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## Epidemiology of Youth Suicide and Suicidal Behavior

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### Abstract

**Purpose of Review**—Suicide is the third leading cause of death among young people in the U.S. and represents a significant public health problem worldwide. This review focuses on recent developments in our understanding of the epidemiology and risk factors for adolescent suicide and suicidal behavior.

**Recent Findings**—The suicide rate among children and adolescents in the U.S. has increased dramatically in recent years and has been accompanied by substantial changes in the leading methods of youth suicide, especially among young girls. Much work is currently underway to elucidate the relationships between psychopathology, substance use, child abuse, bullying, internet use, and youth suicidal behavior. Recent evidence also suggests sex-specific and moderating roles of gender in influencing risk for suicide and suicidal behavior.

**Summary**—Empirical research into the causal mechanisms underlying youth suicide and suicidal behavior is needed to inform early identification and prevention efforts.

### Keywords

suicide; adolescents; youth; risk factors; epidemiology; attempted suicide

### Introduction

This review focuses on recent developments in our understanding of the epidemiology and established and emerging risk factors of youth suicide and suicidal behavior. Specifically, we conducted a PubMed search for all English-language articles published between January 2007 and May 2009 using combinations of the index terms *suicide*, *suicide attempt*, *suicidal*, *adolescent*, *child\**, *epidemiology*, and *risk factors*. For detailed discussions of the epidemiology of youth suicide and suicidal behavior and guidance for the management of suicidal adolescents, please see the following reviews [1-3]. The definitions of suicide and suicidal behavior developed by O'Carroll [4] and adopted by the Institute of Medicine [5] were used (Table 1).

### Descriptive Epidemiology of Youth Suicide and Suicidal Behavior

The prevalence of suicidal ideation and suicide attempts in youth is high, with 14.5% of the 9<sup>th</sup> to 12<sup>th</sup> grade students in the U.S. in 2007 reporting suicidal ideation and 6.9% reporting at least one suicide attempt during the previous year (see Figure 1) [6,7]. In 2006, the latest year for which data are available, the age-adjusted suicide rate among youth aged 10-19 years in

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the U.S. was 4.16 per 100,000 persons, making suicide the 3<sup>rd</sup> leading cause of death in this age group [8].

## Age and Gender

It is well established that rates of suicide and suicide-related behaviors increase with age and a gender paradox exists with regard to youth suicidal behavior: i.e., while suicide rates are higher among boys than girls, girls have higher rates of suicidal ideation and attempted suicide (see Figures 2 and 3 [6, 8]; for discussion of possible underlying reasons for age and sex differences see [9-14]).

## Race and Ethnicity

In the U.S., rates of attempted and completed suicide are highest among Native Americans [15-17]; White youth traditionally have had higher suicide rates than non-whites, but the gap has been decreasing due to an increase in suicide among African American males [18,19]. Compared with non-Hispanic youth, Hispanic youth in the U.S. show higher rates of suicidal ideation and attempted suicide [6], but are not disproportionately represented among suicide completers [20]. Acculturation may play a role in explaining the higher rate of attempted suicide among Hispanic adolescents, particularly young Latinas [21], although recent evidence suggests that the perceived quality of mother-daughter relations may be more predictive of adolescent suicide attempt [22].

Joe et al. [23••] recently conducted the first nationally representative study on the prevalence and psychiatric correlates of suicidal ideation and suicide attempts among African American and Caribbean black adolescents in the U.S. Consistent with previous studies, data from the National Survey of American Life showed that having a psychiatric disorder, especially an anxiety disorder, and living in the Northeast (compared to the South and West) were strongly associated with attempted suicide and suicidal ideation.

Using data from the Mexican Adolescent Mental Health Survey, Borges and colleagues [24•] reported the first representative estimates of the lifetime prevalence of suicidal ideation (11.5%), plan (3.9%), and attempted suicide (3.1%) in 12- to 17-year-olds in metropolitan Mexico City. As in previous studies, the presence of one or more mental disorders was closely linked to suicide ideation, plan, and attempt. Among youth with a history of suicidal ideation, only dysthymia was consistently related with making a suicide plan and attempted suicide.

## Methods of Suicide

Firearms have traditionally been the leading suicide method among U.S. youth, followed by hanging/suffocation, and self-poisoning [1]. Case-control studies reveal that firearms are much more likely to be in the homes of suicide completers than controls and that if a gun is in the home, it is highly likely to be used as the method of suicide [25]. Restriction of access to lethal methods (e.g., more restrictive legislation regarding firearms, barriers on bridges) reduces suicide rates by those methods [26].

Recently, the CDC indicated that substantial changes have occurred in suicide methods of young people in the U.S., most notably among young females [27]. From 2003 to 2004, suicide rates by hanging/suffocation among females aged 10-14 and 15-19 increased 119% (from 0.31 to 0.68 per 100,000 persons) and 44% (from 1.24 to 1.78), respectively. Reasons for the change in suicide methods among U.S. youth are unclear.

## Secular Trend in Pediatric Suicide Rates

Following a decade of steady decline, the suicide rate among U.S. youth younger than 20 years of age increased by 18 percent from 2003 to 2004—the largest single year change in the pediatric suicide rate over the past 15 years [28]. Using log-linear regression, Bridge and colleagues estimated the trend in suicide rates from 1996-2003, the expected suicide rates in 2004 and 2005, and then compared the expected number of deaths to the actual number of deaths [29]. Although the overall suicide rate decreased by 5.3% between 2004 and 2005, observed rates were still significantly greater than expected rates, based on the 1996-2003 trend. Suggested possible contributors to the increase in youth suicides included the influence of internet social networks [30], increases in suicide among young U.S. troops [31], and higher rates of untreated depression in the wake of recent “black box” warnings on antidepressants—a possible unintended consequence of the medication warnings, required by the FDA in 2004 [32,33] [34].

## Psychopathology

Numerous risk factors are associated with youth suicide (Table 2). Psychiatric disorder is present in up to 80-90% of adolescent suicide victims and attempters from both community and clinical settings [1]. Both in completed and attempted suicide, the most common psychiatric conditions are mood, anxiety, conduct, and substance abuse (alcohol and drug) disorders. Comorbidity of psychiatric disorders, particularly of mood, disruptive, and substance abuse disorders, significantly increases the risk for youth suicide and suicidal behavior [10,13,35-38].

A recent Finnish longitudinal population-based study found that, among boys, the strongest predictor of completed suicide or making a severe suicide attempt by age 24 years was comorbid conduct and emotional (mostly anxiety) disorders at age 8 years [39]. One in 20 boys with comorbid conduct and emotional disorders completed suicide or made a serious suicide attempt during adolescence or early adulthood, compared with only one in 250 boys without such problems. Self-reported depression symptoms at age 8 years, however, did not predict suicide outcome. Among females, no predictors of suicide outcome at the age of 8 years were found. A recent prospective cohort study found that anxious-disruptive girls and disruptive boys were more likely than their peers to attempt suicide by early adulthood, suggesting that gender-based differences in risk for suicidal behavior be considered both from a clinical perspective and in future research [40].

## The Suicidality/Depression Link

Psychological autopsy studies have shown a substantial link between clinical depression and suicide in adolescence with up to 60% of adolescent suicide victims having a depressive disorder at the time of death [10,13,38]. Similarly, between 40-80% of adolescents meet diagnostic criteria for depression at the time of the attempt [36,41,42]. Depression is the main predictor of suicidal ideation [36,43]. In clinically referred samples, up to 85% of patients with major depressive disorder (MDD) or dysthymia (i.e., chronic, but less severe depression) will have suicidal ideation, 32% will make a suicide attempt sometime during adolescence or young adulthood [44], 20% will make more than one attempt [45], and by young adulthood, 2.5% to 7% will commit suicide [46]. The association of prior suicidal behavior and depression has been shown to increase the risk for a repeated suicide attempt [47,48] and suicide [10].

Recent studies confirm prior research indicating that suicidal thoughts during adolescence significantly increase the adult risk of psychiatric problems, and are the gateway to attempted suicide, and suicide [49], [50,51]. These findings suggest that ameliorating suicidal ideation

in adolescence offers hope of reducing acute distress and changing the life course of affected individuals.

Fergusson *et al.* [52] examined the impact of recurrence of major depression in adolescence on outcomes at ages 21-25 years. Using data from a 25-year longitudinal study of a birth cohort of New Zealand, the authors found a dose-response relationship between the number of depressive episodes between 16-21 years of age and adverse adult outcomes, including suicidal ideation and attempted suicide, even after controlling for potential confounders. These findings suggest that early identification and treatment of major depression may reduce the risk of future suicidal behavior.

## Alcohol and Drug Use

Substance abuse (alcohol/drug abuse) disorders contribute substantially to risk of suicide, especially in older adolescent males when co-occurring with mood disorder or disruptive disorders [10,13,38]. Recently, Aseltine *et al.* [53•] examined the relationship between heavy episodic drinking (HED) and adolescent suicide attempts. They found that adolescents who were 13 years or younger and who participated in HED were at 2.6 times greater risk of reporting a suicide attempt as compared to those who did not participate in HED. For those youth who were 18 years and older, HED increased their suicide attempt risk by 1.2 times as compared to adolescents of this same age who did not participate in HED. Schilling and colleagues [54] found that drinking while feeling down resulted in a threefold increase in the risk of self-reported suicide attempts.

## Family Factors

Family factors, including parental psychopathology, family history of suicidal behavior, family discord, loss of a parent to death or divorce, poor quality of the parent-child relationship, and maltreatment, are associated with an increased risk of adolescent suicide and suicidal behavior [1].

## Family Constellation

Increasing duration of exposure to a single-parent household before the age of 16 years was significantly associated with higher rates of anxiety disorder between the ages of 21-25 years. Duration of exposure, however, was not significantly associated with suicidal ideation or attempted suicide [55].

## Family History of Suicide Attempt

There is strong and convergent evidence that suicidal behavior is familial, and perhaps, genetic, and that the liability to suicidal behavior is transmitted in families independently of psychiatric disorder [56]. A recent prospective study of early-onset suicidal behavior found a higher relative risk (RR=4.4) of incident suicide attempts in offspring of parents with mood disorders who made suicide attempts, compared with offspring of parents with mood disorders who had not made attempts [57]. Offspring mood disorder and impulsive aggression and parental history of sexual abuse were independent predictors of incident suicide attempts.

## Sexual and Physical Abuse

Exposure to child sexual abuse and child physical abuse leads to a significant increase in the occurrence of a variety of poor mental health outcomes, including suicidal ideation and behavior, experienced between ages 16-25, [58]. The authors found that exposure to child sexual abuse had a more deleterious effect on mental health outcomes than exposure to only child physical abuse. In another study, approximately 50% and 33% of suicide attempts among

women and men, respectively, were attributable to the experience of childhood adversity (physical abuse, sexual abuse, witnessed domestic violence) [59•], indicating that even a small reduction in these childhood experiences could have a dramatic effect on reducing the prevalence of suicide attempts in the general population.

When a child experiences both child abuse and parental divorce versus only parental divorce, there is a statistically significant increase in the likelihood of a suicide attempt later in life [60]. This association, however, was attenuated after controlling for parental psychopathology.

Brezo et al. [61] conducted a longitudinal cohort study to determine the relationship between childhood abuse and later suicide attempts. Non-abused children were less likely to have non-fatal suicide behaviors as compared to those who experienced abuse. Sexual abuse by an immediate family member, repeated sexual abuse incidents, and greater severity of abuse conferred an increased risk of suicide attempts.

Salzinger and colleagues [62] followed two sets of urban school children over a period of 4 years (time 1: average age 10.5 years, n=100 abused and 100 non-abused; time 2: average age 16.5 years, n=78 abused and 75 non-abused). They found that preadolescent physical abuse was an independent predictor of suicidal ideation and attempted suicide; only internalizing behaviors mediated the robust relationship between physical abuse and suicidal ideation.

### **Change of Residence**

Adolescents aged 11-17 years who frequently moved during childhood were more likely to make suicide attempts during adolescence, and the more often they had moved, the more elevated their risk, even after controlling for potential confounders at birth and during upbringing [63••]. There was a dose-response relationship between number of moves and risk of attempted suicide: youth who had moved three to five times were 2.3 times as likely to have attempted suicide compared with those who had never changed residences, while those who had moved more than 10 times were 3.3 times as likely to attempt suicide, controlling for birth order, birthplace, and paternal and maternal factors. Controlling for additional child and parent factors attenuated these specific associations. Analyses of suicide completers revealed a similar association between change of residence and suicide.

### **Sexual Orientation**

Youth who report same-sex sexual orientation are at greater risk than their peers to have attempted suicide, and this risk persists even after controlling for other suicide risk factors, including alcohol abuse, depression, family history of suicide attempts, and prior victimization [64]. A recent study of family response to an adolescent “coming out process” reported that family rejection or negative family reaction to an adolescent who is gay, lesbian, or bisexual was associated with 8-fold greater likelihood of attempted suicide compared to adolescents who experienced minimal or no family rejection [65].

### **Bullying**

Klomek and colleagues [66•] found that boys who were both bullies and victims of bullying had a higher likelihood of suicidal behavior as compared with those who did not exhibit bullying behaviors or who were only victims. For the girls, there was a different effect of bullying; girls who were victims of bullying were more likely to exhibit suicidal behaviors as compared to those who were neither bullies nor victims. Barker et al. [67] examined the developmental trajectories of bullying and victimization during adolescence on delinquency and self-harm in late adolescence. For both boys and girls, those in the bully-victim trajectory showed significantly higher levels of self-harm than their same-sex counterparts in all of the

other trajectories. The girls in the bully-victim trajectory had higher rates of self harm than their male counterparts.

Advances in technology have helped to create a new form of bullying: cyber bullying. Cyber-bullying can occur through emails, texting on cell phones, and posts on internet social sites (e.g., Facebook, MySpace, Twitter) and can be perpetrated by other adolescents or adults, as has been recently reported [68]. At this time, research on cyber-bullying and suicide has not been published.

## Internet and Adolescent Suicide

The internet can be both detrimental and helpful in relation to suicide. Two studies examined the extent to which information on methods of committing suicide and pro-suicide websites could be found using different search engines [30,69]. Biddle and colleagues [30] found that 240 of the 480 suicide sites provided some information on how to commit suicide. Recupero and colleagues [69] reviewed 373 web pages and found 11.0% to contain pro-suicide information, 30.8% to contain both pro- and anti-suicide information, 29.2% to contain anti-suicide information, and 9.1% could not be evaluated. Approximately 20% of the sites that did not contain suicide-specific information had a hyperlink or advertisement for online pharmacies selling medications used for committing suicide.

## Conclusion

This review provides an overview of the most recent research on adolescent suicide and suicidal behavior with a specific focus on epidemiological, psychiatric, psychological, and environmental factors. The informed clinician will optimally be able to use these findings to develop a more comprehensive understanding and assessment of adolescent suicide risk factors, which may promote early assessments that lead to targeted interventions, thus reducing future risk of poor mental health outcomes and suicidal behaviors.

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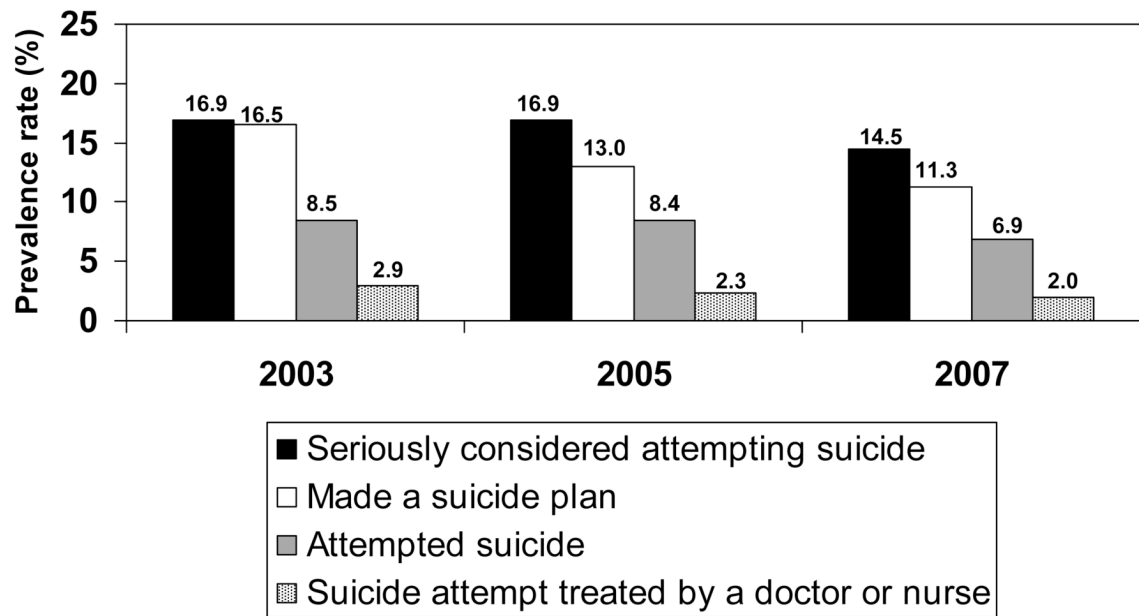
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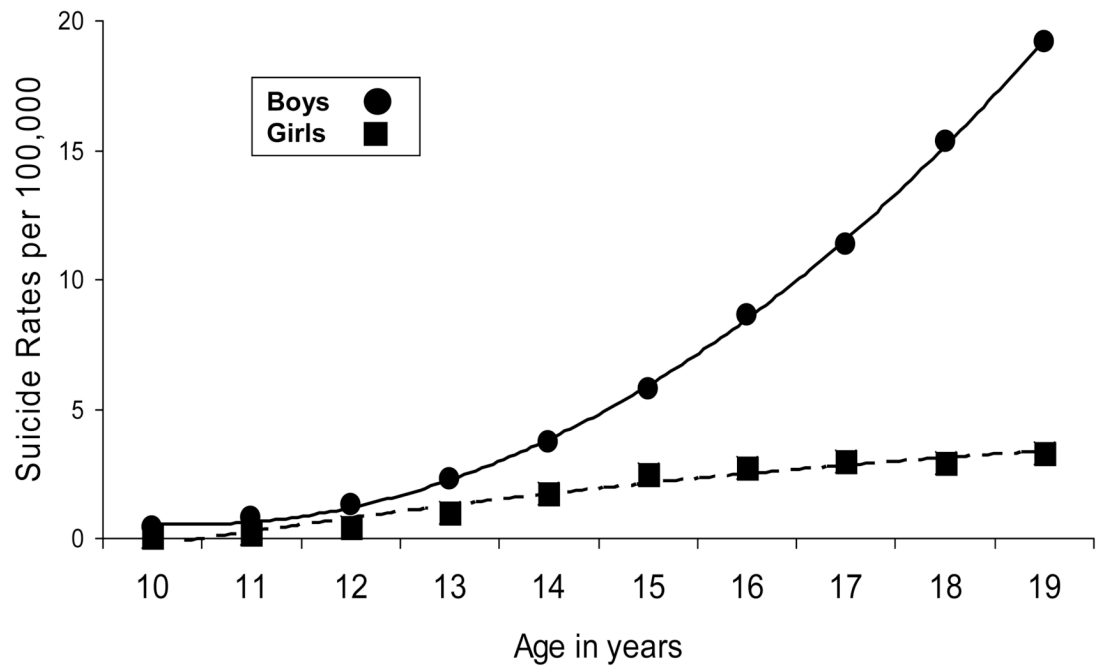
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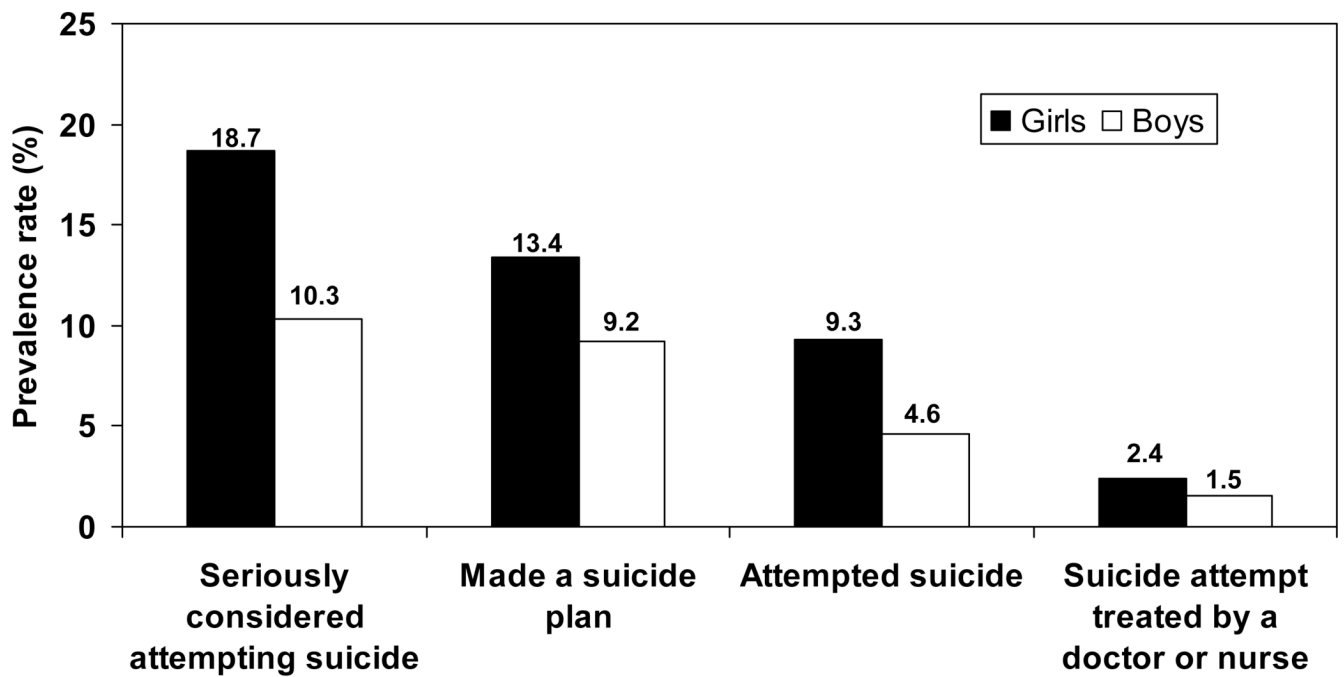
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**Figure 1.**  
Trends in the Prevalence of Suicidal Ideation, Plan, and Suicide Attempt: National Youth Risk Behavior Survey: 2003-2007  
Data from <sup>7</sup>



Solid line indicates the trend in the rate of suicide by age among boys and the dashed line indicates the trend in the suicide rate by age among girls.

**Figure 2.**  
Suicide Rates by Age for Youths Aged 10-19 Years in the United States, 2000-2006 [8]



**Figure 3.**  
Prevalence of Suicidal Ideation, Plan, and Suicide Attempt by Gender: National Youth Risk Behavior Survey: 2007 [6]

**Table 1**Definitions of Suicidal Ideation, Communications, and Behavior<sup>a</sup>

	<b>Definition</b>
Suicidal Ideation	Thoughts of harming or killing oneself.
Suicidal Communications	Direct or indirect expressions of suicidal ideation or of intent to harm or kill self, expressed verbally or through writing, artwork, or other means.
Suicidal Threats	A special case of suicidal communications, used with intent to change the behavior of other people.
Suicide Attempt	A non-fatal, self-inflicted destructive act with the explicit or inferred intent to die.
Suicide	Fatal self-inflicted destructive act with explicit or inferred intent to die.
Suicidality	All suicide-related behaviors and thoughts including completing or attempting suicide, suicidal ideation or communications.

<sup>a</sup> O'Carroll et al. [4]

**Table 2****Major Risk Factors for Suicide Among Adolescents**

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- A previous suicide attempt
  - A psychiatric disorder, especially major depressive disorder, bipolar disorder, conduct disorder, and substance (alcohol and drug) use disorders
  - Psychiatric comorbidity, especially the combination of mood, disruptive, and substance abuse disorders
  - Personality disorders (especially cluster B disorders: antisocial, borderline, histrionic, narcissistic)
  - Impulsive aggression (the tendency to react to frustration or provocation with hostility or aggression)
  - Availability of lethal means
  - Feelings of hopelessness and worthlessness that often accompany depression
  - A family history of depression or suicide
  - Loss of a parent to death or divorce
  - Family discord
  - Physical and/or sexual abuse
  - Lack of a support network, poor relationships with parents or peers and feelings of social isolation
  - Dealing with homosexuality in an unsupportive family or community or hostile school environment
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