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## Youth Suicide in New Mexico: A 26-Year Retrospective Review\*

**ABSTRACT:** Although suicidal behavior in children and adolescents is a major public health problem, large-scale research on suicide in this population is uncommon. In this study, we reviewed autopsy and field reports for all pediatric suicide cases referred to the New Mexico Office of the Medical Investigator from 1979 to 2005. The age-adjusted suicide rate was 4.8 per 100,000. Psychologic stressors and parasuicidal behavior were identified in some cases. Seventy-six percent of suicides occurred in the victim's home or yard, and 25% left a suicide note. In 26% of cases, alcohol or other drugs were detected in postmortem. Gunshot wound was the most common method overall (58%), followed by hanging (30%). Although the age-adjusted suicide rate is higher in New Mexico than nationally, the trends in the population are similar. With a solid understanding of the circumstances, it may be possible to predict, and hopefully prevent, future cases of child and adolescent death.

**KEYWORDS:** forensic science, epidemiology, suicide, adolescent

Suicide is a tragic and potentially preventable public health problem. Whereas suicides account for 1.3% of all deaths in the United States annually, they comprise nearly 12% of deaths among 10- to 24-year olds (1). Although the overall rate of suicide among youth has declined slowly since 1995, several states have seen no significant change in rates over the past 10 years, and some (including Hawaii, Oklahoma, Nebraska, Nevada, and New Mexico) have even seen increasing rates in this time period (2). Suicide remains the third leading cause of death nationwide for people aged 10–24, and is the second leading cause of death in a number of states, as well as among Native Americans, in this age group (2).

The number of completed adolescent suicides reflects only a small portion of the impact of suicidal behavior. Many more young people are hospitalized as a result of nonfatal suicide attempts than are fatally injured, and a still greater number are treated in outpatient settings (or are not treated at all) for injuries resulting from suicidal acts (3,4).

Deaths and injuries from suicidal behavior represent a substantial drain on the economic, social, and health resources of the nation. Suicide accounts for \$25 billion each year in direct costs, including healthcare services, funeral services, autopsies and investigations, and indirect costs such as lost productivity (3). One public health approach for the prevention of suicide involves identifying and providing treatment for those individuals who are at high risk for suicide.

While suicide is often viewed as an impulsive response to a single stressful event, it is typically a far more complicated issue, resulting from complex interactions between biologic, psychologic, social, and environmental factors. As cited in the suicide literature, predisposing characteristics for suicide include mood or psychiatric disorders, chronic family disorganization, and a history of physical or sexual abuse (1,3,5,6). These characteristics in combination

with acute or proximal stressors, such as a fight with a parent or significant other, or being expelled from school, may stimulate suicidal ideation. Researchers tend to conceptualize suicidality as a continuum extending from thoughts about suicide that are not acted upon, to nonfatal suicidal acts, to completed suicide (3,5). Factors that may enhance the risk of acting on suicidal thoughts include access to lethal means, a tendency toward impulsive behavior, and a sense of hopelessness or pessimism (3–5). Current youth suicide prevention efforts are focused on school-based education programs for raising awareness of suicide and its risk factors, screening for “at risk” youth and directing these youth into appropriate mental health treatment; crisis intervention through suicide hotlines; and reducing access to lethal means (particularly through gun control measures) (3,5,6). However, the rate of suicide and attempted suicide has not changed dramatically in the recent past, despite advances in psychiatric and mental health treatment, suicide prevention and awareness programs, and reorganization of health services (1–3).

There is some indication that rates of suicidal behaviors and suicide risk profiles can vary widely among distinct social and cultural subgroups (5). Suicide is far more common among some groups of teens than others; for example, male teens are still almost five times more likely than females to die by suicide, even though females are more likely to attempt suicide (3–5). While white males account for the majority of youth suicide deaths nationwide, the suicide rate among Native American male youths is still exceedingly high in comparison with the overall rate for males 10–19 (16.0 per 100,000 vs. 7.8 per 100,000) (2). And although still relatively low (5.7 per 100,000 in 2000), the suicide rate has been increasing rapidly among African American males 10–19, doubling over the last 20 years (6,7). The stability in suicide rates among young people overall and the increasing rates in certain populations of youth suggest that current prevention strategies are not universally applicable. Research is needed to show which risk and protective factors are most relevant in this age group.

The substantial proportion of youth and the robust mix of ethnicities in New Mexico provide an opportunity to study a diverse group of youth suicide completers, including those less represented in national or other regional studies. In 2005, a total of 80% of the

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U.S. population was White, 13% Black, 1% American Indian/Alaska Native, and 14% Hispanic or Latino. In New Mexico, 85% of the population was White, 2% Black, 10% American Indian/Alaska Native, and 43% Hispanic or Latino, and >25% of the population was under 18 years of age (8). The New Mexico Office of the Medical Investigator (NMOMI) is the statewide, centralized medical examiner agency for New Mexico, and investigates all deaths in the state that are sudden, violent, unexpected, or unattended by a physician. Although OMI does not have jurisdiction on federal lands (military installations and American Indian reservations), the agency is frequently contracted to investigate suicides and homicides on these lands. During medicolegal death investigations, OMI collects demographic information and circumstantial information, as well as any relevant police reports, medical records, microbiologic test results, and toxicologic findings. Examination of the NMOMI database to identify characteristics of suicide associated with age, sex, and race between 1979 and 2005 has allowed us to create one of the largest population-based studies of young suicide decedents and identify patterns of suicide and suicidal behavior in this group.

## Research Methods

### Data Collection

The initial list of youth suicide cases was developed from an Access query of the NMOMI database for January 1979–November 2005, using in-house codes for manner of death and an age limitation of 17 years and younger. Demographic information and basic case information, including age, gender, race/ethnicity, county of residence and county of pronouncement of death, method of suicide, toxicology results (blood alcohol concentration, drugs of abuse, and general drugs), and a brief description of the circumstances, were downloaded electronically into an Excel spreadsheet.

Using this case listing, additional data were abstracted from review of the hard copies of each case, including how and where a child hanged himself, what type of firearm was involved, the anatomic location of the gunshot wound, and where the suicide occurred (in the family home, outside, near school). Data were also collected on the decedent's height and weight, to calculate body mass index (BMI). Investigators' logs, findings from any contact with relevant persons, content of any suicide notes, and any available medical records were reviewed for information regarding risk factors. Individual risk factors were coded as present (1) or absent (0), with each score of 1 contributing to the cumulative total of each subheading of risk factor. The classes of putative risk factors were gleaned from review of the suicide literature and are listed in Fig. 1.

### Data Analysis

Data were cleaned in Microsoft Excel and analyzed with SAS software, version 9.1 (SAS Institute, Cary, NC). Descriptive statistics were generated for youth suicides as a whole, then broken down by age category, gender, race/ethnicity, method of suicide, and presence of risk factors as determined by examination of the numbers of cases in each category. Categorical variables of interest, including sex, race/ethnicity, BMI category (underweight, normal, risk of being overweight, overweight), presence/absence of a note, and method were compared using either chi-squared or Fisher exact tests to determine differences by gender, racial/ethnic classification, age category, and method of suicide. Differences in continuous

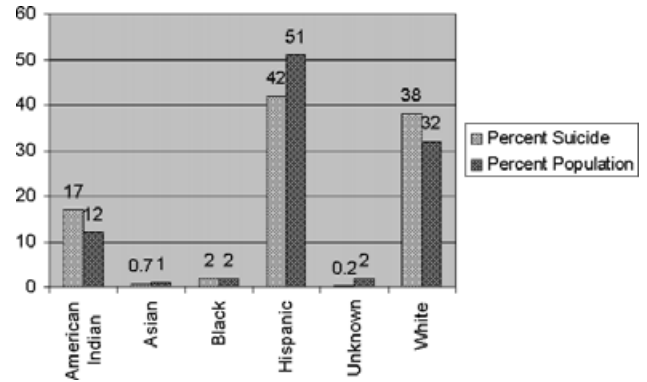


FIG. 1—Ethnic groups, percent suicide versus percent population in New Mexico.

variables, including age and numbers of risk factors, were analyzed using *t*-tests. *p*-Values of 0.05 or less were considered statistically significant.

## Results

### Demographics

A review of OMI's database identified 433 suicides meeting our case definition, with ages ranging from 9 to 17 (Table 1). The age-adjusted suicide rate was 4.8 per 100,000 with a male to female ratio of 3.8:1; in both males and females, suicide was more prevalent among older teens. Interestingly, rates continued to increase with age in males, while in females rates were highest at age 16 and then dropped at age 17. Non-Hispanic White people, American Indians, and males of all ethnic groups were over-represented among suicides, compared to the percentage of population they comprise (Figs. 1 and 2). Genders and ethnic groups did not differ significantly in age, and there was no significant change in gender, race, or age over time, although there was an increase in suicide deaths per year over the study period. Seventy-six percent of decedents killed themselves in their own homes or yards and 24% in some other location (including the home of a friend or relative, hotel or motel, open space, or forest land). Parental location is unknown for 48% of cases; 33% of parents were home at the time of suicide and 19% were away from home.

TABLE 1—Demographic characteristics.

	Male	Female	Total Number (Percent of Total)
Age (years)			
9	4	0	4 (0.9)
10	1	0	1 (0.2)
11	8	0	8 (1.9)
12	16	1	17 (3.9)
13	24	9	33 (7.6)
14	28	17	45 (10.4)
15	58	18	76 (17.6)
16	93	26	119 (27.5)
17	110	20	130 (30.0)
Ethnicity			
American Indian	61	11	72 (16.6)
Asian	1	2	3 (0.7)
Black	8	0	8 (1.9)
Hispanic	141	42	183 (42.3)
White	131	36	167 (38.6)

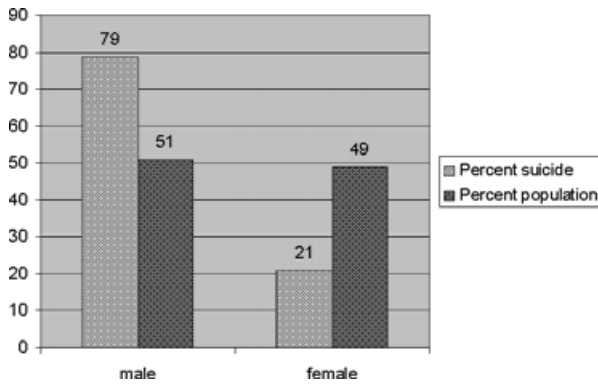


FIG. 2—Gender, percent suicide versus percent population in New Mexico.

### Means

Gunshot wound was the most frequent method of suicide (58%), followed by hanging (30%), overdose (5%), carbon monoxide poisoning (2%), and other (5%, including poisoning, drowning, stabbing, jumping from height, and motor vehicle crash). There was a statistically significant association between age and method of suicide ( $p = 0.0012$ ), with younger age associated with hanging and older age associated with firearm-related death. In addition, hanging deaths were significantly more common among American Indians than other ethnic groups ( $p < 0.0001$ ). Over the study period, there was a statistically significant decrease in deaths by firearm and a concurrent significant increase in hanging deaths.

With regard to firearm-related deaths, a handgun was used in 55% of cases, rifle in 32%, and shotgun in 13%; 87% of decedents shot themselves in the head, 11% in the chest, and 2% in the abdomen. Among hanging deaths, the ligatures most often used were belts and ropes (each 32% of cases), and the most common suspension points were closet rods (25%), roof trusses (18%), trees (15%), and bunk bed frames (10%).

### Predisposing Factors

Psychiatric problems were reported in 46% and denied in 9% of cases; mental health history was not mentioned in 45% of cases. Of those in whom psychiatric problems were reported, 51% were reported to be depressed, 17% to have substance abuse issues, 12% to have "behavior problems," 7% to have problems with impulse control or anger management, and 13% to suffer from other ailments including bipolar disorder, schizophrenia, post-traumatic stress disorder, or eating disorders. Only 15% of decedents were reported to be receiving mental health treatment, 17% were reported to not be under the care of a mental health practitioner, and in 68% of cases the treatment status is unknown. With regard to other predisposing factors, chronic family problems were identified in 24.2% of cases, a history of physical or sexual abuse in 7.6%, and a history of chronic medical problems in 2.1% (Table 2).

Comparing the prevalence of predisposing factors among the three largest racial/ethnic groups in New Mexico (White Hispanic, White non-Hispanic, and American Indian), we found a mention of psychiatric/psychologic problems in 45% of White Hispanics (hereafter referred to as Hispanics), 49% of White non-Hispanics (subsequently referred to as White people), and only 37% of American Indian decedents (Table 3). The prevalence of chronic family

TABLE 2—Predisposing and proximal risk factors for suicide.

Behavioral/psychologic issues (depression, ADD)
History of physical or sexual abuse
History of deliberate self-harm or parasuicidal acts (self-mutilation, previous attempts)
Acute family problems (fight with family member, disciplined at home)
Sex/romance issues (pregnancy, fight with significant other)
School issues (teased at school, poor grades)
Family/friend suicide
Recent community suicide or involvement in suicide pact (contagion)
Chronic family problems (domestic violence, parent substance abuse)
Legal problems or a history of anti-social behavior
History of medical problems
Other social stressors (recent or impending move)
Intoxication at time of suicide
Overweight by BMI

TABLE 3—Prevalence of risk factors for suicide among the three largest racial/ethnic groups in New Mexico.

Risk Factor	Hispanic n (%)	American Indian n (%)	White n (%)
Psychologic problems	82 (45)	27 (37)	82 (49)
Victim of abuse	10 (5)	5 (7)	10 (6)
Parasuicidal behavior	91 (50)	32 (44)	78 (47)
Acute family problems	52 (28)	23 (32)	55 (33)
Chronic family problems	37 (20)	15 (21)	43 (26)
Sex/romance issues	40 (22)	10 (14)	34 (20)
School problems	27 (15)	8 (11)	26 (16)
Contagion	5 (3)	3 (4)	5 (3)
Legal problems/anti-social	40 (22)	15 (21)	39 (23)
Medical problems	6 (3)	0	7 (4)
Intoxicated at time of suicide	53 (24)	22 (31)	31 (19)
Overweight by BMI	41 (28)	14 (32)	29 (21)
Other risk factors/stressors	19 (10)	14 (19)	18 (11)

problems and physical or sexual abuse, as found from examination of medical examiner records, was comparable across the three major racial ethnic groups (Table 3).

Table 4 presents the prevalence of predisposing factors and proximal stressors among youth suicides in New Mexico by gender. The prevalence of psychologic problems was similar between boys and girls (46% and 53%, respectively), whereas 22% of girls and only 2% of boys reported being a victim of abuse. Girls also were more likely to have had a history of chronic family problems than boys (34% vs. 20%).

### Proximal Stressors

Of the cases in which proximal stressors were reported, the most common acute stressors were fighting with parents and problems

TABLE 4—Prevalence of risk factors for suicide among New Mexico youth by gender.

Risk Factor	Males n (%)	Females n (%)
Psychologic problems	150 (46)	27 (53)
Victim of abuse	7 (2)	20 (22)
Parasuicide/self-harm	158 (46)	50 (55)
Acute family problems	106 (31)	28 (32)
Chronic family problems	69 (20)	31 (34)
Sex/romance issues	54 (16)	30 (33)
School problems	52 (15)	10 (11)
Contagion	11 (3)	2 (2)
Legal problems/anti-social	88 (26)	11 (22)
Medical problems	12 (4)	1 (1)
Intoxicated at time of suicide	99 (29)	11 (22)
Overweight by BMI	69 (26)	17 (25)
Other risk factors/stressors	43 (13)	9 (10)

with romantic partner, followed by legal problems, being disciplined at home or school, poor grades, household disruption (including recent death, parental separation or divorce, and recent or upcoming move), and pregnancy or feared pregnancy (Table 2). Ten percent of decedents had been suspended or expelled from school, 2% had dropped out of school, and 1% of decedents were incarcerated at the time of suicide. Another 5% had a history of "skipping" school due to conflicts with administrators, teachers, or fellow students. Eight percent had a history of violent behavior, including assault or homicide. Of note, <4% were noted to have a recent friend or family suicide or were involved in a suicide pact (Table 2).

The prevalence of many proximal stressors was similar across the three largest racial/ethnic groups in New Mexico (Table 3). Acute family problems were mentioned in the investigations of 28–33% of youth decedents by race/ethnicity, and school problems ranged from 11% among American Indians to 16% among White people. Issues with a romantic partner were reported by 22% of Hispanic decedents, 20% of White decedents, and only 14% of American Indian decedents. Girls had mention of problems with romantic partners in 33% of suicides, whereas boys' files mentioned sexual or romantic problems in only 16% of suicides (Table 4).

#### *Parasuicidal and Peri-Suicidal Behavior*

Twenty-eight percent of decedents were known to have previous suicidal gestures or suicide attempts (parasuicidal behavior). This was the most commonly found risk factor for both Hispanic and American Indian youth suicides (Table 3), and the second most commonly reported risk factor among White decedents. Boys and girls both had a high prevalence of reported parasuicidal behavior (Table 4).

Twenty percent of decedents were reported to have told someone about their plans to commit suicide; in 19% of cases, talk of suicide was denied, and in 53% of cases there was no information in the file with regard to this history. Twenty-five percent of decedents left a suicide note; females were three times more likely to leave a note ( $p < 0.0001$ ), but note-leavers did not otherwise differ significantly by age, ethnicity, method of suicide, or the presence of alcohol or other drugs. The most common themes for suicide notes were "suicide is the only solution for my problems" (26%) and "life is too much to bear" (24%). Other note themes included instructions for disposition of goods, apologizing for actions, and expression of anger at someone, usually a parent or step-parent.

#### *Physical Findings*

At autopsy, 21% of decedents had scarring consistent with self-mutilation or "cutting" behavior. Only 13% were overweight and 13% at risk for overweight according to Centers for Disease Control and Prevention (CDC) growth charts. Sixty-nine percent were of normal weight, and 5% were underweight. American Indian youth suicides had a higher prevalence of overweight, with 32% either being overweight by BMI ( $\text{kg}/\text{m}^2$ ) or at risk for being overweight (Table 3), compared to 28% of Hispanic decedents in this study and 21% of White decedents. Girls and boys had similar prevalence of being overweight or at risk of being overweight by BMI (25% and 26%, respectively; Table 4). This number is very similar to that for all high school students in New Mexico, where 24% of the students are either overweight or at risk for being overweight (13).

Toxicology testing was more often positive in decedents over the age of 15 and only rarely positive in decedents younger than 15. Alcohol was present in 20% of cases; males were 2.7 times more likely to have alcohol present than females. American Indians and Hispanics were more likely to be intoxicated at the time of suicide than White people (1.9 times and 1.5 times, respectively), and those who shot themselves were 2.4 times more likely to have alcohol present than those who hanged themselves or used other methods. Boys were more commonly intoxicated at the time of suicide than were girls (29% and 22%, respectively; Table 4). Other prescription and illicit drugs were present in 6% of cases; of note, <5% of decedents had detectable levels of any psychiatric drug. Illicit drugs detected included marijuana (4%), cocaine (1%), volatile inhalants (1%), and heroin, LSD, and peyote (each <1%).

#### **Discussion**

Overall, we found that the rate of suicide is consistently higher in New Mexico than nationally. As noted above, White people, American Indians, and males of all ethnic groups are over-represented among suicides, compared to the percentage of population they comprise in New Mexico. This is consistent with other studies showing higher suicide death rates in western states and in these population subgroups (9–11). The male to female ratio in this study was 3.8:1, also consistent with previous studies showing that males of all ages in the United States are three to four times more likely to take their own lives than females (9–11).

As seen in most studies, firearms were used by a majority of adolescents in this study. However, among younger individuals and Native Americans, the preferred method was hanging. Furthermore, although there was a decrease in gun-related suicides over the study period, there was a concurrent rise in hanging deaths, suggesting that method substitution may interfere with means restriction. The private nature of hanging and the widespread availability of implements for hanging make means restriction less practical for this method than for the use of guns. These factors also make hanging more appealing to youth with limited access to guns or other weapons.

When discussing the prevalence of risk factors in this study, it is important to note that although the scene guidelines used by OMI investigators in youth suicides were designed to gather as much relevant information as possible during the course of an investigation, some questions may be omitted or not answered during a youth suicide investigation. Additionally, other risk factors (such as childhood exposure to domestic violence, or physical and sexual abuse) may not be routinely reported to investigators. No additional interviews were conducted to verify collected information or obtain more information; therefore the prevalence of risk factors may be underestimated in this study. It is also possible that some suicides on federal lands were not investigated by OMI, as OMI can only investigate on federal lands by invitation.

With regard to predisposing factors for suicide, chronic family problems, including physical or sexual abuse, domestic violence in the home, parental substance abuse or mental health problems, and breakup of the family or banishment from the home, were reported in more than 30% of cases. Ongoing psychiatric issues were reported in nearly half of the cases. Psychiatric illnesses appear to be inadequately treated in this population, with only 15% reported to be receiving mental health care and <5% having detectable levels of psychiatric drugs at the time of suicide. While these numbers are low, previous studies have reported that as few as 1% of youth suicide completers were in mental health treatment at the time of

suicide (12). It is not clear whether this is due to lack of compliance, lack of resources, or both.

Of the top 10 reported proximal stressors, most were subacute or chronic problems; even the seemingly acute (fight with parent, breakup with significant other, disciplined at home, fight with sibling) could be exacerbations of chronic problems. This trend suggests that suicide is a response to long-term difficulty in conflict resolution and problem-solving, rather than an impulsive act triggered by an isolated stressful event.

Comparing the prevalence of predisposing factors and proximal stressors between the three largest racial/ethnic populations in New Mexico, we found more similarities than differences. Psychologic and psychiatric problems were commonly found among Hispanic, White, and Native American decedents, as were previous suicidal gestures and self-harm. A history of both recent and more chronic family problems was noted in one-fifth to one-third of all suicides in all three racial/ethnic categories. In all three racial/ethnic groups, contagion and medical problems were rarely mentioned as having contributed to the suicide. Gender differences in risk factor prevalence were more marked than racial/ethnic differences, with girls more commonly having had a reported history of psychologic problems, personal abuse, issues with a romantic partner, and chronic family problems than boys. These differences in risk factors by sex may aid in tailoring appropriate intervention strategies for both boys and girls.

Although alcohol or illicit drug use is frequently cited as a risk factor for suicide, there was a low prevalence of intoxication in this study, again suggesting that, in this population, suicide is more than an impulse. One-quarter of decedents left a suicide note; this is within the range reported in previous studies (4–40%). The leaving of a note in itself suggests some forethought; additionally, these notes almost uniformly reveal chronic hopelessness and a sense of pessimism about the future and the decedent's ability to cope with it. The use of suicide as a way of solving a chronic problem rather than an impulsive response to stress means that prevention programs based on impulse control, such as crisis intervention, will be less effective in this population.

Three-quarters of decedents killed themselves in their own homes or yards; in one-third of the cases, at least one parent was at home. Other studies report suicides at home ranging from 41% to 88% of the time (9–11), without information regarding the whereabouts of parents. Although suicide prevention literature suggests that parents play a vital role in suicide risk assessment (3,6), this does not seem to be the case in the study population. Moreover, given the prevalence of chronic family problems in this population, family-based risk assessment programs will not be effective in a substantial number of cases. It is also notable that *c.* 20% of the decedents were temporarily or permanently out of school at the time of suicide, suggesting that school-based prevention programs will miss a large group of suicidal youth.

## Conclusions

The data from this study suggest that youth suicide in New Mexico is an attempt at problem-solving, characterized by chronic hopelessness rather than impulsivity, and determination rather than ambiguity; this is at variance with conclusions drawn in other studies. The benefit of current secondary and tertiary prevention programs (focused as they are on crisis intervention and means restriction) is not demonstrated. In the face of chronic problems and long-standing hopelessness, crisis intervention may be too little, too late. As noted, controlling access to lethal means can be

circumvented by method substitution (i.e., hanging for shooting) or by using implements that are difficult to control (i.e., using a sweatshirt to hang oneself from a bunk bed). Lastly, the delivery of current prevention programs (through awareness and peer-counseling programs in schools) may not be reaching the target audience; many at-risk youths are alienated from community, family, and peers and are out of school either temporarily or permanently by the time they come to suicide.

Thus the need for primary prevention programs seems clear. These programs, instead of focusing on late-stage prevention such as crisis intervention, would address underlying risk factors for suicide: mental health, social competence, conflict resolution, problem-solving, and family/community support. Pessimism about the future may be tied to the individual's social environment and life experiences, and exposure to social factors, such as poverty, unemployment, prejudice, and discrimination, may differ for various ethnic groups and/or genders. Although this study suggests that predisposing factors and proximal stressors differ more by gender than by ethnic group, further research is needed to examine adolescent subgroups (younger vs. older, male vs. female, White vs. Hispanic vs. Native American) and to compare suicide attempters with suicide completers, to develop alternative risk-profiling and intervention strategies that are robust enough to account for social and cultural differences. To achieve this, we are currently working to compile a comparison group of young people who have attempted but not completed suicide, to allow analysis of both demographic and risk factor differences between these two groups. Intervention strategies tailored specifically to children and adolescents are more likely to be acceptable to, and effective in, this important and vulnerable population.

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