JOURNAL OF FORENSIC SCIENCES

J Forensic Sci, January 2010, Vol. 55, No. 1
doi: 10.1111/j.1556-4029.2009.01254.x
Available online at: interscience.wiley.com

PAPER
PATHOLOGY AND BIOLOGY

Anne N. Styka,[1] M.P.H.; David S. White[2]; Ross E. Zumwalt,[2] M.D.; and Sarah L. Lathrop,[2] D.V.M., Ph.D.

Trends in Adult Suicides in New Mexico: Utilizing Data from the New Mexico Violent Death Reporting System*

ABSTRACT: Although many suicide prevention programs focus on youth suicides, data indicate the vast majority of suicides occur among adults (18–64 years). In 2005 New Mexico joined the Centers for Disease Control and Prevention's National Violent Death Reporting System, collecting data on suicides, homicides, and unintentional firearm fatalities to better inform state and national prevention programs. We utilized data collected by the New Mexico Violent Death Reporting System in its first 2 years of operation (2005 and 2006) in order to define the demographic patterns of adult suicides in the state and characterize risk factors. A total of 526 suicides occurred among adults during this time, with the majority being male (78.5%) and White non-Hispanic (56.7%). The highest incidence was in adults between 45 and 54 years (28.1%). Firearms were the most commonly used mechanism, and "current depressed mood" the most commonly identified risk factor. High rates of adult suicide indicate the need for targeted prevention programs.

KEYWORDS: forensic science, suicide, epidemiology, violent death

Although suicide is recognized as a serious public health issue worldwide (1–4), most publications and preventive research have focused on youth and adolescent suicides (5–7), suicide ideation (8), parasuicidal behaviors (9), and depression (10,11). Both nationally and internationally the rate of suicide increases with age, and in general, the suicide rate for males is nearly four times higher than the suicide rate for females across all ages (1). In 1995, suicide was the sixth leading mechanism of death for all persons under age 65 in the United States (12); 10 years later, suicide was the fourth leading type of death for persons under age 65 in both the United States and New Mexico for this age group (13).

Most suicide research has focused on a single contributory factor such as depression or mental health history (10,11). However, many times multiple factors influence the decision to commit suicide. It is important to recognize the effect that multiple circumstances and situations have on the decision to end one's life. The vast majority of suicide analyses have focused on non-Hispanic Whites, with very few studies targeting American Indians/Alaska Natives (14–16) and even less suicide research has focused solely on the Hispanic population (17–20). Therefore, the unique tri-ethnic adult population of New Mexico provides valuable epidemiologic data to explore the role of the multitude of circumstances that contribute to the completion of suicide in this population.

The New Mexico Violent Death Reporting System (NM-VDRS), the New Mexico implementation of the National Violent Death Reporting System (NVDRS) is an active, population-based surveillance system designed to monitor trends in violent deaths, including homicides, suicides, unintentional firearm fatalities, and deaths of undetermined intent. Recognizing the need for standardized data regarding violent deaths, the Centers for Disease Control and Prevention (CDC) instituted NVDRS in 2002, expanding the network to 17 states by 2004. New Mexico joined the network in 2004 and began collecting data on January 1, 2005. As in other NVDRS states, NM-VDRS collects detailed information on all violent deaths occurring within the state from several data sources, including death certificates, medical examiner reports, law enforcement investigations, and crime labs. A more complete description of the objectives and methods of NVDRS can be found in "Surveillance for Violent Deaths—National Violent Death Reporting System, 16 States, 2005," *Morbidity and Mortality Weekly Report,* CDC, published April 11, 2008 (21).

With this data collection system in place in New Mexico for the past 3 years, adequate data are now available to help answer questions of public health significance. For our current study, we used NM-VDRS data to analyze patterns of adult suicides in the state of New Mexico. Although many prevention strategies rightfully focus on the problem of youth suicides, we have also been observing high rates of suicides in our adult population. Better understanding the populations at risk, the most commonly observed distal and proximal stressors, and the circumstances of adult suicides can help inform public health policy and prevention programs.

Methods

In New Mexico, the New Mexico Department of Health (NMDOH) collaborates with the Office of the Medical Investigator (OMI) and the Bureau of Vital Records and Health Statistics

[1]New Mexico Department of Health, Santa Fe, NM.
[2]Office of the Medical Investigator, University of New Mexico, Albuquerque, NM.

*Funded by the Centers for Disease Control and Prevention/New Mexico Department of Health Cooperative Agreement #U17CE624126-05. Opinions expressed are solely those of the authors.

Received 25 Nov. 2008; and in revised form 26 Jan. 2009; accepted 31 Jan. 2009.

(BVRHS) to operate NM-VDRS. The OMI is the statewide, centralized medical examiner agency for the state of New Mexico, authorized to investigate any deaths within the state that are sudden, violent, unexpected, or unattended by a physician. Eight board-certified forensic pathologists work at the OMI facility at the University of New Mexico in Albuquerque to perform death investigations, investigating approximately one-third of all the deaths occurring in New Mexico each year (5000/15,000). In 2005 and 2006, the years included in this study, OMI investigated 5159 and 5031 deaths, respectively (22). Although OMI does not have jurisdiction on federal lands, including military installations and tribal land, it is often contracted to investigate suspicious deaths occurring there. BVRHS uses an electronic system to issue death certificates for all deaths in the state, and can query this system to identify any deaths of interest to NM-VDRS which were not investigated by OMI. NM-VDRS is housed at OMI, where case ascertainment and data entry are performed.

Case Ascertainment

NM-VDRS cases selected for inclusion in this study had suicide as the manner of death, age at death between 18 and 64 years, and New Mexico residency. The determination of the manner of death as suicide was "abstractor defined," which was felt to be more accurate than a determination of manner by a single document, given that the abstractor has the advantage of reviewing several source documents and often has knowledge of the circumstances, or precipitating events, surrounding the fatal injury. Suicide is defined by the NVDRS as a death resulting from the use of force against oneself when a preponderance of evidence indicates that the use of force was intentional (21). Included in the suicide category are those decedents who intended only to injure rather than kill themselves, and cases involving the possibility of harm or death, such as "Russian Roulette." Not included in this category are deaths caused by acute or chronic substance abuse without the intent to die and deaths due to autoerotic asphyxiation. For purposes of this review, adult was defined as a person between the ages of 18 and 64, and in order to calculate and present rates, we limited the decedents to New Mexico residents.

Mechanism of Suicide

Weapons/mechanisms were grouped into four categories: firearm (only), asphyxia (hanging, suffocation, or strangulation) (only), poisoning (only), and other. Other weapon/mechanism includes sharp instruments, falls, drowning, fire or burns, motor and transport vehicles, and combinations of any of the mechanisms. Due to the small numbers of these mechanisms used to commit suicide in each year, they were combined into one category. Only the weapon/mechanism that was listed as the immediate cause of death was used for these analyses.

Information on Circumstances

Circumstances regarding suicides were collected from the OMI field investigator reports and/or reports from law enforcement. If either of these sources indicated a circumstance to be true, it was entered into the record of the database as true. Veteran status was also included in circumstances, although it was collected as a data element rather than a suicide-specific circumstance in the NVDRS database. In New Mexico, the information provided from the death certificate determines whether a person is considered a veteran. If an affirmative response to the question "Was decedent ever in U.S. Armed Forces?" was given, then the decedent was considered to be a veteran.

Analysis Methods

Data were entered into CDC-provided NVDRS software, then extracted from the NM-VDRS database for analysis. All analyses were done using SAS v 9.1 software (Cary, NC) on NM-VDRS file version 1 (extracted from the NM-VDRS server June 7, 2008). Since individual data years in the NM-VDRS database are never closed, records are often updated when more information becomes available; therefore, for this analysis using combined 2005 and 2006 data, the numbers may change slightly if these data are reanalyzed at a later date. Descriptive statistics were generated to compare decedents based on selected demographic factors, including sex, race/ethnicity, age, and marital status. Rates per 100,000 population were calculated using 2005 and 2006 population estimates from the University of New Mexico Bureau of Business and Economic Research (23). As only six decedents were reported to be of Black or Asian race, these persons were omitted from all race/ethnicity specific analyses. Race/ethnicities were grouped to reflect the tri-ethnic population of New Mexico: White non-Hispanic (hereafter referred to as White), White Hispanic (hereafter referred to as Hispanic), and American Indian/Alaska Native (hereafter referred to as Native American).

Results

Demographic characteristics of the 526 adult suicides identified by NM-VDRS between 2005 and 2006 are presented in Table 1. The majority of adult suicides were male (78.5%) and White (56.7%). Whites were over-represented, as they comprise only 43% of New Mexico's racial/ethnic distribution (23). The highest percentages of adult suicides were found in the older age categories, specifically 45–54 year olds (28.1%) and 35–44 year olds (21.1%). More adults were never married than married, divorced, or widowed. Calculating rates of suicide by sex and age group, we found the rates for males to be consistently higher than the rates for females across all age and race/ethnicity categories (Fig. 1).

TABLE 1—*Frequency distributions of demographic characteristics for adult suicide decedents.*

	Number	%	Rate per 100,000
Sex			
Male	413	78.5	33.6
Female	113	21.5	9.0
Race/ethnicity			
Non-Hispanic White	298	56.7	27.1
Hispanic White	177	33.7	17.6
Native American	41	7.8	15.6
Other/Unknown	10	1.9	—
Age group			
18–24	96	18.3	22.6
25–34	94	17.9	19.1
35–44	111	21.1	20.7
45–54	148	28.1	25.3
55–64	77	14.6	17.3
Marital status			
Married	180	34.2	—
Never married	195	37.1	—
Widowed	9	1.7	—
Divorced	137	26.0	—
Single, not otherwise specified	3	0.6	—
Missing	2	0.4	—

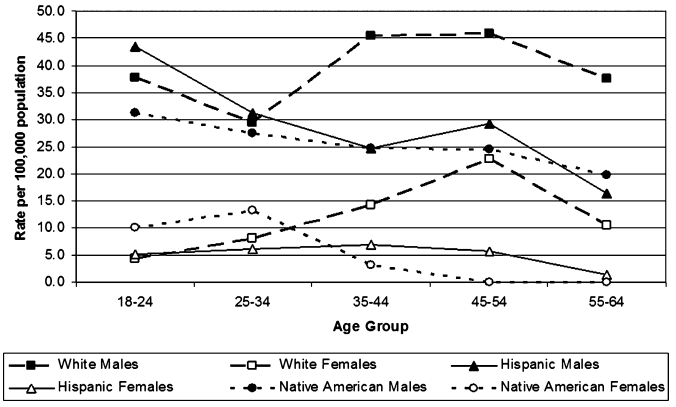

FIG. 1—*Rate of suicide by age group, sex, and race/ethnicity.*

When these rates were calculated per 100,000 population, males aged 35–44 and 45–54 years had the highest rates of suicide (45.4 per 100,000 and 45.9 per 100,000, respectively). Among females, Native American females had higher rates of suicide than either White or Hispanic females in the younger age groups (18–34 years), but lower rates of suicide in the older age categories (35–64 years). These rates should be interpreted with caution, however, given a lack of stability due to fewer than 20 counts in all female race/ethnicity and age categories. Native American males had consistently lower suicide rates than White and Hispanic males across all adult age categories. Both males and females experienced a spike in the suicide rates for the 45–54 year age group. In the 45–54 year age group, the suicide rate for White females increased by nearly 60% from the previous age category, 35–44 years, to have nearly the same suicide rate as Native American males (22.6 per 100,000 and 24.6 per 100,000 population, respectively).

The numbers of weapons/mechanisms used to commit suicide by sex, race/ethnicity, and age group are shown in Fig. 2*a–c*. While firearms, followed by asphyxia (hanging, strangulation, suffocation), were the most commonly selected mechanism of suicide for adult males, females most commonly employed poisoning, then firearms. Firearms were also the weapons of choice for both White and Hispanic decedents, as contrasted to asphyxia mechanisms that were the most commonly used methods for Native American suicides in this study. Self-inflicted gunshot wounds were the most common cause of suicidal deaths across all age groups (Fig. 2*c*), followed by asphyxia in younger age groups (18–34 years) and poisoning in the older age categories (35–64 years).

The numbers and percentages of decedents reporting each of 21 suicide-specific circumstances collected by the NM-VDRS are shown by sex and race/ethnicity in Table 2 and by age category in Table 3. Overall, at least one circumstance was known for 98.1% of the decedents. More than 60% of females were reported to have six or more circumstances, whereas only 38% of males had six or more circumstances reported. Both male and female decedents were commonly reported to have a "currently depressed mood" (52.8% and 75.2%, respectively). Women were more likely than men to be reported as having a current mental health problem, ever having been treated for a mental illness, and having left a note. Both men and women were commonly found to have a history of intimate partner problems (47.2% and 39.8%, respectively) and a history of alcohol abuse (40.4% and 31.9%, respectively). Over 40% of men and women who committed suicide had disclosed their intent to do so (43.6% and 45.1%, respectively). Males were more likely than females to be known to have a job problem (18.6% vs. 12.4%),

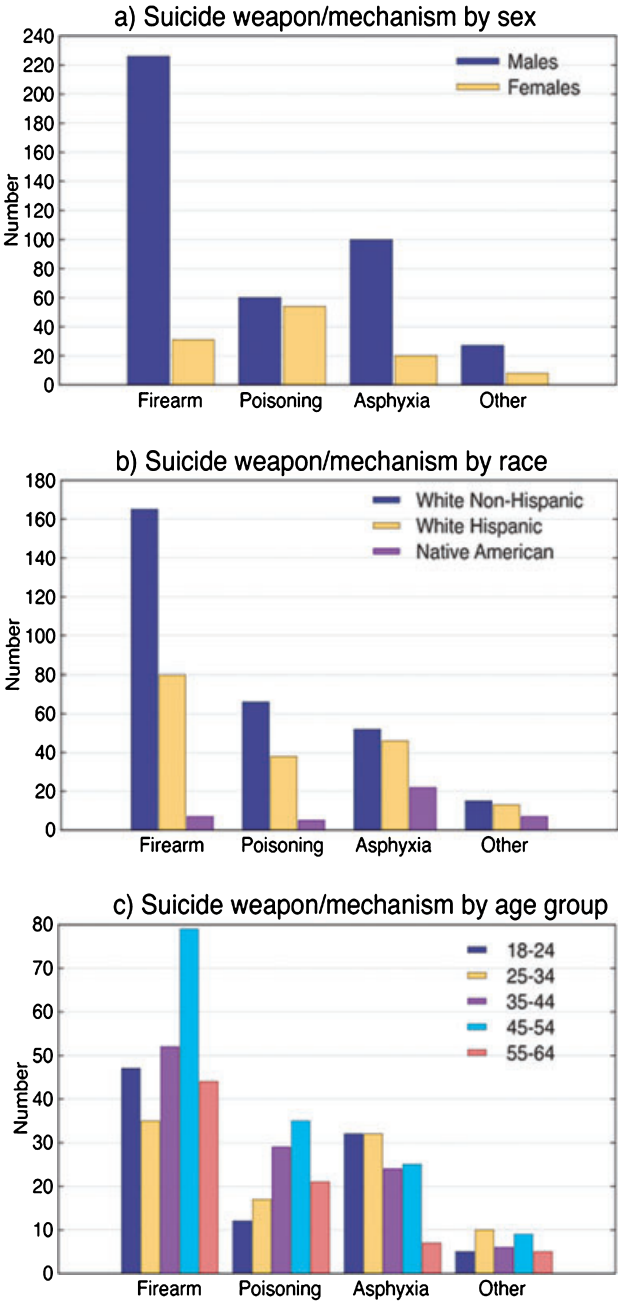

FIG. 2 *(a–c)—Suicide weapon/mechanism by sex (a), race/ethnicity (b), and age group (c).*

recent criminal legal problem (16.0% vs. 6.2%), and to be a perpetrator of interpersonal violence in the month prior to the suicide (13.1% vs. 1.8%). Seventy-seven of the men (18.6%) and five of the women (4%) in this study who committed suicide were veterans.

Considering the circumstances by race/ethnicity, "currently depressed mood" was the most common circumstance reported overall (59.4% of Whites, 55.9% of Hispanics, and 51.2% of Native Americans). More than 50% of White decedents had six or more circumstances reported compared to 40% of Hispanics and 26.8% of Native American decedents. White decedents were much more likely to have a reported current mental health problem and to have ever been treated for a mental illness (52.7% and 50.3%,

TABLE 2—*Frequency distributions of suicide circumstances by sex and race/ethnicity.*

	Male		Female		Non-Hispanic White		Hispanic White		Native American	
Circumstance[†]	*N*	%*	*N*	%*	*N*	%*	*N*	%*	*N*	%*
Total	413		113		298		177		41	
Any circumstance known	405	98.1	111	98.2	291	97.7	176	99.4	40	97.6
Mental health										
Current depressed mood	218	52.8	85	75.2	177	59.4	99	55.9	21	51.2
Current mental health problem	151	36.6	81	71.7	157	52.7	64	36.2	8	19.5
Ever treated for mental illness	141	34.1	79	69.9	150	50.3	59	33.3	8	19.5
Substance abuse										
Alcohol problem	167	40.4	36	31.9	110	36.9	70	39.5	22	53.7
Other substance problem	123	29.8	31	27.4	76	25.5	65	36.7	9	22.0
Suicidal forethought										
Person left a suicide note	88	21.3	49	43.4	101	33.9	25	14.1	8	19.5
Disclosed intent to commit suicide	180	43.6	51	45.1	119	39.9	98	55.4	12	29.3
History of suicide attempts	102	24.7	46	40.7	78	26.2	52	29.4	17	41.5
Suicide of friend or family in past 5 years	17	4.1	5	4.4	10	3.4	8	4.5	4	9.8
Relationship problems										
Intimate partner problem	195	47.2	45	39.8	124	41.6	90	50.8	21	51.2
Other relationship problem	72	17.4	22	19.5	47	15.8	35	19.8	10	24.4
Other death of friend or family	44	10.7	20	17.7	31	10.4	28	15.8	5	12.2
Victim of interpersonal violence in the past month	3	0.7	1	0.9	2	0.7	2	1.1	0	0.0
Perpetrator of interpersonal violence in the past month	54	13.1	2	1.8	24	8.1	25	14.1	5	12.2
Legal problems										
Recent criminal legal problem	66	16.0	7	6.2	41	13.8	22	12.4	10	24.4
Other legal problems	37	9.0	4	3.5	24	8.1	14	7.9	2	4.9
Proximal stressors										
Crisis in the past 2 weeks	96	23.2	30	26.5	69	23.2	45	25.4	9	22.0
Financial problem	82	19.9	12	10.6	65	21.8	24	13.6	1	2.4
Physical health problem	79	19.1	37	32.7	81	27.2	27	15.3	6	14.6
Job problem	77	18.6	14	12.4	56	18.8	30	16.9	4	9.8
Veteran	77	18.6	5	4.4	61	20.5	18	10.2	1	2.4

*Percentages may not add to 100% due to rounding.
[†]There is no limit on the number of circumstances that can be reported.

respectively) as compared to Hispanics (36.2% and 33.3%, respectively) and Native Americans (19.5% and 19.5%, respectively). Hispanics were more likely to disclose their intent to commit suicide (55.4%) as compared to Whites (39.9%) and Native Americans (29.3%). An alcohol problem was reported for 53.7% of Native American decedents and was the most common circumstance reported for this racial group. Whites were more likely to leave a suicide note (33.9%) compared to Hispanics (14.1%) and Native Americans (19.5%), but Native Americans had a much higher proportion of history of suicide attempts (41.5%) compared to Whites and Hispanics (26.2% and 29.4%, respectively). Intimate partner problems were reported for more than 50% of Hispanic and Native American decedents, compared to 41.6% of Whites. Sixty-one (20.5%) White, 18 (10.2%) Hispanic decedents, and one Native American decedent were veterans.

When looking at the reported suicide circumstances by age group (Table 3), nearly 60% of the decedents 18–24 years and 55–64 years of age had between three and six circumstances reported. In the middle year age groups (25–34, 35–44, and 45–54) the majority of decedents had four or more circumstances reported. Current depressed mood was the most commonly reported circumstance across every age group. A current mental health problem was reported from a low of 34.4% in 18–24 year olds, to a high of 51.4% in 45–54 year olds. Alcohol and other substance abuse problems were highest in the 25–34 and 35–44 year age groups. The 25–34 year age group was more likely than the other age categories to disclose the intent to commit suicide as well as have a history of suicide attempts, but decedents in the 55–64 year age group were more likely than the other age groups to leave a note. Reported intimate partner problems were highest in the 18–24 year age group (55.2%) with decreasing proportions as the age groups increased to a low of 18.2% in the 55–64 year age group. The largest proportion of veteran suicide decedents (37.7%) is in the 55–64 year age group. This group also contained the largest proportion of decedents where financial problems (24.7%) and physical health problems (54.5%) directly contributed to the decision to commit suicide.

Discussion

Overall, the majority of adult suicide decedents were male (78.5%) and White (56.7%), which is consistent with both national statistics (10,13) and previous studies of suicide in New Mexico (18). Considering males comprise 49% of the New Mexico population and Whites comprise 43% of the New Mexico population, these groups are over-represented among suicides. The highest percentage of suicides in any age category (28.1%) occurred in the 45–54 year age group, which is over-represented, as only 14.8% of the New Mexico population is between these ages. The ratio of male to female suicides was 3.7:1, which is consistent with previous studies of suicide in the United States (5,10,20).

Consistent with previous studies that reported weapon/mechanism of suicide, the majority of decedents used a firearm (48.9%) to complete the suicide. Males in this study most frequently chose firearms as the mechanism of suicide (54.7%), followed by asphyxiation (hanging, strangulation, suffocation) and poisoning (24.2% and 14.5%, respectively), while women most commonly selected poisoning (47.8%), followed by firearms and asphyxiation (27.4%

TABLE 3—*Frequency distributions of suicide circumstances by age group.*

	18–24		25–34		35–44		45–54		55–64	
Circumstance[†]	*N*	%*	*N*	%*	*N*	%*	*N*	%*	*N*	%*
Total	96		94		111		148		77	
Any circumstance known	92	95.8	91	96.8	109	98.2	148	100.0	76	98.7
Mental health										
Current depressed mood	54	56.3	57	60.6	64	57.7	80	54.1	48	62.3
Current mental health problem	33	34.4	34	36.2	50	45.0	76	51.4	39	50.6
Ever treated for mental illness	30	31.3	31	33.0	46	41.4	75	50.7	38	49.4
Substance abuse										
Alcohol problem	31	32.3	42	44.7	49	44.1	57	38.5	24	31.2
Other substance problem	28	29.2	39	41.5	38	34.2	43	29.1	6	7.8
Suicidal forethought										
Person left a suicide note	22	22.9	23	24.5	21	18.9	46	31.1	25	32.5
Disclosed intent to commit suicide	39	40.6	49	52.1	54	48.6	57	38.5	32	41.6
History of suicide attempts	28	29.2	31	33.0	28	25.2	47	31.8	14	18.2
Suicide of friend or family in past 5 years	10	10.4	4	4.3	2	1.8	4	2.7	2	2.6
Relationship problems										
Intimate partner problem	53	55.2	50	53.2	59	53.2	64	43.2	14	18.2
Other relationship problem	25	26.0	18	19.1	17	15.3	23	15.5	11	14.3
Other death of friend or family	14	14.6	15	16.0	12	10.8	16	10.8	7	9.1
Victim of interpersonal violence in the past month	2	2.1	1	1.1	1	0.9	0	0.0	0	0.0
Perpetrator of interpersonal violence in the past month	8	8.3	11	11.7	15	13.5	20	13.5	2	2.6
Legal problems										
Recent criminal legal problem	14	14.6	15	16.0	23	20.7	16	10.8	5	6.5
Other legal problems	6	6.3	10	10.6	11	9.9	10	6.8	4	5.2
Proximal stressors										
Crisis in the past 2 weeks	30	31.3	26	27.7	22	19.8	31	20.9	17	22.1
Financial problem	12	12.5	15	16.0	20	18.0	28	18.9	19	24.7
Physical health problem	4	4.2	10	10.6	17	15.3	43	29.1	42	54.5
Job problem	10	10.4	17	18.1	29	26.1	27	18.2	8	10.4
Veteran	4	4.2	6	6.4	13	11.7	30	20.3	29	37.7

*Percentages may not add to 100% due to rounding
[†]There is no limit on the number of circumstances that can be reported.

and 17.7%, respectively). Males have been previously noted to preferentially select firearms for suicide (62% of all suicides by men) (10), but an earlier study of suicide among females in New Mexico found that during the period 1990–1994, women were also more likely to select firearms over poisoning (46% vs. 29% of all female suicides) (24). Our finding of poisoning as the preferred method of suicide in women during this time period is more in keeping with findings that women more often select "soft" methods of suicide, while men more often choose "hard," more violent methods of suicide, with less chance for bystander intervention (10). Whereas asphyxiation mechanisms were more common in adolescent suicides (5), firearms were the most commonly used weapon across all adult age groups, a difference most likely due to the lack of restrictions for obtaining and owning guns for adults. Although the majority of White and Hispanic adults in this study used firearms to commit suicide, Native Americans most commonly used asphyxia. Previous studies have found hanging, particularly outdoors, to be a more common choice for suicide among Native Americans, given differences in cultures and accessibility of firearms (25).

When considering circumstances and precipitating factors for suicide by sex, current depressed mood, a current mental health problem, and ever being treated for a mental illness were the most commonly reported events preceding the suicide (75.2% of females, 52.8% of males for current depressed mood). This is similar to previous findings that up to 90% of adult suicides have a psychiatric diagnosis from the Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV and that depression is one of the diagnoses most highly predictive of suicide (10,26). The percentage of women who had a report of interpersonal violence (0.9%) was lower than that previously found in a study of female suicides in New Mexico, which reported that intimate partner violence (IPV) was documented in 5.1% of female suicides (24). However, our study only collected information on IPV for the month preceding the suicide, leading to potential underreporting of this risk factor. Almost 40% of adult females included in this study had a report of an "intimate partner problem," more comparable to the 22% of female suicide victims who were known to have fought with or separated from an intimate partner in the previous study (24). Thirteen percent of men in this study reported being a perpetrator of IPV in the month preceding their suicide, and more men than women had a history of an intimate partner problem, confirming findings suggesting that people are at higher risk for suicide when they struggle with interpersonal relationships (10).

Overall, the percentage of adults who left a suicide note (26%) was very similar to that of the New Mexico youth suicides previously studied (25%) (5). However, adults were more likely to have disclosed their intent to commit suicide to a person with enough time to intervene, with 44% of adults having done so, compared to 20% of New Mexico youth suicides (5). Youth who committed suicide may have felt more socially isolated (10), and acted more spontaneously than the adults in this study, who more often had expressed their intent to a friend or loved one. The intent to commit suicide was highest in the 25–34 year age group (52.1%) and lowest in the 45–54 year age group (38.5%).

Regarding substance abuse problems by gender, alcohol and substance abuse problems were reported more often for men than for women, but a third or more of both genders in this study reported a problem with alcohol, and over one-fourth had a history of some other type of substance abuse problem. Numerous studies have

described the association between alcohol/substance abuse and suicide, noting that 18% of alcoholics die by suicide, and that 50% of suicide victims are intoxicated at the time of death (10,27).

The most commonly reported circumstances surrounding suicide differed by race/ethnicity among the three groups. Whereas current depressed mood was most often reported for Whites (59.4%) and Hispanics (55.9%), an alcohol problem was the most commonly reported circumstance for Native Americans (53.7%). This is similar to a previous finding of Native American suicides in New Mexico between 1980 and 1998, which found that alcohol was detected in 69% of all Native American suicides with a mean blood alcohol concentration (BAC) of 0.198, more than double the level considered legally intoxicated (0.08 g/dL) (15). Both alcohol abuse and drinking are associated with an elevated risk of both attempted and completed suicides (15). Whites were much more likely to have a reported current mental health problem (52.7%) or have ever been treated for a mental illness (50.3%) than Hispanics (36.2% and 33.3%, respectively) and Native Americans (19.5% and 19.5%, respectively). This may be due to lack of access to or availability of treatment, as both school-based and community-based suicide prevention programs (in other states) have been found to be effective in some Native American communities (15). Additionally, other studies have found that perceived discrimination may discourage under-served populations from seeking needed health care (28). Medical insurance information and hospital/treatment records were not collected, making it impossible to know whether or not a person had mental health coverage or could be treated if they had wanted. Native Americans were almost three times more likely than Whites and more than twice as likely as Hispanics to have experienced the suicide of a friend or family member in the past 5 years, a documented risk factor for increased suicide risk (29). More than 50% of Hispanic and Native American decedents were reported to have an intimate partner problem, compared to 41.6% of Whites. Recent criminal legal problems were reported in nearly a quarter of Native American suicides, but for only 13.8% of White and 12.4% of Hispanic decedents.

The circumstances associated with suicide in this New Mexican adult resident population varied by age group. Circumstances around youth and adolescent suicides in New Mexico differed from the most reported circumstances in the adult suicide population. Singh and Lathrop found that psychological problems were a factor in 46% of male and 53% of female adolescent suicides in New Mexico from 1979 to 2005 (5). Although the NM-VDRS collects more specific mental health information, this range is consistent with a reported current mental health problem at the time of death for adults and also for reports of having ever been treated for a mental illness. In all five adult age groups, current depressed mood was the most common reported circumstance, a well-documented risk factor for suicide attempts and completion (10,26). Alcohol problems were most commonly reported in the 25–34 (44.7%) and 35–44 (44.1%) age groups, with lowest prevalence reported for 55–64 year olds. A similar pattern is observed for having a substance problem, with a peak in the 25–34 year age group (41.5%) and the lowest reported in the 55–64 year age group (7.8%).

A history of suicide attempts was highest in the 25–34 year age group, with nearly one-third of decedents in this age group having attempted suicide at least one time before their fatally inflicted injury. Previous studies of parasuicidal behavior similarly found higher rates of suicide attempts and self-destructive behavior in younger people, with the highest rates being found among females 15–24 and males 25–34 years of age at 10 research centers in the U.S. (9). Experiencing a crisis in the 2 weeks before the suicide was reported more frequently in the two youngest age groups compared to the older age groups. As expected, the proportion of decedents with a reported physical health problem increased as the age groups increased, where 54.5% of decedents 55–64 years reported such an ailment, the second most common precipitating factor in this age group. Intimate partner problems were cited as circumstances contributing to the suicide for more that 50% of decedents in age groups 18–24, 25–34, and 35–44 years, whereas only 18.2% of decedents aged 55–64 years had this reported circumstance, perhaps due to "aging out" of the higher frequency of intimate partner problems through divorce or death of a spouse. The proportion of decedents with reported job problems was shaped as an inverted "U," with more than one quarter of the 35- to 44-year-old decedents and only about 10% of 18–24 and 55–64 year decedents reporting this circumstance. This finding was not surprising, as most 18–24 year olds are usually in school or just starting employment, and 55–64 year olds are beginning to retire during this time frame. The number of veteran decedents increased with increasing age groups, as would be expected, but it is not known whether the suicide was associated directly with service in the armed forces.

Although scene guidelines used by the OMI investigators are designed to collect as much relevant information as possible during the course of an investigation, some circumstance questions may have been omitted or not answered during the investigation, especially depending on the person providing the information (spouse vs. friend vs. coworker). No additional interviews were conducted to verify collected information or to obtain more information. Additionally, the OMI does not have jurisdiction on federal lands, including military installations and tribal land, and is not always contracted to investigate suicides occurring there. However, with NM-VDRS also collecting data from BVRHS, more of these suicides were included in this study than previously would have been, even if strictly from death certificate identification and not medical examiner investigations. In 2006 the BVRHS implemented an electronic death certificate system based on the national standard. Therefore, some changes were made in the variables collected or how some data elements were classified. It is also possible that the descriptive statistics reported are underestimated due to misclassification of undetermined intent cases that may have been suicides, particularly undetermined deaths that involved submersion or poisoning (30,31). In previous studies, it has been estimated that this misclassification of undetermined deaths could reduce a suicide rate by as much as 10% (32). If this was also true in New Mexico during the study period, we would expect from 34 to 36 additional adult decedents per year would have been included in this analysis.

Based on the results presented and the high suicide rates found across all adult age groups, the need for primary prevention programs is clear. Many suicide prevention activities focus on youth, but more prevention initiatives and allocation of some suicide prevention funding should focus on the adult population. Although late-stage prevention programs, such as crisis hotlines, are important, it may be more effective to fund primary prevention initiatives, including increasing access to mental health care, counseling services, and access to treatment for addictive behaviors (alcohol and/or substance abuse). Other programs, such as those through work, where most adults spend one-third of their time, that follow the example of school-based prevention programs for adolescents may also be effective. The results from this study suggest suicide-specific circumstances differ by sex, race/ethnicity, and age group; thus, further research is needed to determine the most effective preventive measures for these different groups (e.g., White males between the ages of 45–64 and Native American females 18–24 years old).

Risk profiling and determining evidence-based intervention strategies that can be used in the entire adult population, as well as subsets of this population, are priorities of the NM-VDRS and NMDOH staff. As additional years are added, the data will become more robust and enable us to examine extremely targeted questions of public health significance to further suicide prevention efforts. More research is needed into the complex interplay of the many circumstances and predisposing factors surrounding suicide in the adult population of New Mexico, as well as programs to target the multiple causes.

Acknowledgments

We would like to thank all our partners at the NMDOH, BVRHS, OMI, and New Mexico law enforcement agencies.

References

1. Krug EG, Mercy JA, Dahlberg LL, Zwi AB, Lozano R, editors. The world report on violence and health. Lancet 2002;360(9339):1083–8.
2. Szadoczky E, Vitrai J, Rihmer Z, Furedi J. Suicide attempts in the Hungarian adult population. Their relation with DIS/DSM-III-R affective and anxiety disorders. Eur Psychiatry 2000;15(6):343–7.
3. Kjoler M, Helweg-Larsen M. Suicidal ideation and suicide attempts among adult Danes. Scand J Public Health 2000;28:54–61.
4. Zeng K, Le Tendre G. Adolescent suicide and academic competition in East Asia. Comp Educ Rev 1998;42(4):513–28.
5. Singh VD, Lathrop SL. Youth suicide in New Mexico: a 26-year retrospective review. J Forensic Sci 2008;53(3):703–8.
6. Molina JA, Duarte R. Risk determinants of suicide attempts among adolescents. Am J Econ Sociol 2006;65(2):407–34.
7. Dunn MS, Goodrow B, Givens C, Austin S. Substance use behavior and suicide indicators among rural middle school students. J School Health 2008;78(1):26–31.
8. Forman EM, Berk MS, Henriques GR, Brown GK, Beck AT. History of multiple suicide attempts as a behavioral marker of severe psychopathology. Am J Psychiatry 2004;161(3):437–42.
9. Welch SS. A review of the literature on the epidemiology of parasuicide in the general population. Psychiatr Serv 2001;52(3):368–75.
10. Maris RW. Suicide. Lancet 2002;360(9329):319–26.
11. Brown SL, Vinokur AD. The interplay among risk factors for suicidal ideation and suicide: the role of depression, poor health, and loved ones' messages of support and criticism. Am J Community Psychol 2003;32(1/2):131–41.
12. Kachur SP, Potter LB, James SP, Powell KE. Suicide in the United States 1980-1992, violence summary series, No. 1. Atlanta, GA: National Center for Injury Prevention and Control, 1995.
13. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS). http://www.cdc.gov/injury/wisqars/index.html. Accessed January 6, 2009.
14. Van Winkle NW, May PA. An update on American Indian suicide in New Mexico, 1980-1987. Human Organization 1993;52(3):304–15.
15. May PA, Van Winkle NW, Williams MB, McFeeley PJ, DeBruyn LM, Serna P. Alcohol and suicide death among American Indians of New Mexico: 1980-1998. Suicide Life Threat Behav 2002;32(3):240–55.
16. Alcantara C, Gone JP. Reviewing suicide in Native American communities: situating risk and protective factors within a transactional-ecological framework. Death Stud 2007;31(5):457–77.
17. Smith JC, Mercy JA, Rosenberg ML. Suicide and homicide among Hispanics in the Southwest. Public Health Rep 1986;101(3):265–70.
18. Sewell CM, Becker TM, Wiggins CL, Key CR, Hull HF, Samet JM. Injury mortality in New Mexico's American Indians, Hispanics, and Non-Hispanic Whites, 1958 to 1982. West J Med 1989;150:708–13.
19. Centers for Disease Control and Prevention. Suicide among Hispanics—United States, 1997-2001. Surveillance Summaries 2004. MMWR 2004;53(22):478–81.
20. Garcia C, Skay C, Sieving R, Naughton S, Bearinger LH. Family and racial factors associated with suicide and emotional distress among Latino students. J School Health 2008;78(9):487–95.
21. Centers for Disease Control and Prevention. Surveillance for violent deaths—National Violent Death Reporting System, 16 States, 2005. MMWR CDC Surveill Summ 2008;57(SS-3):1–43.
22. New Mexico Office of the Medical Investigator Annual Reports, http://omi.unm.edu/
23. Bureau of Business and Economic Research. Population estimates and projections program, University of New Mexico; 2005 and 2006 data. http://www.unm.edu/~bber/demograp2.htm.
24. Olson L, Huyler F, Lynch AW, Fullerton L, Werenko D, Sklar D, et al. Guns, alcohol, and intimate partner violence: the epidemiology of female suicide in New Mexico. Crisis 1999;20(3):121–6.
25. Komar D, Beattie O, Dowling G, Bannach B. Hangings in Alberta, with special reference to outdoor hangings with decomposition. Can Soc Forensic Sci J 1999;32:85–96.
26. Moscicki E. Epidemiology of suicide. In: Goldsmith S, editor. Suicide prevention and intervention. Washington, DC: National Academy Press, 2001;1–4.
27. Roy A, Linnoila M. Alcoholism and suicide. In: Maris RW, editor. Biology of suicide. New York, NY: Guilford, 1986;244–73.
28. Burgess DJ, Ding Y, Hargreaves M, van Ryn M, Phelan S. The association between perceived discrimination and underutilization of needed medical and mental health care in a multi-ethnic community sample. J Health Care Poor Underserved 2008;19(3):894–911.
29. Qin P, Agerbo E, Mortenson PB. Suicide risk in relation to family history of completed suicide and psychiatric disorders: a nested case control study based on longitudinal registers. Lancet 2002;360:1126–30.
30. Sorenson SB, Shen H, Kraus JF. Undetermined manner of death: a comparison with unintentional injury, suicide, and homicide death. Eval Rev 1997;21(1):43–57.
31. Lindqvist P, Gustaffson L. Suicide classification—clues and their use. A study of 122 cases of suicide and undetermined manner of death. Forensic Sci Int 2002;128(3):136–40.
32. Ohberg A, Lonnqvist J. Suicides hidden among undetermined deaths. Acta Psychiatr Scand 1998;98(3):214–8.

Additional information and reprint requests:
Sarah L. Lathrop, D.V.M., Ph.D.
New Mexico Office of the Medical Investigator
MSC11 6030
1 University of New Mexico
Albuquerque
NM 87131-0001
E-mail: slathrop@salud.unm.edu