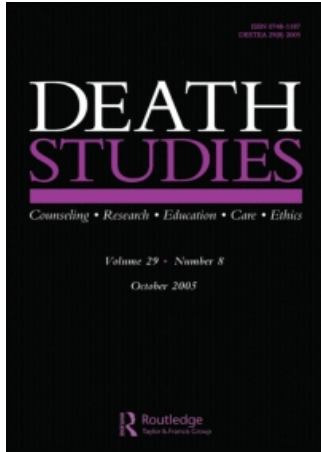


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CHARACTERISTICS OF SUICIDE FROM 1998–2001 IN A METROPOLITAN AREA

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In order to establish effective suicide preventive programs, it is important to know the etiologic factors and causal relationships between suicide and behavior. Coroner data was analyzed for the 468 suicides that occurred in Indianapolis, Indiana during 1998–2001. The age-adjusted suicide rate was 14.08 per 100,000. Almost one-half of the victims had a mental illness and 26% had a history of alcohol/substance abuse. The leading risk factors for suicide were age, impaired health, psychosocial stressors, and access to firearms. This information can be used by health departments and mental health professionals to help reduce suicide.

Suicide has been identified as a critical public health priority. According to the CDC, suicide is the 11th leading cause of death among Americans (Anderson & Smith, 2003), the second leading cause of death for young adults aged 25–34 years, and the third leading cause of death for those 10–24 years of age (National Center for Injury Prevention and Control [NCIPC], 2002). The U.S. Surgeon General announced a call to action to prevent suicide in 1999 (U.S. Department of Health & Human Services, 1999), and a national strategy was developed in 2001 (National Strategy, 2001). However, in order to establish effective preventive programs, it is important to know the etiologic factors and causal relationships between suicide and modifiable individual behaviors (Hammond, 2001; Potter, Powell, & Kachur, 1995). Descriptive epidemiology can provide detailed assessments on the impact of suicides, thus leading to the development of program strategies.

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Suicide is often viewed as a response to a single stressful event. However, it results from complex interactions between psychiatric disorders, social factors, stressful events, genetic factors, and physical disease (Roy, 2001; MoScicki, 1997). Statistics demonstrate some of the demographic characteristics related to suicides in the United States. Men are four times more likely to kill themselves than women (NCIPC, 2004). On average, suicide rates are higher among Caucasians compared with African Americans (National Strategy, 2001). One study reported that women attempt suicide during their lifetime three times as often as men (Krug et al., 2004). Numerous studies have identified mental illness such as depression, substance/alcohol abuse, stressful life events such as interpersonal loss, and legal issues as significant risk factors (Gould & Kramer, 2001; MoScicki, 1997; Roy, 2001).

The suicide rate in Indiana has been higher than the national average for the past decade. According to the CDC, the suicide rate in Indiana over the past decade has been 7.6 to 11.3 deaths per 100,000 persons while the U.S. rate has been 6.7 to 10.6 deaths per 100,000 persons (CIPC, 2005). According to the 2001 Indiana Mortality Report, suicide ranked as one of the five leading causes of death for Indiana residents ages 15–54 (Indiana State Department of Health, 2003b). When comparing Indiana's suicide mortality data to the national data, suicide ranks as the 11th cause of death in both the United States and in Indiana. However, compared with the national average, suicide rates in Indiana are higher for all age groups, except senior citizens (Indiana State Department of Health, 2003a). Many state suicide prevention organizations have developed intervention programs. Evidence-based, data-driven programs are frequently requested by funding agencies. Therefore, efforts to collect and characterize demographic and epidemiologic suicide data are important. The data are presented at a local metropolitan city level in order to implement local preventive measures. However, the demographic characteristics of Indianapolis are similar to the Midwest Region of the United States according to the U.S. Census Bureau as shown in Table 1. Therefore, the findings presented might be helpful in implementing other preventive programs throughout other metropolitan Midwest cities of the United States.

This descriptive study was designed to identify cases of suicide that occurred in the greater Indianapolis area of Indiana during

TABLE 1 Comparison of Population Characteristics for Marion County, Indiana with the Midwest Region of the United States

Characteristic	Indianapolis, Indiana	Midwest region of United States
Male (%)	48.8	49.0
Female (%)	51.2	51.0
White (%)	82.1	83.6
African American (%)	13.9	10.1
Median age (years)	34.6	35.6
Average family size	3.05	3.09

Source: US Census Bureau, Census 2000.

1998 through 2001 and to explore the circumstances surrounding these deaths. The study provides detailed information related to the victim, his or her circumstances, immediate antecedents of the suicide, and toxicology test information in an effort to better identify risk factors for suicide in a metropolitan area and to help establish effective preventive programs.

Materials and Methods

The Marion County Coroner’s Office reviews all unnatural unattended deaths in Indianapolis, Indiana. All suicides recorded in the coroner’s database from January 1, 1998 to December 31, 2001 were extracted and reviewed. In order to reflect the characteristics of a metropolitan population, all suicides that occurred outside Indianapolis were excluded from the study, even though the suicide victims may have died at an Indianapolis hospital.

Information about the victim, his or her circumstances, immediate antecedents of the suicide, and toxicology test information were systematically reviewed and abstracted from the coroner’s database. Information regarding location of the suicide, previous medical history, circumstance, cause/mechanism of death, and type of firearm used were coded according to Uniform Data Elements of National Violent Injury Statistical System (NVISS Workgroup, 2002). Depression was coded if the coroner’s report stated that the victim was depressed or had a history of depression. Victims who had been diagnosed with schizophrenia,

bipolar disorder, anxiety disorder, or any psychiatric symptoms were coded as other mental illness.

A history of alcohol or substance abuse was coded if others perceived the victim as having a problem with alcohol and/or illegal drugs. Coding circumstances were based on the coroner's investigation regarding the victim's experience at the time of death. More than one code could be used if the suicide victim experienced multiple stressors. Details for homicide-suicide incidents were coded and categorized according to Marzuk's classification, which is based on the relationship between victim and perpetrator (Marzuk, Tardiff, & Hirsch, 1992).

Results

During 1998 to 2001, 468 people lost their lives due to suicide in Indianapolis, Indiana (14.0 per 100,000 per year). Of these 468 people, 380 (83%) were men, and the ratio of men to women was 5:1. Eighty-two (18%) of the suicide victims were persons aged less than 25 years and 64 (14%) were 65 years or older. Approximately 69% or 322 of the victims were between 25 and 64 years of age with a mean age of 42 \pm 17.6 years (See Table 2). The racial distribution was 393 (84%) White, 65 (14%) Black, and 10 (2%) other. Compared with the proportion of the White population in Indianapolis in 2000 (U.S. Census Bureau, 2000), the frequency of suicide was significantly higher in Whites than all others, $\chi^2(2, N = 468) = 41.54, p < 0.001$ (see Table 2).

A total of 280 (60%) victims died from gunshot wounds, followed by 88 (19%) victims who died from suffocation, and 72 (15%) victims who died from poisoning. According to the data in Table 3, men and women committed suicide in different manners. Out of 390 men, 251 (64%) committed suicide using firearms, whereas only 29 (37%) of women used firearms. Among 280 fire-arm suicides, the type of gun was most often a handgun (186; 66%), shotgun (49; 18%), and rifle (17; 6%). The majority (382; 82%) of the suicides took place at a private home, which includes either a house or an apartment; another 34 (8%) occurred in a motel or on the street; the remaining 52 (10%) suicides occurred in parks, public use areas, parking lots, garages, cemeteries, jails, or hospitals.

TABLE 2 Age, Gender, and Race of Suicide Victims in the Greater Indianapolis Area of Indianapolis, 1998–2001

Suicide victim	Men	Women	Overall (SD)	% in suicides	% in population*
Race					
White	326	67	393	84.0	70.5
Black	56	9	65	13.9	24.2
Other	8	2	10	2.1	5.3
Age					
Youth					
10–14	2	0	2		7.0
15–19	28	4	32		6.7
20–24	43	5	48		7.3
Subtotal	73	9	82	17.5	21.0
Adult					
25–34	87	11	98		16.5
35–44	86	31	117		16.5
45–54	57	13	70		12.7
Subtotal	262	60	322	68.8	53.3
Senior					
65–74	22	7	29		5.8
75–84	27	2	29		3.9
85+	6	0	6		1.3
Subtotal	55	9	64	13.7	11.0
Total (N)	390	78	468		
Mean age (years)	42.1	41.9	42(17.6)		

Note. *Population values based off of 2000 census.

TABLE 3 Methods of Suicide

Method	Total	% of total	Men	% of men	Women	% of women
Gunshot wound	280	60	251	64	29	37
Suffocation (hanging)	88	19	75	19	13	17
Poisoning						
Carbon monoxide	24	5	17	4	7	9
Overdose	48	10	24	6	24	31
Subtotal	72	15	41	11	31	40
Other	28	6	23	6	5	6
Total	468		390		78	

TABLE 4 Psychological Factors of Suicide Victims

Health status category	Youth (n = 72)		Adult (n = 282)		Senior (n = 55)		Total (n = 409)	
	n	%	n	%	n	%	n	%
Mental illness								
Depression	13	8.1	115	40.8	27	49.1	155	37.9
Other mental disorder	5	6.9	19	6.7	0	0.0	24	5.9
Depression + other mental disorder	3	4.2	10	3.5	0	0.0	13	3.2
Subtotal	21	29.2	144	51.1	27	49.1	192	46.9
Alcohol/substance abuse								
Alcohol	3	4.2	42	49.9	5	9.1	50	12.2
Substance abuse	11	15.3	15	5.3	0	0.0	26	6.4
Alcohol + substance abuse	7	9.7	25	8.9	0	0.0	32	7.8
Subtotal	21	29.2	82	29.1	5	9.1	108	26.4
Mental illness + alcohol/ substance abuse	4	1.0	40	14.2	3	5.5	47	11.5
Victims with a mental illness who received treatment	14	66.7	73	50.7	11	40.7	98	51.0

Of the 468 suicides, 59 (12.6%) had no detailed information regarding the medical history and existing circumstances within the coroner's report. Based on 409 (87%) suicides, Table 4 presents the psychological factors of the victims. A total of 155 (38%) suicide victims had a history of depression or appeared depressed before they took their own lives; 24 (6%) victims had a mental disorder other than depression; 13 (3%) victims had both a mental disorder and depression. Overall, 192 (47%) suicide victims had mental illness, 50 (12%) victims had a problem of alcohol abuse, 26 (6%) victims had a problem with substance abuse, 32 (8%) victims had both alcohol and substance abuse problems, and 47 (12%) victims had a combination of mental illness and alcohol/substance abuse. When comparing the three different age groups, using a Pearson chi-square test, mental illness seemed to increase with age, $\chi^2(2, N = 409) = 15.76, p < 0.01$.

Suicide communication was defined and analyzed if the coroner's report indicated that the victim left a note prior to the suicide or communicated a suicide warning to a relative or friend. Of all suicide victims, 158 (38%) either left a suicide note and/or gave

a suicide warning before they died. Those who left a suicide note and/or provided a suicide warning before they died included 29 seniors (53%), defined as age 65 years or older; 25 youths (35%), defined as ages 10–24 years old; and 104 (37%) adults, defined as ages 25–64 years old. When comparing the three different age groups, using a Pearson Chi-Square test, the senior age group had a significantly higher rate of communicating about suicide compared with adults, $\chi^2(1, N = 337) = 4.5, p < 0.01$, but not compared with the youth age group, $\chi^2(1, N = 127) = 3.74, p > 0.5$. Previous suicide attempts were also tabulated, and 28 (10%) adults had previously attempted suicide, whereas only 3 (6%) seniors and 5 (7%) youth had attempted suicide.

Psychological stressors varied depending upon age. Circumstances related to suicide included relationship, crime/legal, physical illness, job problem, finance, death/suicide of friend or family member, and school-related issues. In persons aged 10–24, a relationship problem such as a break-up of partners or divorce accounted for 34 (47.2%) of the circumstances leading to suicide, followed by crime/legal issues (17; 23.6%). The stressors under crime/legal issues included police pursuit, recently committed crime, currently in jail, impending criminal court date, interpersonal violence, custody dispute, and civil lawsuit. In persons aged 25 to 64 years, a relationship problem and crime/legal issues were also the major psychological stressors, accounting for 98 (35%) and 56 (20%), respectively. In addition, physical illness, loss of a job and financial difficulty were common factors. In persons aged 65 years and over, declining health or physical illness was the most common factor involved; 34 (62%) of the persons had a serious physical illness such as cancer or other chronic disease. The coroner's reports did not delineate circumstances leading to suicide for 199 (29%) of the suicide victims. There were statistically significant differences for psychological stressors when comparing the three different age groups. Problems with interpersonal relationships were more likely to be factors contributing to suicide in young adults than other age groups, $\chi^2(2, N = 409) = 15.96, p < 0.001$. In contrast, declining health or physical illness contributed to suicidal ideation in older people more than other age groups, $\chi^2(2, N = 409) = 11.76, p < 0.001$.

There were 15 (3%) incidents of combined homicide–suicide. The crude rate for combined homicide–suicide was 0.4 per

100,000 per year. All 15 perpetrators were men and 16 (82%) of the victims were women and children. The perpetrator ages ranged from 20 to 61 years and averaged 37.9 years, whereas the victim ages ranged from 9 months to 58 years and averaged 28.6 years. When the relationships between perpetrator and victim were known, 11 were spousal or consortial (present or ex-girlfriend/spouse), 3 were familial relationships each involving the father as the perpetrator, and 1 was outside the family. Firearms, the dominant weapon used, were involved in 14 events, killed 30 people, and accounted for 14(93%) of the total homicide-suicide events. Ten perpetrators used a handgun to murder the victims and subsequently commit suicide.

Post-mortem toxicology screens for the presence of substances and drugs/medications, and measurement of blood alcohol concentration (BAC) were performed in 200 suicide incidents, which accounted for 43% of the total suicides. Among the youth and adult suicide victims, 11(25%) and 39(28%) of the suicides, respectively, were positive for one or more substances, and 12(27%) and 40(29%) of youth and adult suicides, respectively, had a BAC greater than 0.05% w/v. Of the 16 senior suicide victims, 2(13%) of the victims were positive for substances and 2(13%) of the victims had a BAC greater than 0.05% w/v. Cocaine and marijuana were the most common substances found in the youth and adult suicide victims. The most common single prescription drug detected from the screen was benzodiazepines, followed by tricyclic antidepressants. Combinations of substances and medication/drugs, and/or alcohol were found in 29(21%) of the adult suicide victims.

Discussion

In Indianapolis from 1998 to 2001, 468 persons (or an average of 117 persons per year) committed suicide according to the Marion County Coroner's Office. The Indiana State Department of Health reported an average of 116 suicides per year for Indianapolis for the period 1998 to 2001 (Indiana State Department of Health, 2002, 2003b). The information indicates that the coroner's data were well-captured and represent all suicides in Indianapolis. However, there are several advantages of analyzing coroner's data over the death certificate data. The on-site and follow-up investigations

and personal interviews yield more detailed information regarding reasons for the suicide, previous medical history, a toxicological screen, and the ability to capture combined homicide–suicide events. Also, it is advantageous that studies of coroner’s files provide information in relation to 100% of suicides (Snowdon & Baume, 2002). Overall, the coroner’s reports provide a more detailed picture of circumstances surrounding death from suicide versus death certificate data alone (Hawton et al., 1998; National Strategy, 2001; Snowdon & Baume, 2002).

As noted in several studies, mental disorders and substance and alcohol abuse are closely linked to suicide (Harris & Barraclough, 1997; Roy, 2001; Snowdon & Baume, 2002). A meta-analysis showed that almost all mental disorders (with the exception of mental retardation, dementia, and agoraphobia) could increase the risk of suicide (Harris & Barraclough, 1997.). In the present study, over 45% of the suicides had mental illness and nearly 30% of the suicides had substance/alcohol abuse. Similar results were reported in 1997 and 2002 where the authors concluded that as many as 90% of the suicidal behaviors were linked to mental illness and/or substance abuse, and 45% of the suicides were linked to depression (Harris & Barraclough, 1997; MoScicki, 1997; Roy, 2001).

In general, population-based reports regarding risk factors and the immediate situation prior to the action of suicide are lacking. In an annual report of violent deaths in Wisconsin, the majority of fire-arm suicides occurred in or around the decedent’s home or apartment, and nearly 40% of the suicide victims showed or expressed warning signs of suicide (Medical College, 2000). Similar findings are present in this report where approximately 82% of suicides occurred around the descendant’s house or apartment and suicide communication and warnings were present in 38.6% of victims.

Disability or poor health has been considered a major factor contributing to suicidal ideation in older people, and prior studies concluded that these factors account for 58% of suicides in older people (Snowdon & Baume, 2002). Similar findings were also found in London and Manchester, England where a majority of older persons who killed themselves were concerned about their physical health (Cattell, 1988; Cattell & Jolley, 1995). The present study reiterates this finding with 63% of older people committing suicide related to physical illness circumstances.

Combined homicide–suicide is a rare event. Prior studies indicated that most perpetrators were middle-aged men (average 38 years old) and most victims were women who were younger than their perpetrators. The most common relationship was the consortial type, and a firearm was the dominant method used (Aderibigbe, 1997; Felthous et al., 2001; Marzuk et al., 1992). The combined homicide–suicide rate in the current study was identical to the above studies with the mean age of the perpetrator being 37.9 and the victim being a girl or woman 71% of the time with a mean age of 28.6.

It is noteworthy that crime or legal issues are one of the common circumstances contributing to suicidal ideation, especially for young people. Suicide is closely associated with violence and homicide (Indiana State Department of Health, 2001). The odds ratio for association of legal/disciplinary problems with suicide was 5.8 ($CI = 2.0\text{--}11.6$) and, furthermore, having legal/disciplinary problems was even more strongly associated with suicide when the issue of conduct disorder and substance abuse was present (Brent et al., 1993). One study reported that the suicide rate of prisoners was nine times higher than that of the general population (National Strategy, 2001). Another analysis showed that 63% of suicide victims aged 13 to 21 years had several contacts with the juvenile justice system (Gray et al., 2002). In this study, approximately 25% of the youth and young adults who committed suicide had evidence of crime or legal issues. This finding is especially relevant for planning and implementing suicide prevention programs.

Limitations of this study may underestimate the effect of mental illness on suicide due to the fact that most medical histories were obtained from persons close to the victim rather than from a physician. In a cross-sectional study, 80% to 100% of older people aged 70 to 105 who had suicidal ideation were suffering from mental disorders and 50% to 75% of them could be diagnosed with at least one specific psychiatric disease (Barnow & Linden, 2000).

The primary purpose of a coroner's investigation is to determine the cause and manner of death. Recall bias and unreliability could occur during an interview with the key informants, such as family and physicians. In addition, some informants may not be able or willing to respond (Snowdon & Baume, 2002). Also, different coroner officers may use different questionnaires when interviewing family or informants. All of these factors could influence

the results and limit the findings in this research. For example, screens for substances and drugs, and measurement of BAC were not performed in every case in this data set. Whether the screen and test were performed was solely dependent upon the need of the coroner's investigation to determine cause of death. This discrepancy could result in an unrepresentative sample of toxicology testing and yield an inaccurate prevalence of substance/alcohol abuse in suicide victims. Therefore, assessing the relationship between suicide and substance and/or alcohol abuse is limited in this study.

In conclusion, the age-adjusted suicide rate in Indianapolis was 14.08 per 100,000 in 1999 (age-adjusted to the population of 2000), which is higher than the national average of 10.7 per 100,000 and the state average of 10.4 per 100,000 (Hoyert et al., 2001; Indiana State Department of Health, 2002). Because of the increased nature of suicide in Indianapolis, it is important to identify risk factors for suicide in order to develop effective preventative programs, such as ones being developed by state suicide prevention committees in Indiana or among other Midwest states. The present results are valuable to the local mental health provider who serves an elderly population to query risk factors and provide psychiatric assistance in a timely manner. Insurance providers need to be aware of the need for mental health programs for the elderly because they are an at-risk population. Also, clergy, who may be one of the first people an individual who is contemplating suicide would turn to for help, would need to know this information to provide guidance and referrals to appropriate mental health providers. Finally, policymakers need to be aware of the statistics on suicide to help address mental health and injury prevention needs of the local community.

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