greater risk for suicide by shooting than by self-poisoning. Further, compared to black men, a greater number of black women died by shooting.

Across the present sample, 12.5% of suicidal deaths were caused by self-poisoning. Men who completed suicide by self-poisoning were younger than women using self-poisoning. Also, men who completed suicide by self-poisoning were significantly younger and more likely to be single than men who died by shooting.

The current study also examined small groups of individuals who died by less common methods used to commit suicide: self-immolation, vehicle-assisted suicide which included trains, buses and other motorized vehicles, self-inflicted knife wounds, drowning, and self-imposed asphyxiation. The majority of individuals who died by self-immolation ($n = 10$) were middle-aged white men, which is consistent with prior research (Castellani, Beghini,

Barisoni, & Marigo, 1995). The individuals who were intentionally struck by a vehicle ($n = 20$) were mostly single, white men with a mean age 40 years old. Previous research found that suicides by train occur in individuals aged 20 to 40 (Krysinska & De Leo, 2008).

The current study examined all suicide completers in a moderately sized, urban county over 15 years. Despite the strengths of the large sample, the data is representative of individuals in only one county in the US and generalizability to other areas of the country is unknown. In addition, data available for analysis was limited to a few demographic factors and did not include psychiatric history or current stressors, or detailed information about suicide method (i.e. gun type, wound site, caliber). Significant findings should be interpreted with some caution given the possibility of chance findings due to a large number of comparisons. Additionally, some cases of suicide may not have been included since suicides are frequently under-reported and misclassified by Medical Examiners (Linsley, Schapira, & Kelly, 2001; Phillips & Ruth, 1993). Misclassification could be due to incomplete data collection in the initial investigation of the death, ambiguous circumstances surrounding the death, such as single car accidents ruled as accidental when they were suicides (Linsley et al., 2001), or the deceased having taken steps to disguise the suicide (Phillips & Ruth, 1993).

A common strategy for the primary prevention of suicide relies on restricting access to certain methods used in suicidal acts (Mann et al., 2005; Spirito & Overholser, 1993). These methods have often included gas detoxification, constructing retaining walls around bridges and limiting availability of handguns and access to prescription drugs. Some research shows that restricted access to common, lethal methods has been effective in reducing the overall rate of suicide in a region (Loftin, McDowell, Wiersema, & Coffey, 1991), yet other studies have reported 'method switching', whereby someone who is truly intent on dying will switch to a different method when their chosen strategy is not readily available (Lester, 1998). In cases of method substitution, a less preferred, available method may be less lethal than the restricted method, thereby increasing chances of survival (Lester). Many people indicate that they would only consider one method for suicide, and thus, restricted access to the preferred method may prevent suicide (Lester). A delay in accessing a lethal method may allow more time for therapeutic or other intervention. Identifying preferred suicide methods used by different groups of individuals may be an important step in tailoring means restriction and other suicide prevention efforts. For example, replication of the current findings may warrant greater screening of access to firearms among black women and relatively younger women. A broader, nationwide examination of the impact of age, gender, race, and marital differences on suicide method preferences is needed in order to generate meaningful means restrictions to targeted groups of at risk individuals.

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Table 1

Differences between 1,829 Men and 518 Women who Died by Suicide

Method of Suicide *	Men (<i>n</i> = 1,829)		Women (<i>n</i> = 518)	
	<i>n</i>	%	<i>n</i>	%
Shooting	968	52.9%	154	29.7%
Hanging	379	20.7%	76	14.7%
Carbon Monoxide poisoning	129	7.1%	43	8.3%
Poisoning by drugs	128	7.0%	165	31.9%
Jumping	106	5.8%	30	5.8%
Stabbing	36	2.0%	13	2.5%
Drowning	22	1.2%	9	1.7%
Asphyxia- plastic bag	19	1.0%	19	3.7%
Struck by train/vehicle	15	0.8%	5	1.0%
Burning/fire/explosion	9	0.5%	1	0.2%
Other	18	1.0%	3	0.6%

* $\chi^2(10) = 274.03, p < .001$

Table 2
Demographic Factors across the Five Most Common Methods Used in Completed Suicide

	Shooting			Hanging			Poisoning			Jumping			CO Poisoning		
	M	W	t / χ^2	M	W	t / χ^2	M	W	t / χ^2	M	W	t / χ^2	M	W	t / χ^2
N	968	154		379	76		128	165		106	30		129	43	
Age, Mean (SD)	47.85 (19.85)	43.36 (18.22)	2.64**	40.70 (17.17)	38.38 (19.67)	0.96	41.54 (12.41)	49.25 (15.64)	4.70***	40.58 (16.02)	50.97 (18.93)	3.00**	48.12 (17.99)	53.35 (17.20)	1.67
Race															
% White	78.3	70.4	4.27*	85.5	77.1	2.51	80.3	85.5	1.01	87.5	73.3	2.55	91.5	97.6	0.95
% Black	21.7	29.6		14.5	22.9		19.7	14.5		12.5	26.7		8.5	2.4	
Marital Status															
% Married	33.7	24.7	5.50	32.6	35.5	1.70	23.4	34.4	32.62***	25.0	20.0	6.96	45.0	41.9	5.64
% Divorced	19.0	19.5		17.8	15.8		22.7	27.6		12.5	26.7		17.1	25.6	
% Single	37.8	43.5		44.8	40.8		52.3	23.9		59.6	43.3		31.8	18.6	
% Widowed	9.5	12.3		4.8	7.9		1.6	14.1		2.9	10.0		6.2	14.0	
Blood Alcohol Level															
% negative	71.1	75.3	3.10	63.9	81.3	8.86*	71.9	78.8	2.06	79.4	89.3	2.08	66.9	66.7	0.09
% .01 -.04	4.9	6.7		5.5	4.0		7.4	4.5		5.2	0.0		4.0	4.8	
% .05 -.09	6.1	4.7		7.4	2.7		6.6	5.1		6.2	3.6		5.6	4.8	
% > .09	17.9	13.3		23.1	12.0		14.0	11.5		9.3	7.1		23.4	23.8	

* $p < .05$.

** $p < .01$.

*** $p < .001$.

M = Men, W = Women, CO = Carbon monoxide.

Note. Blood alcohol levels were available for 1,751 men and 501 women, constituting about 96% of the entire sample.