

# Examining the Impact of Psychopathological Comorbidity on the Medical Lethality of Adolescent Suicide Attempts

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BOSTON COLLEGE  
Graduate School of Social Work

**EXAMINING THE IMPACT OF PSYCHOPATHOLOGICAL COMORBIDITY  
ON THE MEDICAL LETHALITY OF ADOLESCENT SUICIDE ATTEMPTS**

A dissertation  
by  
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of the requirements for the degree of  
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## ABSTRACT

The primary aim of this study was to determine if various typologies of psychiatric diagnoses and patterns of comorbidity are differentially related to the medical lethality of adolescent suicide attempts. The secondary aim was to determine if the relationship between psychopathological comorbidity and suicide attempt lethality is significantly different across gender, age, and race in adolescents. To investigate these relationships, psychiatric evaluations were reviewed for all adolescents that presented to Children's Hospital Boston (CHB) from 2006 to 2010 for a suicide attempt (N = 375). Bivariate and OLS regression analyses were used to test hypotheses. Bivariate results showed that attempters diagnosed with a Substance Abuse Disorder comorbid with any other disorder had higher levels of suicide attempt lethality than those without the diagnosis. Additionally, having Bipolar or Mood Disorder NOS in combination with either Substance Abuse alone or Substance Abuse and Disruptive Disorders had a significant positive relationship with suicide attempt lethality when compared to other comorbidity patterns. In OLS regression, having Substance Abuse comorbid with any other disorder was the only significant diagnostic predictor of lethality. Female gender did not have a significant relationship with lethality. Age group was not predictive of lethality in regression analysis. African-American/Black race had a negative relationship with lethality in bivariate and multivariate analyses. Study findings have important implications for practice, policy, and future research with suicidal adolescents. Results suggest that improvements in the assessment and treatment of substance abuse in suicidal adolescents can play a critical role in decreasing the adolescent suicide rate. Screening

for symptoms other than depression, such as substance use, will be critical to effective suicide prevention practices. Future research should focus on the development of effective treatment strategies with suicidal adolescent substance abusers, and aim for a better understanding of suicidal behaviors of adolescents with comorbid bipolar and substance abuse diagnoses. In order to further develop prevention and treatment strategies with this population, policies must be initiated that will support their advancement.

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## CHAPTER I

### Purpose and Specific Aims

Suicide is the third leading cause of death for adolescents, as compared to the eleventh leading cause of death for all ages (CDC, 2008). Suicide attempts by adolescents occur at a disturbing rate, as 7% of high school students report having attempted suicide one or more times, with 2% of students reporting an attempt that required medical treatment (CDC, 2008). The set of risk factors for adolescent suicide is complex and not fully understood. However, research suggests that medical lethality of a suicidal act, defined as the seriousness of the physical consequences or risk to life, is the main determinant of the likelihood of death following a suicide attempt (Nasser & Overholser, 1999). Further, it has been suggested that the characteristics of highly lethal suicide attempters may be similar to those of suicide completers (Beautrais, 2003; Brent, 1987). Therefore, studies differentiating the medical lethality of attempts can help to expand the knowledge base about risk factors for adolescent suicide.

Psychopathology is one risk factor for adolescent suicide that is not comprehensively understood. Previous research suggests mood disorders such as depression are common diagnoses in adolescents that both attempt and complete suicide. Additionally, we know that psychopathological comorbidity, defined as the co-occurrence of two or more psychiatric diagnoses, increases the risk for suicide in adolescents (Wagner, 2009). However, it is unclear at this time if certain combinations of psychiatric disorders or particular comorbidity patterns pose more of a threat to the medical lethality of suicide attempts in this population. The goal of this study is to

determine if there is a relationship between psychopathological comorbidity and the medical lethality of suicide attempts in adolescents, and to better understand the nature of this relationship. The findings will enhance our understanding of the specific psychopathological and demographic risk factors that predict the medical seriousness of adolescent suicide attempts. Because the existing literature on the relationships between these constructs is largely outdated, the overarching goal of this study is to examine these associations in the current context in an effort to update the knowledge base in the field.

The primary aim of this study is to determine if various typologies of psychiatric diagnoses and patterns of comorbidity are differentially related to the medical lethality of adolescent suicide attempts. The secondary aim is to determine if the relationship between psychopathological comorbidity and suicide attempt lethality is significantly different across gender, age, and race in the adolescent population.

## **Theory and Previous Studies**

### **Suicide Attempts in Adolescence**

Examining adolescent suicide attempts through a developmental lens is critical. There are significant cognitive shifts as well as physiological and socio-emotional changes that put adolescents at risk for suicidal behaviors. Adolescent and adult suicide attempts have different characteristics. For instance, adolescents attempt suicide with greater frequency (Safer, 2007) while adult suicide attempters are more likely to have deadly intentions (Parellada et al., 2007). Adolescence represents a period of rapid reorganizations in all developmental domains (Lerner, Lerner, von Eye, Ostrom, Nitz, Talwar-Soni, et al., 1996). The influence of these developmental changes is essential to

our knowledge of risk factors, and makes the understanding of adolescent suicide attempts distinctly different from those of adults, creating a need to examine the populations separately.

Much of the distinction between adolescent and adult suicide attempts can be attributed to cognitive differences in decision-making processes in their respective life stages. Piaget's (1972) cognitive developmental stage model places adolescents in the formal operations stage, where they begin to perform more complex mental processes and start using more systematic approaches to reasoning. The cognitive processes associated with goal-directed behavior also continue to develop throughout adolescence (Keating & Bobbitt, 1978), suggesting that not all adolescents who engage in suicidal behaviors have fully developed conceptualizations about suicide. Because of their lack of experience and limitations to problem-solving in this stage, adolescents often resort to using ineffective and unhealthy coping skills that involve risky and self-destructive behaviors (Baumeister, 1990). Elkind (1967) suggests specifically that the early to mid-adolescent period is characterized by a self-absorbed, egocentric focus on one's own mental processes. From this we can posit that younger adolescents may be even more vulnerable to using more detrimental coping mechanisms, such as lethal suicide attempts, than their older adolescent counterparts.

To better understand risk factors for adolescent suicide, it is important to examine potential disparities in cognitive maturity within the adolescent period itself. Some studies indicate that changes in cognitive capacity after mid-adolescence are very modest in magnitude (Steinberg, 2008). Conklin, Luciana, Hooper, and Yarger (2007) found performance on tasks that activate the frontal lobes to improve through middle

adolescence, until about age sixteen. Other research indicates that important advances are made at some time in late adolescence, and these changes have a profound effect on the ability to make mature decisions on a consistent basis (Halpern-Felsher & Cauffman, 2001). The development of the executive functioning of the frontal lobes is critical to the ability to recognize the consequences of one's actions. Adolescence marks a period of heightened risk-taking, and increases in risky behaviors are closely linked to the physiological changes found in the onset of puberty. Early to mid-adolescence represents a time where adolescents are more prone to acting on biologically and emotionally driven motivations because they do not have the cognitive capacity to cope and reason with them (Steinberg et al., 2006).

In addition to the cognitive and physiological changes experienced during puberty, adolescents also experience changes in socio-emotional development during this stage that may precipitate suicidal behaviors. The psychosocial process of identity development first emerges during adolescence (Erikson, 1968). Peers, interpersonal relationships, and school-based achievement become of paramount importance to adolescents (Wagner, 2009), and failures in these areas can lead to a significant amount of distress. Acute stress in these areas can contribute to an overall feeling of disconnectedness for adolescents, which heightens their vulnerability to suicidal thoughts and behaviors (Wagner, 2009). From this we can posit that it may be more difficult for adolescents than adults with a psychopathological disturbance to find solutions other than suicide to cope with distress.

Further complicating the understanding of the role of development in suicidal behavior of adolescents is that the physiological and socio-emotional developmental

trajectory is experienced very differently across gender. Pubertal development typically occurs two years earlier for females than males. Females with an earlier onset of puberty tend to experience more significant distress than those with a later onset (Dubas & Petersen, 1993; Ge, Conger, & Elder, 2001). Conversely, males with late pubertal onset tend to experience greater challenges than their peers (Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997). There may be specific developmental periods during which males and females are particularly vulnerable to suicide attempts. Boeninger, Masyn, Feldman, and Conger (2010) found the prevalence patterns of suicide attempts to be similar for males and females, with both increasing through middle adolescence and then declining. However, they found the risk for female suicide attempts to decline slightly more rapidly after this mid-adolescence period.

### **Suicide Attempt Lethality**

O'Carroll and colleagues (1996) define a suicide attempt as a "potentially self-injurious behavior with a non-fatal outcome, for which there is evidence (either implicit or explicit) that the person intended at some (nonzero) level to kill him/herself" (247). Despite this seemingly specific nomenclature, the suicide attempt definition is frequently disputed by mental health professionals (Wagner, Wong, & Jobes, 2002), and research studies on suicide attempts have used a variety of definitions over the years (Wagner, 2009). This is problematic as there are vastly different lethality levels inherent in the suicide attempt construct (Wagner et al., 2002) which demonstrates the importance of using instruments with strong psychometric properties in adolescent suicide attempt research.



One component of self-harm behavior that is critical to the determination of suicide risk and should be measured in studies on suicide attempts is medical lethality. Nasser and Overholser (1999) define the medical lethality of a suicide attempt as the “seriousness of the physical consequences or risk to life” (423). The concept of medical lethality is important in suicide research, as individuals who make highly lethal suicide attempts have been found to exhibit a similar risk profile to suicide completers (Beautrais, 2003; Brent, 1987). Lethality is especially important to examine in suicide research with adolescents, as they are significantly less certain of the possible fatal outcome of their suicide attempt than adults (Parellada et al., 2007). This suggests that adolescents do not have the same knowledge of lethality of different suicide attempt methods (Nasser & Overholser, 1999) and that there may be characteristics other than depression severity and suicidal intent that contribute to adolescent suicide attempt lethality.

In a study on adolescent and young adult suicide attempts, Swahn and Potter (2001) found young age (13-17 years) to be significantly associated with a nearly lethal suicide attempt. Despite this knowledge, few research studies have examined factors associated with the medical lethality of adolescent suicide attempts specifically (Beautrais, 2003; Brent, 1987; Nasser & Overholser, 1999) and no studies have been conducted on this topic in the past 10 years. Because of the scarcity of research in this area, it is still unclear what factors are associated with suicide attempts of high lethality (Swahn & Potter, 2001), and even less knowledge exists specific to the adolescent suicide attempter population.

## Lethality and Psychopathological Comorbidity

Psychiatric disorders are the most common risk factor for suicide attempts among adolescents (Brent, 1995). The issue of psychopathological comorbidity, defined as the co-occurrence of two or more psychiatric disorders, has garnered attention from adolescent suicide researchers because certain combinations of disorders have been found to increase the risk of suicidal behavior (Wagner, 2009). There is still some controversy regarding which types of psychopathology are more significant risk factors for suicide in the adolescent population, although it has been suggested that a diagnosis of a mood disorder with comorbidity appears to increase the risk of suicide (Nasser & Overholser, 1999; Renaud, Berlim, McGirr, Tousignant, & Turecki, 2008). However, the literature still remains unclear about what specific patterns of comorbidity contribute to increased suicide risk among youth (Fordwood, Asarnow, Huizar, & Reise, 2007). In order to better understand the role of psychopathological comorbidity as a risk factor for adolescent suicide, the impact of specific typologies of psychiatric diagnoses on the lethality of adolescent suicide attempts must be further examined. Table 1 summarizes the findings and limitations of related studies.

**Table 1**

Findings and Limitations of Studies on Psychopathology and Suicide Attempts in Adolescents

Study	Sample	Findings	Limitations
Beautrais (2003)	Child, adolescent, and young adult suicide completers	Males, because of use of more lethal method, were more likely to complete	Not a purely pediatric sample; suicide attempts of

	(N = 60), serious suicide attempters (N = 125), and non-suicidal/non-attempter comparisons (N = 151)	suicide. Suicide completers more likely than attempters to have bipolar disorder. Suicide attempters more likely than completers to have mood disorders. Suicide attempters more likely than non-attempters to have mood, antisocial, substance use, or anxiety disorders.	moderate and low lethality of attempt not differentiated; effect of comorbidity not assessed.
Brent (1987)	Youth suicide attempters (N = 131)	Comorbid mood and substance abuse disorders were predictive of suicide attempts of higher lethality.	Study conducted 20 years ago; exact age of subjects unclear; disruptive disorders not measured.
Fordwood, Asarnow, Huizar, & Reise (2007)	Depressed adolescent primary care suicide attempters (N = 451)	Comorbid externalizing behaviors was strongest unique predictor of suicide attempts after accounting for severity of depressive symptoms.	Not a purely pediatric sample; lethality of attempt not differentiated.

Kelly, Cornelius, & Lynch (2002)	Adolescent psychiatrically disordered suicide attempters (N = 96) and psychiatrically disordered non- attempters (N = 96)	Bipolar, inhalant use, cocaine use, and hallucinogen use disorders were predictive of attempted suicide after adjusting for all other covariates.	Lethality of attempt not differentiated.
Kelly, Lynch, Donovan, & Clark (2001)	Adolescent psychiatrically disordered suicide attempters (N = 89) and psychiatrically disordered non- attempters (N = 343)	Major depression predictive of suicide attempts. Females with comorbid alcohol and conduct disorders 3 times more likely to have attempted suicide.	Lethality of attempt not differentiated.
Nasser & Overholser (1999)	Adolescents with suicide attempts of low (N = 20), medium (N = 20), and high (N = 20) lethality	Adolescents with comorbid depression and attention deficit disorder more likely to make suicide attempts of high lethality. Lethality groups did not differ in diagnoses of depressive, adjustment,	Study conducted over 10 years ago; only utilized bivariate analyses; sample size of lethality groups too small to conduct regression analyses.

		substance abuse, or bipolar disorders.	
Nrugham, Larsson, & Sund (2008)	Adolescent suicide attempters (N = 36) and non-attempters (N = 229)	Depressive disorder predicts suicidal acts for older adolescents only.	Relatively small sample size; loose definition of suicide attempt; comorbidity not assessed; lethality of attempt not differentiated.
Portzky, Audenaert, & van Heeringen (2005)	Adolescent suicide completers (N = 19)	All 19 had a psychiatric disorder; 13 had a mood disorder. In 9 cases, comorbid mood and substance abuse disorder.	Autopsy method; small sample size; no attempt or control groups.
Renaud, Berlim, McGirr, Tousignant, & Turecki (2008)	Children and adolescents who committed suicide (N = 55) and community controls (N = 55)	Depressive, substance abuse, and disruptive disorders predict suicide. Of suicide completers, 60% had comorbid disorders, compared to 9.1% of controls.	Autopsy method; relatively small sample size; did not specify comorbidity patterns; no attempt groups.

Swahn & Potter (2001)	Adolescent nearly lethal (N = 37) and less lethal (N = 3) and young adult nearly lethal (N = 116) and less lethal (N = 44) suicide attempters	Young age (13-17 years) significantly associated with nearly lethal suicide attempts.	Psychopathology and comorbidity not assessed.
Wu, Hoven, Liu, Cohen, Fuller, & Shaffer (2004)	Children and adolescents with suicidal ideation only (N = 74), suicide attempt (N = 49), and non-suicidal (N = 1,335).	Attempters distinguished from ideators by female gender and substance use.	Comorbidity not assessed; lethality of attempt not differentiated.

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*Depressive disorders.* Depressive disorders fall under the broader category of mood disorders in the *DSM-IV-TR* (American Psychiatric Association, 2000). The mood disorder category includes those disorders where the primary symptom is a disturbance in mood. Once subset of mood disorder diagnoses includes depressive disorders, which are characterized by depressed mood, reduced interest in activities that used to be enjoyed,

sleep disturbance, loss of energy, difficulty concentrating, and/or suicidal thoughts or intentions (APA, 1994).

Depression is arguably the biggest diagnostic risk factor for adolescent suicide (Fordwood et al., 2007; Kelly et al., 2001; Renaud et al., 2008). However, depression alone does not predict which suicidal adolescents make lethal suicide attempts (Wetzler et al., 1996), suggesting that there are other psychopathological risk factors, as well as reasons beyond psychopathology, that distinguish suicide completers from attempters. In the most recent study on adolescent suicide attempters that differentiated between both psychopathology and medical lethality, Nasser and Overholser (1999) found significant differences in suicide attempt lethality for adolescents with comorbid psychiatric diagnoses. They examined psychopathological differences between non-lethal (N = 20), low-lethal (N = 20), and high-lethal (N = 20) adolescent suicide attempters, using the Lethality of Suicide Attempt Rating Scale (LSARS) (Smith, Conroy, & Ehler, 1984). They found the high-lethal group to be the only group that had several individuals diagnosed with a major depressive episode and comorbid attention deficit disorder (Nasser & Overholser, 1999). Many adolescent suicide attempts are unplanned and made impulsively (Brown, Overholser, Spirito, & Fritz, 1991), making the propensity for impulsive and disruptive behaviors in the context of a mood disturbance especially concerning. This inability to control aggressive impulses may even be a greater indicator of risk for impulsive suicide attempts than depression (Simon et al., 2001).

*Bipolar disorders.* Bipolar disorders also fall under the broader category of mood disorders in the *DSM-IV-TR* (APA, 2000). For a diagnosis of bipolar disorder, a person must have had at least one manic or hypomanic episode in addition to a major depressive

episode. Manic episodes are characterized by racing speech and thoughts, increased energy, decreased need for sleep, elevated mood and exaggerated optimism, increased physical and mental activity, excessive irritability, aggressive behavior, poor judgment, reckless behavior, difficulty concentrating, and inflated sense of self-importance.

Because bipolar disorders have symptoms distinct from depressive disorders, and can be viewed as more externalizing than the typical internalizing symptoms of depression, it is important to consider the disorders separately in adolescent suicide research.

Considering the role of bipolar diagnoses in adolescent suicide attempts is critical, as the recognition, diagnosis, and treatment of the disorder has increased in the last decade. Because the knowledge base surrounding bipolar disorder is still underdeveloped, little is known about its relationship with adolescent suicidal behavior (Goldstein et al., 2005), and even less is known about the relationship between suicide attempt lethality and psychopathological comorbidity with the disorder. This is likely because many studies on adolescent suicide attempts exclude subjects with bipolar diagnoses either because they are examining comorbidity with depression alone or because the sample size of bipolar subjects is not large enough to draw conclusions about the population.

Some adult studies have found bipolar disorder to be over-represented in suicide attempts of high lethality, suggesting the risk of suicide completion is higher in patients with bipolar disorder (Raja & Azzoni, 2004); however, findings on the relationship between pediatric bipolar and suicide are mixed. In a study comparing adolescent suicide completers with medically serious attempters, Beautrais (2003) found that child, adolescent, and young adult suicide completers were significantly more likely to have a



diagnosis of bipolar disorder than attempters. However, Nasser and Overholser (1999) found no significant differences in the medical lethality of suicide attempts of adolescents with bipolar disorders when compared to those with depressive disorders. Due to the scarcity of research on the impact of psychopathological comorbidity with bipolar disorder on suicide attempt lethality in the adolescent population, there is scant knowledge in this area. However, in a study of adolescent suicide attempts that did not measure lethality, Kelly, Cornelius, and Lynch (2002) found bipolar disorder to be the one non-substance-related psychiatric disorder that places adolescents most at risk for attempted suicide.

*Disruptive disorders.* Disruptive disorders include, but are not limited to, such diagnoses as attention deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD) (APA, 2000). These disorders have impulsive and externalizing characteristics that are not inherent in mood disorders, but when added as a secondary diagnosis, contribute a dangerous component to the psychopathological risk profile of the suicidal adolescent. Aside from the findings of the Nasser and Overholser (1999) study, there is no other research that specifically examines the impact of psychopathological comorbidity with disruptive disorders on suicide completion or suicide attempt lethality in adolescents. However, in support of this idea, there are some broader studies that suggest co-occurring disruptive and depressive disorders are significant indicators of risk for suicide attempts in adolescents.

A study by Fordwood et al. (2007) found externalizing behaviors to be the strongest unique predictor of suicide attempts after accounting for the severity of depressive symptoms. Penn and colleagues (2003) found that incarcerated adolescents

with conduct problems have higher rates of suicide attempts and use more violent methods than adolescents in the general population. In one study that examined the impact of disruptive disorders when comparing child and adolescent suicide completers with community controls, Renaud et al. (2008) found that depressive disorders, disruptive disorders, and substance abuse disorders were the only independent significant psychopathology predictors of child and adolescent suicide completion.

*Substance abuse disorders.* In addition to knowledge from the Renaud et al. (2008) study which found substance abuse disorders to be one of the few types of psychopathology that differentiated suicide completers from community controls, Fleischmann and colleagues (2005) found youths with substance abuse disorders to be five to ten times more likely to complete suicide. Other research demonstrates a strong link between having a comorbid mood and substance abuse disorder and completed suicide in adolescents. In a psychological autopsy study, Portsky, Audenaert, and van Heeringen (2005) found substance abuse to be the secondary diagnosis to a mood disorder in 9 of 19 adolescent suicide completers.

Research on the impact of psychopathological comorbidity with substance abuse on adolescent suicide attempt lethality is sparse. In one of the few prior studies with youth that examined both suicide attempt lethality and psychopathological comorbidity, Brent (1987) found comorbid mood and substance abuse disorders to be predictive of suicide attempts of higher lethality. Although there are no other studies that specifically measure suicide attempt lethality, there is other research that demonstrates substance abuse disorders to be significantly associated with adolescent suicide attempts (Epstein & Spirito, 2009). Specifically, having an inhalant use, cocaine use, or hallucinogen use

disorder has been found to be predictive of attempted suicide in adolescents (Kelly, Cornelius, & Lynch, 2002). Wu and colleagues (2004) found suicide attempts to be strongly associated with alcohol abuse and dependence, even after controlling for depression. In a study of children and adolescents with bipolar disorder, it was found that bipolar suicide attempters were more likely to have a history of a substance abuse disorder when compared with bipolar non-attempters (Goldstein et al., 2005).

### **Lethality and Other Risk Factors**

In addition to the presence and severity of psychopathology, there are numerous other factors that influence the lethality of adolescent suicide attempts. In investigating the impact of comorbid psychiatric diagnoses on suicide attempt lethality, it is especially important to take the variables of gender, age, and race into account. Prior research demonstrates that these demographic groups have diverse psychopathological experiences as well as differing suicide attempt and completion rates within the adolescent population. Therefore, it is possible that certain typologies of psychiatric diagnoses and patterns of comorbidity have different effects on the medical lethality of adolescent suicide attempts across various gender, age, and race groups.

*Lethality and gender.* Epidemiological studies consistently demonstrate that female adolescents attempt suicide more frequently than males, and that male adolescents are more likely to complete suicide than females (CDC, 2007). Beautrais (2003) similarly found male gender to be a predictor of suicide completion when compared to suicide attempts of high medical lethality. However, after controlling for suicide attempt method, she found these differences to be explained by method choice, with males using more lethal means, which has been echoed in prior studies (Brent, Baugher, & Bridge et

al., 1999). This finding becomes concerning in light of recent statistics which reveal an increase in lethal suicide attempt methods by adolescent females of hanging, suffocation, and poisoning (CDC, 2007). This finding demonstrates that the more violent means of suicide attempts historically adopted by males and the more passive means of self-destruction utilized by females (Portes et al., 2002) may be changing. The likelihood of completion of a suicide attempt is largely about the chosen means; therefore, the recent adoption of more lethal suicide attempt methods puts females at greater risk of suicide completion, and raises concern that the adolescent female suicide rate may meet or even exceed that of males (Beautrais, 2003). Changes in gender roles may also serve to narrow the gap between male and female suicide rates, as females take on more traditionally male-oriented characteristics (Portes et al., 2002).

Prior research has also shown statistical associations between psychopathology and suicide attempts to be moderated by gender. For instance, Brezo and colleagues (2007) found psychiatric comorbidity to have a significant effect on suicide attempts for females but not for males. Kelly and colleagues (2001) found female adolescents with comorbid alcohol use and conduct disorders to be three times more likely to have attempted suicide than those with only one diagnosis. Similarly, Wannan and Fombonne (1998) found substance abuse to be a significant predictor of adolescent suicidal behavior for both genders, but depression had significant interaction effects with substance abuse and conduct disorder for females only. Also notable is that in an adult sample, Verona, Sachs-Ericsson, and Joiner (2004) found the co-occurrence of internalizing and externalizing disorders to play more of an influential role in suicide attempts among females than males. Most recently, Webb (2009) conducted a literature review in which

she found young female substance abusers to present with more frequent and severe psychopathological comorbidity that suggests they are at increased risk for suicide. From her findings she proposes that female gender can no longer be accepted as a protective factor for suicide completion.

In sum, research demonstrates that psychopathological comorbidity may have a larger effect on suicide attempt risk for adolescent females than males. The next step in understanding this relationship is to examine if various patterns of psychopathological comorbidity have significantly different links with suicide attempt lethality across gender. Prior studies have not had a sample size large enough to make cross-gender comparisons, and have not had the ability to specifically measure suicide attempt lethality. Research that accounts for gender differences in suicidal behaviors can enhance our understanding of adolescent suicide and will likely result in more focused adolescent suicide prevention efforts (Kelly et al., 2001).

*Lethality and age.* In addition to gender, age is another demographic variable with significant implications for adolescent suicidal behavior. As stated by Portes, Sandhu, and Longwell-Grice (2002), “the adolescent’s egocentric, rigid here-and-now perspective reflects an inability to utilize his or her growing cognitive competencies” (809). Adolescence marks a period of intellectual transition and instability, contributing to a limited ability to project themselves and others into the future (Portes et al., 2002). Because of these deficiencies, impulsivity can play a much larger role in the outcome of suicide attempts for adolescents than for adults. The permanency of death may not be comprehended in adolescence (Portes et al., 2002), and adolescents are significantly less certain of the possible fatal outcome of their suicide attempt than adults (Parellada et al.,

2007). Because adolescents do not have the same knowledge of the lethality of different methods of attempting suicide as adults (Nasser & Overholser, 1999), we can posit that the impulsive adolescent or the adolescent impaired by substances is at greater risk for unintentionally making a lethal attempt.

Due to the differences in cognitive capacities between younger and older adolescents, we can surmise that younger adolescents (ages 13 to 15) may be at greater risk than older adolescents (ages 16 to 18) for making a suicide attempt of high lethality that is unintentional. While the older adolescent suicide attempter may be clear about his or her intention to die, the younger adolescent may not adequately understand the concept of death and likely has not fully considered the options, risks, consequences, and benefits of suicide. And perhaps more importantly, it is likely that younger adolescents have less knowledge about the lethality of chosen means, making them more vulnerable to unintentional attempts of high lethality. In support of the influence of cognitive differences on suicidal behaviors, Nruham, Larsson, and Sund (2008) found that having a depressive disorder predicts suicidal acts for older adolescents, but not for younger adolescents. This finding suggests that for younger adolescents, there may be a profile of psychopathology other than depression that puts them at greater risk for a suicide attempt than their older adolescent counterparts. It is possible that because of the continuous development of cognitive skills within the adolescent period, younger adolescents diagnosed with externalizing or impulsive disorders may be at greater risk of making lethal suicide attempts than older adolescents.

*Lethality and race.* In addition to gender and age, the variable of race is important to consider in the relationship with suicide attempt lethality. It is unclear at

this point if this relationship differs across race; however, further investigation is warranted to determine if race is associated with the lethality of suicide attempts. Race comparisons of adolescent suicidal behavior have rarely been conducted with adequate sample sizes from which to draw conclusions, as the majority of adolescent suicide research has involved predominately Caucasian samples (Langhinrichsen-Rohling, Friend, & Powell, 2009). Epidemiological data on race differences in adolescent suicide completion rates show that White adolescents have had a higher rate of suicide than both Hispanic and Black older adolescents, with Black older adolescents having the lowest suicide rate of all race groups. However, suicide attempt rates demonstrate a very different race pattern, as Hispanic adolescents have had the highest attempt rate, followed by Blacks, and then Whites with the lowest rate (Wagner, 2009).

While there do not exist prior studies that specifically investigate the relationship between race and suicide attempt lethality in adolescents, previous research exploring race in relation to adolescent suicidal behaviors are on the whole inconclusive. Using secondary data from the 2007 Youth Risk Behavior Survey, Kim (2010) found that race was not a good predictor of adolescent suicidal behaviors. In a study of depressed adolescent primary care patients who attempted suicide, Fordwood and colleagues (2007) found that race was not significantly related to suicide attempts. There is some other research that suggests cultural differences in risk factors for suicide do exist. For instance, Blum and colleagues (2000) found that White adolescents were more likely to attempt suicide in the younger years than Black or Hispanic youth. Race requires further study in adolescent suicide research because it is unclear if race differences in risk factors for suicide exist in this population. While prior studies have included race as a control

variable in predictive models of suicidal behavior, this does not inform us about whether or not suicidal processes vary by race (Watt & Sharp, 2002). Although there have been some small scale studies on risk factors for adolescent suicidal behaviors within specific cultural groups, few of these studies have included cross-cultural comparisons, which are necessary in order to build knowledge about race differences in risk factors for adolescent suicide.

### **Study Significance**

Mental health professionals are not able to predict the occurrence of adolescent suicide attempts with high accuracy, largely because there are multiple pathways to the common endpoint of suicide in adolescents (Wagner, 2009). Research findings on adolescent suicide can be misleading because studies often place all suicidal behaviors in the same category, regardless of the medical lethality of the behavior. For instance, many studies will include both non-suicidal self-injury and highly lethal suicide attempts under the same construct of suicidality when looking at risk factors. This is an enormous methodological weakness, as an adolescent who scratches herself on the forearm in a moment of distress cannot be theoretically compared to an adolescent who has made a suicide attempt with lethal means such as a firearm. These variations make it difficult to draw general conclusions about risk factors for adolescent suicide in studies that do not specify medical lethality. Research methodologies that account for differences in levels of lethality can help specify risk factors and will contribute to more effective adolescent suicide prevention efforts (Kelly et al., 2001).



Psychopathology is another construct that has been poorly defined in prior studies on adolescent suicide. Prior research has not always specified the type of psychiatric disorder associated with suicide risk, and very few studies have examined the co-occurrence of psychiatric diagnoses. In order to best understand the role of psychopathology in explaining adolescent suicide, both the suicidal behavior and the psychopathology must be specified. Prior researchers have attempted to do this using psychological autopsy studies. However, autopsy studies are limited in what they can explain about the psychopathology of adolescent suicide completers, as psychiatric evaluations prior to the suicide are rarely available. Autopsy studies rely upon retrospective examinations of completed suicides that use information from secondary sources. Autopsy studies can over-diagnose depression and other mood disorders, which may introduce bias into the assessment and diagnosis of psychopathology of the suicide completer, leading to a cautious interpretation of the results (Portsky et al., 2005). Because of the limitations inherent in psychological autopsy studies, the assessment of specific typologies of psychiatric disorders in adolescent suicide attempts of high lethality is critical to the understanding of risk factors for adolescent suicide. Due to sample size limitations, recent research has not explicitly examined differences in psychopathology across varying levels of medical lethality of adolescent suicide attempts. Even the older research conducted by Nasser and Overholser (1999) did not have a sample size large enough to conduct a regression analysis, which would have been more explanatory than the bivariate analyses they utilized.

Research that includes highly lethal attempters, differentiates between psychiatric typologies, and uses advanced statistical analysis will expand our understanding of

psychopathological risk factors for adolescent suicide. The strength of this study is that it has a sample size large enough to break down the construct of the suicide attempt into different levels of medical lethality and the construct of psychopathology into specific typologies and comorbidity patterns of psychiatric disorders. In doing so, this study enables us to look at the psychopathological risk factors for adolescent suicide attempts in a new way. It allows us to see if suicide attempts of high lethality, which we can compare most closely with suicide completion, are associated with different typologies and combinations of psychiatric disorders than those suicide attempts that are non-life-threatening. By making up for past methodological limitations, this study adds to the existing knowledge base to help inform adolescent suicide risk assessment, treatment, and prevention practices.

This study also contributes to our understanding of the impact of psychopathological indicators on suicide attempt lethality across the demographic groups of gender, age, and race. While gender differences in risk factors for adolescent suicide are understood, the interplay between gender and psychopathology is much less clear. The large sample size in this study allows us to examine differences in psychopathology across gender to see how it impacts suicide attempt lethality. An additional strength of the study is that it enables us to look at adolescence not just as one age group, but instead as a period of transition that can have different implications on the medical seriousness of suicide attempts. Breaking down the construct of adolescence into younger and older age groups allows for a more specific examination of the relationship between psychopathology and suicide attempt lethality across age. Having a large sample from a

city hospital also allows for comparisons to be made across multiple races, which has not been possible in previous studies.

### **Hypotheses**

To address the aims of this study, seven hypotheses (H) were tested:

H1: Adolescents diagnosed with a Depressive Disorder do not make suicide attempts of higher lethality than adolescents without a Depressive Disorder.

H2: Adolescents diagnosed with a Disruptive Disorder do not make suicide attempts of higher lethality than adolescents without a Disruptive Disorder.

H3: Adolescents diagnosed with a Substance Abuse Disorder make suicide attempts of higher lethality than adolescents without a Substance Abuse Disorder.

H4: Adolescents diagnosed with a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, make suicide attempts of higher lethality than adolescents with a Depressive Disorder alone.

H5: Adolescents diagnosed with a Disruptive or Substance Abuse Disorder, in addition to Bipolar or Mood Disorder NOS, make suicide attempts of higher lethality than adolescents with Bipolar or Mood Disorder NOS alone.

H6: Having a diagnosis of a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, has a stronger effect on suicide attempt lethality for adolescent females than adolescent males.

H7: Having a diagnosis of a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, has a stronger effect on suicide attempt lethality for younger adolescents than older adolescents.

Although current literature does not support a hypothesis specific to the relationship between race and suicide attempt lethality in adolescents, the relationship between race and suicide attempt lethality will be investigated.

## CHAPTER II

### Methodology

#### Study Design and Sample

This study used a chart review to examine the relationship between psychopathological comorbidity and the medical lethality of adolescent suicide attempts. The research design was quantitative and explanatory in nature. A basic power analysis yielded an N of 271, with sufficient power to include approximately 30 covariates (Decision Support Systems, LP, 2010). For regression analyses, a strategy developed by Green (1991) suggests that  $N > 50 + 8m$  (where m is the number of covariates) for testing multiple correlations. This would suggest the need for an N of 290 for 30 covariates.

Data were collected from psychiatric evaluations of all adolescents that presented to Children's Hospital Boston (CHB) from 2006 to 2010 for a suicide attempt (N = 380). Adolescent suicide completers were not included in this study. The sample included subjects between 13 and 18 years of age at the time of evaluation. Exclusions were subjects with mental retardation (N = 1), subjects for whom it was unclear whether or not the self-injurious behavior was a suicide attempt (N = 3), and subjects for whom data were missing regarding the dependent variable of suicide attempt lethality (N = 1). There were no missing independent variable data in this study. Taking the five exclusions into account, the final analytic N was 375. There were a small number of repeat attempters in this study; considering these, the overall patient total was N = 362. Repeat patients were given the same case ID but were treated as multiple cases, as psychiatric diagnoses and suicide attempt lethality can evolve, making it possible for patients to have very different

profiles at two points in time. Additionally, repeat attempters were not dropped because it could not be determined if any of the other attempters in the study had multiple suicide attempts which were previously treated at different hospitals. White correction for standard errors was used to address the issue of correlation of multiple observations from the same patient (White, 1980).

### **Data Collection**

A chart review was conducted to collect data for the variables of suicide attempt lethality, psychopathology, gender, age, and race. The data for the independent variables were all found in the content of the psychiatric evaluation. The dependent variable of medical lethality of the suicide attempt was collected for each subject using the Lethality of Suicide Attempt Rating Scale II (LSARS-II) (Berman, Shepherd, & Silverman, 2003) (See Appendix A). Psychiatric evaluations and medical notes for all subjects were reviewed by the principal investigator to assess the lethality of the suicide attempt using the LSARS-II scale. LSARS-II scores for subjects in this study were assessed based upon detailed information about the medical lethality and circumstances of the suicide attempt found in both the psychiatric evaluation and medical documentation. To enhance the reliability and validity of the assessment tool, a research assistant also independently rated the lethality of the suicide attempt for 50% of the subjects using the LSARS-II and compared her results to the results of the principal investigator. Prior to data collection, in order to train for the use of the LSARS-II, the principal investigator and research assistant first reviewed the scale together and then practiced using a few 2011 evaluations that would not be used in the study. In the data collection process, for 50% of the subjects, they reviewed and rated the psychiatric evaluations and medical notes

separately. The raters achieved exact agreement on 85% of the evaluations that they both reviewed. They discussed the remaining 15% by reviewing the contents of the psychiatric evaluation and medical documentation together to decide on a value for those scores. To decrease bias, the lethality of the suicide attempt was assessed first for all subjects prior to documenting their psychopathology, so that the knowledge of psychopathology would not influence the raters' decision about the lethality of the attempt. Once all data were collected, the dataset was de-identified and compiled into a separate dataset for analysis. The data entry form used for the data collection process can be found in Appendix B.

### **Measurement**

*Suicide attempt lethality.* The dependent variable in this study is the medical lethality of the adolescent suicide attempt, which was measured using the LSARS-II. The LSARS-II was updated from the LSARS, which was developed as a tool to objectively measure the medical lethality of a suicide attempt (Smith, Conroy, & Ehler, 1984). The updated LSARS-II includes a completely revised and redesigned table of drugs and chemicals. This revision was imperative for two reasons; the need for an updated table incorporating more current medications, and the necessity of a new format to evaluate toxicity given the difficulty in determining the minimum lethal dose of an ingested substance in humans (Berman et al., 2003). In the LSARS-II, the lethality of the suicide attempt is rated on an 11-point scale ranging from 0, where "death is an impossible result," to 10, where "death is almost a certainty." The scale includes comprehensive descriptions and examples of suicide attempt methods, as well as a table of drug and substances and their lethal doses for two different body weights. The

lethality of the suicide attempt is measured as a single rating which reflects both the medical lethality, and the circumstances of the attempt. The fact that circumstances are included speaks to the clinical utility of the instrument to the assessment of suicide risk, as it integrates the role of suicidal intent in the lethality of the attempt (Berman et al., 2003).

While a number of scales to measure lethality have been used in prior studies, only three have published data on their psychometric properties. While all three of these scales have good concurrent validity and inter-rater reliability (Goldston, 2003), the LSARS is arguably superior. The reason for this is twofold: it provides a broader range of reference points for decision markers regarding levels of risk which allows for much greater empirical and clinical sensitivity, and it includes an extensive table of lethal levels of ingested substances (Berman et al., 2003). The LSARS and LSARS-II have demonstrated good inter-rater reliability in prior studies, with intra-class correlation coefficients between 0.80 and 0.90 (Nasser & Overholser, 1999; Smith et al., 1984). Important to this study is the fact that the LSARS-II has been used with adolescent populations (Nasser & Overholser, 1999). One issue with the use of the LSARS-II is that if multiple substances are ingested the interpretation of the scale becomes more difficult (Berman et al., 2003).

*Demographic variables.* In this study, gender was made into a dichotomous variable (1 = Male, 0 = Female). Age was made into both a continuous and dichotomous variable, with 13-15 years representing one group and 16-18 years representing another group (1 = Younger, 0 = Older). There were no issues of validity or reliability for gender or age variables. Race was coded categorically (1 = Caucasian/White, 2 = African-



American/Black, 3 = Hispanic/Latino, 4 = Asian, 5 = Biracial, 6 = Other). The Biracial category included all adolescents who identified themselves as a combination of two or more race groups. Due to small numbers in the Asian, Biracial, and Other categories, they were collapsed into the same group for bivariate and multivariate analysis. The race categories do pose some threats to reliability and validity. The Other category was not always specified by the evaluator, and therefore it was not possible to get an accurate race description for those subjects. An additional limitation of the study is that it was not possible to measure socioeconomic status (SES). Lack of SES measurement is not only a limitation in itself, but also affects the interpretation of race in this study. SES interacts with and confounds analyses of race and gender, with a growing body of research suggesting its influence on child health outcomes (American Academy of Pediatrics, 2000). Therefore, any findings in this study with respect to the variable of race must be interpreted with caution, as it was not possible to control for SES when analyzing race effects.

*Suicide attempt method.* The variable of suicide attempt method was also collected in this study (1 = Ingestion/poisoning, 2 = Cutting, 3 = Suffocation, 4 = Strangulation, 5 = Jumping, 6 = Hanging, 7 = Firearm, 8 = Swallowing of Object, 9 = Electrocutation, 10 = Drowning). If two attempt methods were used, the last method used was recorded. For instance, if an adolescent first attempted by ingestion without any effect and then decided to self-strangulate, the strangulation would be considered as the method used.

*Psychopathology and comorbidity.* The primary independent variables of analysis in this study were psychopathology and psychopathological comorbidity. Psychiatric

disorders were first defined and categorized in terms of *Diagnostic and statistical manual of mental disorders* (4th ed., Text Revision) (*DSM-IV-TR*) criteria, and then recorded into dichotomous categories, where subjects could meet criteria for more than one disorder simultaneously (1 = Yes, 0 = No) (APA, 2000). Diagnoses were generalized into the following *DSM-IV-TR* categories: Depressive, Bipolar, Mood Disorder NOS, Disruptive, Substance Abuse, Anxiety, and Other. Diagnoses which were not definitive, such as rule-out diagnoses, were not included in analysis. Additionally, personality disorders were not included in analysis, as the *DSM-IV-TR* criteria maintain that an individual must be 18 years of age to receive such a diagnosis. All subjects in this study carried at least one psychiatric diagnosis.

After frequencies were collected, attempters with Mood Disorder NOS were combined with attempters diagnosed with a Bipolar Disorder, into a new variable named Bipolar or Mood Disorder NOS. Mood disorder NOS is diagnosed when the primary symptom is a problem of mood, but the symptomatology does not fit into a specific mood disorder category. This diagnosis is typically given when it is difficult to choose between depressive and bipolar disorders, usually because there is an externalizing or impulsive component to the symptomatology (APA, 2000). Therefore, because of this externalizing component, attempters diagnosed with either bipolar disorder or mood disorder NOS were combined into the same category for analysis.

The diagnoses used in this study had already been determined by CHB psychiatric clinicians following interviews with the patient, family members, and other collateral contacts. The reliability of raters in this study was unable to be assessed, as the study is retrospective and not all raters still work at CHB. While all CHB clinicians diagnose

their patients in accordance with *DSM-IV-TR* criteria, it must be noted that this assessment procedure may lead to a certain degree of diagnostic uncertainty and may cause comorbid diagnoses to be under-recognized. Because of this, the impact of comorbidity on the lethality of the suicide attempt may be underestimated. To address this limitation, documented histories of prior psychiatric diagnoses, even if not diagnosed at time of psychiatric evaluation, were noted as prior diagnoses in this study, and were included as indicators in bivariate and multivariate analysis.

To test comorbidity hypotheses, dichotomous variables were made to represent that the subject met criteria for certain disorders simultaneously (1 = yes, 0 = no). For bivariate analyses, six comorbidity variables were created: Depressive and Disruptive, Depressive and Substance Abuse, Depressive and Disruptive and Substance Abuse, Bipolar or Mood NOS and Disruptive, Bipolar or Mood NOS and Substance Abuse, and Bipolar or Mood NOS and Disruptive and Substance Abuse. For multivariate analyses, due to inadequate numbers, only two comorbidity variables were created: Depressive and Disruptive or Substance Abuse, and Bipolar or Mood NOS and Disruptive or Substance Abuse.

It is important to address the issues of validity and utility in research involving psychiatric diagnoses. While the validity of medical syndromes is rarely contested, psychiatric disorders face different challenges in research and practice. Psychiatric disorders often have overlapping symptoms, making it difficult to determine an appropriate diagnosis. Clinicians do not always report comorbid disorders when evaluating suicidal patients, likely because the mood disorder tends to be primary and may appear to overshadow other symptomatology at the time of the patient's

presentation. Because of this, comorbid diagnoses are often under-recognized (Nasser & Overholser, 1999), which contributes to limitations in both practice and research.

Despite the problems involved in distinguishing one psychiatric disorder from another and in resolving issues of comorbidity, the utility of using diagnostic criteria in psychiatric research is invaluable and must be recognized (Kendell & Jablensky, 2003). Such research can inform etiology, risk factors, and outcomes, as well as help clinicians to make decisions about symptom management and treatment (Spitzer, 2001). Therefore, it is appropriate for most psychiatric research to be based on precisely defined disorders, whether or not they have been shown to be valid (Kendell & Jablensky, 2003).

### **Statistical Analysis**

Data analysis was conducted using the STATA 11.0 statistical package. The first step of the data analysis process included a descriptive analysis of each of the variables via frequency distributions. Second, bivariate tests were run to determine if statistically significant relationships existed between each of the independent variables and the dependent variable of suicide attempt lethality. Independent *t*-tests, Pearson correlation, and one-way ANOVA were used to determine if there were statistically significant differences in means of the LSARS-II scores for the different independent variable groups. Third, ordinary least squares (OLS) regression was used to determine the percent of variance in the dependent variable explained by the independent variables and to rank the relative importance of the independents. Despite the fact that there were few independent variables and the dependent variable can only be positive, OLS is still a good reduced form model for data analysis. OLS is good model to use when there is no multicollinearity, and can be used as a maximum likelihood estimator when errors are

normally distributed. However, the method has good statistical properties for a much broader class of distributions. In this study, White standard error adjustments were used to correct for correlations created by repeated observations for subjects (White, 1980).

To test the first three hypotheses, OLS regression analysis was performed with the independent variables of gender, age group, race, and specific psychiatric diagnoses. Due to multicollinearity issues, psychiatric diagnoses were entered one psychopathology variable at a time. The next set of models used the psychopathological comorbidity variables to test the fourth and fifth hypotheses. To test the fourth hypothesis a subset of attempters with Depressive Disorders was used, and to test the fifth hypothesis a subset of attempters with Bipolar or Mood Disorder NOS was used. The sixth and seventh hypotheses posited that gender and age may alter the strength of the causal relationship between psychopathological comorbidity and lethality; thus, moderating effects were examined. A moderating variable is a variable that alters the strength of a causal relationship (Baron & Kenny, 1986). To assess moderation, regressions were run for gender and age groups separately using the psychopathological comorbidity variables. In addition, interaction terms were made between gender and psychopathological comorbidity, as well as age group and psychopathological comorbidity, and were used in OLS regression analysis to examine the moderating effect of gender and age group differences as they influence the link between psychopathological comorbidity and suicide attempt lethality. It is important to note that in order to have reasonable power to detect moderating effects when one of the variables is continuous, a sample size of at least 200 is needed (Aguinis, 2004).

## CHAPTER III

### Results

#### Frequencies

*Demographics.* In the sample, there were 85 males (22.7%) and 290 females (77.3%). This study used adolescents ranging in age from 13 to 18 years ( $\bar{x}$  = 15.42; SD = 1.34). Adolescents were broken down into age groups for this study; there were 183 attempters in the range of 13 to 15 years (48.8%) and 192 between the age of 16 to 18 years (51.2%). The frequencies for race included Caucasian/White (250; 66.7%), Hispanic/Latino (56; 14.9%), African-American/Black (36; 9.6%), Biracial (21; 5.6%), other (8; 2.1%), and Asian (4; 1.1%). The Biracial category included all adolescents who identified themselves as a combination of two or more race groups. Due to low numbers in the categories of Asian, Biracial, and Other, the groups were combined together under the “Other” category (33; 8.8%) for bivariate and multivariate analysis. Table 2 summarizes the frequencies of the demographic variables.

**Table 2**

Frequencies of Demographics (N = 375)

Demographic Variable	Category	Frequency
Gender	Male	85; 22.7%
	Female	290; 77.3%

Age	13	38; 10.1%
	14	56; 14.9%
	15	90; 24.0%
	16	107; 28.5%
	17	66; 17.6%
	18	18; 4.8%
Age Group	13-15	183; 48.8%
	16-18	192; 51.2%
Race	Caucasian/White	250; 66.7%
	Hispanic/Latino	56; 14.9%
	African-American/Black	36; 9.6%
	Biracial	21; 5.6%
	Other	8; 2.1%
	Asian	4; 1.1%

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*Suicide attempt method.* Frequencies of suicide attempt method were also examined. Ingestion/poisoning (327; 87.2%) was the leading suicide attempt method, followed by cutting (14; 3.73%), strangulation (12; 3.20%), hanging (10; 2.67%), jumping (7; 1.87%), suffocation (1; 0.27%), firearm (1; 0.27%), swallowing of object (1; 0.27%), electrocution (1; 0.27%), and drowning (1; 0.27%).

*Psychopathology.* The frequencies of psychopathological disorders were examined. Depressive Disorders (272; 72.5%) were the most prevalent, followed by Disruptive Disorders (135; 36.0%), Substance Abuse Disorders (106; 28.0%), Mood

Disorder NOS (70; 18.7%), Anxiety Disorders (61; 16.3%), Other Disorders (47; 12.5%), and Bipolar Disorders (17; 4.5%). All subjects in this study carried at least one psychiatric diagnosis. It is important to note that these groups were not mutually exclusive and the sum of the percentages did not equal 100 percent. Table 3 summarizes the psychopathology frequencies.

**Table 3**

Frequencies of Psychopathology (N = 375)

Psychopathology Variable	Frequency
Depressive Disorder	272; 72.5%
Bipolar Disorder	17; 4.5%
Mood Disorder NOS	70; 18.6%
Disruptive Disorder	135; 36.0%
Substance Abuse Disorder	106; 28.2%
Anxiety Disorder	61; 16.2%
Other Disorder	47; 12.5%

*Psychopathological comorbidity.* Psychopathological comorbidity frequencies were also observed in this study. Attempters diagnosed with either Bipolar Disorder or Mood Disorder NOS (87; 23.1%) were combined into one category for all bivariate and multivariate analyses. The psychopathological comorbidity pattern with the largest frequency was Depressive and Disruptive (77; 20.5%), followed by Depressive and Substance Abuse (59; 15.7%), Bipolar or Mood NOS and Disruptive (50; 13.3%), Bipolar or Mood NOS and Substance Abuse (41, 10.9%), Bipolar or Mood NOS and



Disruptive and Substance Abuse (31, 8.2%), and Depressive and Disruptive and Substance Abuse (25; 6.7%). It is important to note that Substance Abuse was never the sole diagnosis for attempters in this sample; it was always comorbid with at least one other psychiatric disorder. While there did exist other comorbidity patterns, these specific combinations were chosen to test the theoretically informed hypotheses of this study. These groups were not mutually exclusive and the sum of the percentages did not equal 100 percent. Table 4 summarizes the frequencies for psychopathological comorbidity.

**Table 4**

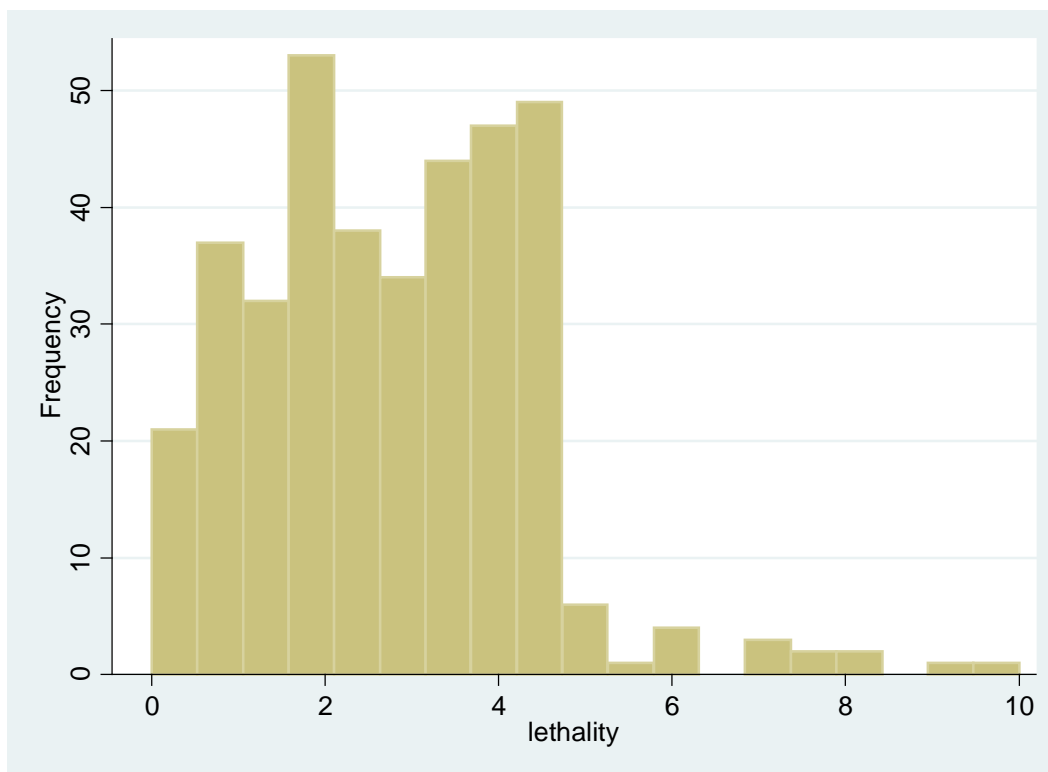
Frequencies of Psychopathological Comorbidity (N = 375)

Psychopathological Comorbidity Variable	Frequency
Depressive and Disruptive	77; 20.5%
Depressive and Substance Abuse	59; 15.7%
Depressive and Disruptive and Substance Abuse	25; 6.7%
Bipolar or Mood NOS and Disruptive	50; 13.3%
Bipolar or Mood NOS and Substance Abuse	41; 10.9%
Bipolar or Mood NOS and Disruptive and Substance Abuse	31; 8.2%

*Lethality.* The lethality of suicide attempts in this study ranged from 0.0 to 10.0 ( $\bar{x} = 2.88$ ;  $SD = 1.56$ ). The lethality variable was skewed left, as Figure 1 illustrates.

**Figure 1**

Lethality Distribution



However, a plot of the studentized residuals demonstrated no clear pattern.

Taking the log and square root of the lethality variable also made no changes in the pattern of the residuals. Therefore, there was no indication that the variable required transformation in order to be used in the regression model; using robust estimation was adequate to address the issue of heteroskedasticity of the residuals. The fact that these deviations existed suggests that there is little explanatory value in the regression models. This makes sense as the aim of this study was not to develop a comprehensive model of the predictors of suicide attempt lethality, but rather, to examine only certain demographic and psychopathological predictors.

## Bivariate Tests

*Demographics.* Independent  $t$ -tests, Pearson correlation, and one-way ANOVA were used to examine relationships between suicide attempt lethality and selected demographic variables. Independent  $t$ -tests demonstrated that lethality was not significantly different between males and females. Age group differences in lethality were not significant between the younger ( $\bar{x} = 2.78$ ) and older ( $\bar{x} = 2.98$ ) groups ( $t_{(df=373)} = 1.23$ ;  $p = 0.21$ ). The continuous age variable was also not significantly correlated with lethality ( $r = 0.04$ ;  $p = 0.36$ ). One-way ANOVA demonstrated no significant difference in lethality across race groups ( $F_{(df=5)} = 0.97$ ;  $p = 0.43$ ). However, ANOVA postestimation showed trend level differences between the African-American/Black and Caucasian/White groups, with African-American/Blacks having lower lethality than Caucasian/Whites ( $F_{(df=5)} = 3.54$ ;  $p = 0.06$ ). Table 5 summarizes the results of the bivariate relationships between demographics and lethality.

**Table 5**

Bivariate Relationships between Demographics and Lethality (N = 375)

Demographic Variable	$\bar{x}$	$t/F$
Gender		-1.07
Male	3.04	
Female	2.83	
Age Group		1.23
13-15 Years	2.78	
16-18 Years	2.98	

Race	0.97
Caucasian/White	2.94 <sup>a</sup>
African-American/Black	2.41 <sup>a</sup>
Hispanic/Latino	2.78
Other	3.15

<sup>a</sup>Between group differences trend level significant at  $p < .10$

*Psychopathology.* Independent *t*-tests were used to examine relationships between lethality and the individual psychopathology variables. For each *t*-test one psychopathology variable was compared to all others in the sample. The only significant relationship with lethality was Substance Abuse, as adolescent suicide attempters with a Substance Abuse diagnosis had higher lethality scores than attempters without the diagnosis ( $\bar{x} = 3.22$ ;  $t_{(df=373)} = -2.65$ ;  $p = 0.008$ ). Table 6 summarizes the results of the bivariate relationships between psychopathology and lethality.

**Table 6**

Bivariate Relationships between Psychopathology and Lethality (N = 375)

Variable	$\bar{x}$	<i>t</i>
Depressive	2.85	0.67
Bipolar or Mood Disorder NOS	3.06	-1.24
Disruptive	2.89	-0.08
Substance Abuse	3.22	-2.65**
Anxiety	3.03	-0.79
Other	3.10	-1.02
Total Sample	2.88	

\*\*Significant at the  $p < .01$  level

*Psychopathological comorbidity.* Independent *t*-tests were used to examine relationships between suicide attempt lethality and the psychopathological comorbidity variables. For each *t*-test one psychopathological comorbidity variable was compared to all others in the sample. Findings for lethality differences across psychopathological comorbidity were only significant for the relationships with Bipolar or Mood Disorder NOS and Substance Abuse ( $\bar{x} = 3.37$ ;  $t_{(df=373)} = -2.14$ ;  $p = 0.03$ ) and Bipolar or Mood Disorder NOS and Disruptive and Substance Abuse ( $\bar{x} = 3.46$ ;  $t_{(df=373)} = -2.16$ ;  $p = 0.03$ ). Attempters with those diagnoses had significantly more lethal attempts than attempters without the diagnoses. Table 7 summarizes the results of the bivariate relationships between psychopathological comorbidity and lethality.

**Table 7**

Bivariate Relationships between Psychopathological Comorbidity and Lethality (N = 375)

Variable	$\bar{x}$	<i>t</i>
Depressive and Disruptive	2.81	0.47
Depressive and Substance Abuse	3.16	-1.46
Depressive and Disruptive and Substance Abuse	3.16	-0.90
Bipolar or Mood NOS and Disruptive	3.08	-0.93
Bipolar or Mood NOS and Substance Abuse	3.37	-2.14*
Bipolar or Mood NOS and Disruptive and Substance Abuse	3.46	-2.16*

\*Significant at the  $p < .05$  level

### Multiple Regression

*Psychopathology and lethality.* The first set of regression models were used to test the first three hypotheses of the study:

H1: Adolescents diagnosed with a Depressive Disorder do not make suicide attempts of higher lethality than adolescents without a Depressive Disorder.

H2: Adolescents diagnosed with a Disruptive Disorder do not make suicide attempts of higher lethality than adolescents without a Disruptive Disorder.

H3: Adolescents diagnosed with a Substance Abuse Disorder make suicide attempts of higher lethality than adolescents without a Substance Abuse Disorder.

Since the psychopathology categories were not mutually exclusive, and due to multicollinearity problems from including dummy variables for all psychopathology variables in one model, it was determined that the optimal modeling strategy was to run six separate OLS regression models assessing the role of one psychopathology category at a time. In these models, attempters with the designated psychopathological diagnosis were compared to all other attempters in the sample.

The only demographic variable that showed a significant relationship with lethality was African-American/Black race, as it had a negative relationship with lethality in all psychopathology models tested ( $\beta = -0.52$ ;  $p = .03$  for Model 1) when compared to Caucasian/White race. Post-hoc tests for race demonstrated one trend level significant group difference between the African-American/Black and Other race groups ( $F = 3.04$ ;  $p = 0.07$  for Model 1) in all models, with African-American/Blacks having significantly lower lethality than those in the Other race group. The only significant psychopathological predictor of lethality was Substance Abuse, as adolescent suicide attempters with a Substance Abuse diagnosis had higher lethality scores ( $\beta = 0.42$ ;  $p = .02$ ) than the rest of the sample. Table 8 summarizes results from the first set of regression models.

**Table 8**

Multiple Regression on Lethality (N = 375)

Variable	Lethality (Model 1)	Lethality (Model 2)	Lethality (Model 3)	Lethality (Model 4)	Lethality (Model 5)	Lethality (Model 6)
	B	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$
Younger Age	-0.23	-0.23	-0.22	0.16	-0.22	0.22
Male Gender	0.21	0.22	0.20	0.17	0.21	0.20
Af-Am/Black	-0.52 <sup>*a</sup>	-0.51 <sup>*a</sup>	-0.53 <sup>*a</sup>	-0.51 <sup>*a</sup>	-0.53 <sup>*a</sup>	-0.50 <sup>*a</sup>
Hispanic/Latino	-0.11	-0.09	-0.13	-0.09	-0.12	-0.13
Other Race	0.25 <sup>a</sup>	0.25 <sup>a</sup>	0.25 <sup>a</sup>	0.25 <sup>a</sup>	0.29 <sup>a</sup>	0.26 <sup>a</sup>
Depressive	-0.12					
Bipolar/Mood NOS		0.24				
Disruptive			0.01			
Substance Abuse				0.42 <sup>*</sup>		
Anxiety					0.20	
Other Disorder						0.19
<i>F</i>	1.54	1.81 <sup>+</sup>	1.33	2.80 <sup>*</sup>	1.61	1.32
<i>R</i> <sup>2</sup>	0.02	0.02	0.02	0.03	0.02	0.02

+Trend level significant at  $p < .10$ \*Significant at the  $p < .05$  level<sup>a</sup> Between group differences trend level significant at  $p < .10$ 

*Psychopathological comorbidity and lethality.* The next regression model was used to test the fourth hypothesis:

H4: Adolescents diagnosed with a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, make suicide attempts of higher lethality than adolescents with a Depressive Disorder alone.

This model included all attempters with a Depressive Disorder diagnosis that did not have a comorbid Anxiety or Other Disorder ( $N = 200$ ). This condensed the original sample into a subset of attempters with a Depressive Disorder only ( $N = 137$ ) and attempters with a Depressive Disorder and either a comorbid Disruptive or Substance Abuse Disorder ( $N = 63$ ). A dummy variable was created for attempters with comorbid Depressive and Disruptive or Substance Abuse Disorders, leaving attempters with a Depressive Disorder only as the reference group. Race groups did not have adequate numbers to be included in analysis. The psychopathological comorbidity variable did not have a significant relationship with lethality in this model; however, male gender was found to have a positive relationship with suicide attempt lethality at trend level ( $\beta = 0.53$ ;  $p = .09$ ). Table 9 summarizes the results of the Depressive Disorder comorbidity regression model.

**Table 9**

Multiple Regression on Lethality, with Psychopathological Comorbidity, for Subset of Attempters with a Depressive Disorder ( $N = 200$ )

Variable	Lethality	
	$\beta$	SE
Younger Age Group ( $N = 99$ )	-0.01	0.22
Male Gender ( $N = 45$ )	0.53+	0.31
Depressive and Disruptive or Substance Abuse ( $N = 63$ )	-0.08	0.24



<i>F</i>	0.95
<i>R</i> <sup>2</sup>	0.02

+Trend level significant at  $p < .10$

The next regression model was used to test the fifth hypothesis:

H5: Adolescents diagnosed with a Disruptive or Substance Abuse Disorder, in addition to a Bipolar or Mood Disorder NOS, make suicide attempts of higher lethality than adolescents with Bipolar or Mood Disorder NOS alone.

This model included all attempters with Bipolar or Mood Disorder NOS that did not have a comorbid Anxiety or Other Disorder ( $N = 67$ ). This condensed the sample into attempters with Bipolar or Mood Disorder NOS only ( $N = 22$ ) and attempters with Bipolar or Mood Disorder NOS and either a comorbid Disruptive or Substance Abuse Disorder ( $N = 45$ ). A dummy variable was created for attempters with comorbid Bipolar or Mood Disorder NOS and Disruptive or Substance Abuse Disorders, leaving attempters with Bipolar or Mood Disorder NOS only as the reference group. Race analysis was not possible due to inadequate numbers for comparison. No demographic or psychopathological comorbidity variables had a significant relationship with lethality in this model. Table 10 summarizes the results of the Bipolar or Mood Disorder NOS comorbidity regression model.

**Table 10**

Multiple Regression on Lethality, with Psychopathological Comorbidity, for Subset of Attempters with Bipolar or Mood Disorder NOS ( $N = 67$ )

Variable	Lethality	
	$\beta$	SE

Younger Age Group (N = 35)	-0.29	0.35
Male Gender (N = 11)	0.20	0.66
Bipolar or Mood Disorder NOS and Disruptive or Substance Abuse (N = 45)	0.01	0.38
<i>F</i>	0.37	
<i>R</i> <sup>2</sup>	0.01	

*Gender and lethality.* The next set of regression models tested the sixth hypothesis:

H6: Having a diagnosis of a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, has a stronger effect on suicide attempt lethality for adolescent females than adolescent males.

Regression models were first run for each gender separately to examine what findings were statistically significant among each gender group. Race groups were excluded due to inadequate numbers for comparison. Assessment of coefficients showed no significant findings for the female or male group. Table 11 summarizes the regression analysis for the female group, and Table 12 summarizes results for the male group.

**Table 11**

Multiple Regression on Lethality, with Psychopathological Comorbidity, for Female Gender Group, for Subset of Attempters with a Depressive Disorder (N = 155)

Variable	Lethality	
	$\beta$	SE
Younger Age Group (N = 99)	0.21	0.23
Depressive and Disruptive or Substance Abuse (N = 46)	0.15	0.25

<i>F</i>	0.53
<i>R</i> <sup>2</sup>	0.00

**Table 12**

Multiple Regression on Lethality, with Psychopathological Comorbidity, for Male Gender Group, for Subset of Attempters with a Depressive Disorder (N = 45)

Variable	Lethality	
	$\beta$	SE
Younger Age Group (N = 99)	-0.75	0.59
Depressive and Disruptive or Substance Abuse (N = 17)	-0.73	0.59
<i>F</i>	2.23	
<i>R</i> <sup>2</sup>	0.07	

To test the sixth hypothesis using a different technique, interactions terms were made between gender and the comorbidity variable to determine if gender had a moderating effect on lethality. Assessment of coefficients showed that females without comorbidity had significantly lower lethality than males ( $\beta = -0.87$ ;  $p = 0.03$ ). Table 13 summarizes the regression analysis with gender interaction effects.

**Table 13**

Multiple Regression on Lethality, with Psychopathological Comorbidity, with Gender Interaction Effects, for Subset of Attempters with a Depressive Disorder (N = 200)

Variable	Lethality	
	$\beta$	SE

Younger Age Group (N = 99)	0.00	0.22
Female Gender	-0.87*	0.39
Depressive and Disruptive or Substance Abuse (N = 63)	-0.80	0.59
Female x Depressive and Disruptive or Substance Abuse (N = 46)	0.95	0.64
<i>F</i>	1.22	
<i>R</i> <sup>2</sup>	0.03	

\*Significant at the  $p < .05$  level

*Age group and lethality.* The next set of regression models tested the seventh hypothesis:

H7: Having a diagnosis of a Disruptive or Substance Abuse Disorder in addition to a Depressive Disorder has a stronger effect on suicide attempt lethality for younger adolescents than older adolescents.

Regression models were run for each age group separately to examine what findings were statistically significant among each age group. Race groups were excluded due to inadequate numbers for comparison. No significant relationships were found in the regression analyses for the younger age group, which Table 14 summarizes.

**Table 14**

Multiple Regression on Lethality, with Psychopathological Comorbidity, for Younger Age Group, for Subset of Attempters with a Depressive Disorder (N = 99)

Variable	Lethality	
	$\beta$	SE
Male Gender (N = 24)	-0.03	0.44

Depressive and Disruptive or Substance Abuse (N = 32)	-0.02	0.35
<i>F</i>	0.01	
<i>R</i> <sup>2</sup>	0.00	

For the older age group, male gender had a significant positive relationship with suicide attempt lethality ( $\beta = 1.06$ ;  $p = 0.02$ ). Table 15 summarizes the regression analysis for the older age group.

**Table 15**

Multiple Regression on Lethality, with Psychopathological Comorbidity, for Older Age Group, for Subset of Attempters with a Depressive Disorder (N = 101)

Variable	Lethality	
	$\beta$	SE
Male Gender (N = 21)	1.06*	0.45
Depressive and Disruptive or Substance Abuse (N = 31)	-0.10	0.33
<i>F</i>	1.76	
<i>R</i> <sup>2</sup>	0.07	

\*Significant at the  $p < .05$  level

To test the seventh hypothesis using a different technique, interactions terms were made between age group and the comorbidity variable to determine statistically significant differences between age groups. Assessment of coefficients showed that males had higher lethality than females ( $\beta = 0.53$ ;  $p = 0.09$ ) at trend level, but did not support the hypothesis that age group had a moderating effect on lethality. Table 16 summarizes the regression analysis with age group interaction effects.

**Table 16**

Multiple Regression on Lethality, with Psychopathological Comorbidity, with Age Group Interaction Effects, for Subset of Attempters with a Depressive Disorder (N = 200)

Variable	Lethality	
	$\beta$	SE
Male Gender (N = 99)	0.53+	0.31
Younger Age Group	-0.01	0.26
Depressive and Disruptive or Substance Abuse (N = 63)	-0.08	0.33
Younger Age x Depressive and Disruptive or Substance Abuse (N = 32)	0.01	0.49
<i>F</i>	0.72	
<i>R</i> <sup>2</sup>	0.02	

+Trend level significant at  $p < .10$

### Summary of Hypothesis Testing

H1: Adolescents diagnosed with a Depressive Disorder do not make suicide attempts of higher lethality than adolescents without a Depressive Disorder.

Independent *t*-tests and OLS regression showed no significant relationship between Depressive Disorders and suicide attempt lethality. *Hypothesis supported.*

H2: Adolescents diagnosed with a Disruptive Disorder do not make suicide attempts of higher lethality than adolescents without a Disruptive Disorder.

Independent *t*-tests and OLS regression showed no significant relationship between Disruptive Disorders and suicide attempt lethality. *Hypothesis supported.*

H3: Adolescents diagnosed with a Substance Abuse Disorder make suicide attempts of higher lethality than adolescents without a Substance Abuse Disorder.

Independent  $t$ -tests showed adolescent suicide attempters with a Substance Abuse diagnosis had higher lethality scores than attempters without the diagnosis ( $\bar{x} = 3.22$ ;  $t_{(df=373)} = -2.65$ ;  $p = 0.008$ ). OLS regression showed that adolescent suicide attempters with a Substance Abuse diagnosis had higher lethality scores ( $\beta = 0.42$ ;  $p = .02$ ) than the rest of the sample. *Hypothesis supported.*

H4: Adolescents diagnosed with a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, make suicide attempts of higher lethality than adolescents with a Depressive Disorder alone.

Bivariate analysis and OLS regression demonstrated no significant relationships between attempters with a Depressive and Disruptive or Substance Abuse Disorders and suicide attempt lethality. *Hypothesis not supported.*

H5: Adolescents diagnosed with a Disruptive or Substance Abuse Disorder, in addition to Bipolar or Mood Disorder NOS, make suicide attempts of higher lethality than adolescents with Bipolar or Mood Disorder NOS alone.

Bivariate analyses showed attempters with comorbidity patterns of Bipolar or Mood Disorder NOS and Substance Abuse ( $\bar{x} = 3.37$ ;  $t_{(df=373)} = -2.14$ ;  $p = 0.03$ ) and Bipolar or Mood Disorder NOS and Disruptive and Substance Abuse ( $\bar{x} = 3.46$ ;  $t_{(df=373)} = -2.16$ ;  $p = 0.03$ ) had suicide attempts of higher lethality than those without those comorbidity patterns. OLS regression showed no significant relationships between attempters with Bipolar or Mood Disorder NOS and Disruptive or Substance Abuse

Disorders and suicide attempt lethality. *Hypothesis supported by bivariate analysis; hypothesis not supported by multivariate analysis.*

H6: Having a diagnosis of a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, has a stronger effect on suicide attempt lethality for adolescent females than adolescent males.

When comorbidity regression models were run separately for each gender for the subset of attempters with Depressive Disorders, no significant relationships with lethality were found for either the female or male group. When interaction terms were made between gender and the comorbidity variable, assessment of coefficients showed that females without comorbidity had significantly lower lethality than males ( $\beta = -0.87$ ;  $p = 0.03$ ). *Hypothesis not supported.*

H7: Having a diagnosis of a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, has a stronger effect on suicide attempt lethality for younger adolescents than older adolescents.

OLS regression showed no significant differences in the relationship between comorbidity and suicide attempt lethality either within or between groups of younger and older adolescents. *Hypothesis not supported.*

With respect to race findings, one-way ANOVA demonstrated no significant difference in lethality across race groups ( $F_{(df=5)} = 0.97$ ;  $p = 0.43$ ). However, ANOVA postestimation showed trend level differences between the African-American/Black and Caucasian/White groups, with African-American/Blacks having lower lethality than Caucasian/Whites ( $F_{(df=5)} = 3.54$ ;  $p = 0.06$ ). In OLS regression, African-American/Black race had a significant negative relationship with lethality in all psychopathology models



tested ( $\beta = -0.52$ ;  $p = .03$ ) when compared to Caucasian/White race. Post-hoc tests for race demonstrated one trend level significant group difference between the African-American/Black and Other race groups ( $F = 3.04$ ;  $p = 0.07$  for Model 1) in all models, with African-American/Blacks having significantly lower lethality than those in the Other race group.

## CHAPTER IV

### Discussion

The primary aim of this study was to determine if various typologies of psychiatric diagnoses and patterns of comorbidity are differentially related to the medical lethality of adolescent suicide attempts. The secondary aim was to determine if the relationship between psychopathological comorbidity and suicide attempt lethality is significantly different across gender, age, and race in the adolescent population. Though not all hypotheses in this study were supported, those that were supported have important implications for adolescent suicide prevention programs, treatment of suicidal adolescents, and policies affecting adolescents at risk for suicide.

#### **Lethality and Psychopathological Comorbidity**

*Depressive Disorders.* Having a Depressive Disorder was the most common psychopathological characteristic of this sample, as 74% (N = 272) of adolescent suicide attempters in this study carried the diagnosis. This finding supports prior studies that posit depression may be the biggest diagnostic risk factor for adolescent suicide attempts (Fordwood et al., 2007; Kelly et al., 2001; Renaud et al., 2008). However, depression alone did not predict suicide attempt lethality in either bivariate or multivariate results of this study, which also supports prior research findings (Wetzler et al., 1996). This suggests that while a Depressive Disorder may be the most common diagnosis in adolescent suicide attempters, simply having the diagnosis does not distinguish medically serious suicide attempters from other less lethal attempters. What was surprising in this

study was that Depressive Disorders and comorbid Disruptive or Substance Abuse Disorders were not found to be a unique predictor of suicide attempt lethality.

This lack of support for this hypothesis contrasts previous research that suggests adolescents with either or both of these comorbidity patterns are more likely to have lethal attempts than those without (Brent, 1987; Nasser & Overholser, 1999; Portzky et al., 2005). Possible reasons for this contrast in findings could be related to the differences in methodology and population among the studies. Of all the studies that assessed for suicide attempt lethality, the only one to use the LSARS was the Nasser and Overholser (1999) study. However, due to inadequate numbers this study had to separate out adolescents with suicide attempts of low ( $N = 20$ ), medium ( $N = 20$ ), and high ( $N = 20$ ) lethality. Thus, they were only able to use bivariate analyses because the size of lethality groups was too small to conduct regression analyses. The study by Portzky and colleagues (2005) was an autopsy study ( $N = 19$ ) of small sample size that had no comparison group. While the Brent (1987) study ( $N = 131$ ) was a chart review, it was conducted 20 years ago, and the exact age of the child and adolescent subjects was unclear. This study used the Risk Rescue Rating (RR) to measure suicide attempt lethality, and combined depression and bipolar together under the broader category of mood disorder, which also may explain some of the differences in results.

The lack of significant findings for attempters with depressive disorders in this study suggests the importance of screening for symptoms other than depression in suicide prevention practices. Many adolescent suicide prevention programs focus on the identification of depressive symptoms as the key to assessing suicide risk. This is a fallacy, as depression alone does not predict which suicidal adolescents make lethal

suicide attempts (Wetzler et al., 1996), suggesting that there are other risk factors that distinguish suicide completers from attempters. Suicide prevention programs that focus on the identification of depressive symptoms tend to overlook impulsivity and substance use as major contributing factors to lethal suicide attempts, and therefore may be missing a critical piece of the suicide risk assessment process.

*Bipolar Disorders.* Only 5% of the sample in this study had a Bipolar Disorder diagnosis, but when combined with Mood Disorder NOS, the total increased to just over one-fifth of the sample (N = 87). Bivariate analysis showed attempters with comorbidity patterns of Bipolar or Mood Disorder NOS and Substance Abuse alone and Bipolar or Mood Disorder NOS and Disruptive and Substance Abuse had suicide attempts of higher lethality than attempters without those comorbidity patterns. However, OLS regression showed no significant relationship between attempters with Bipolar or Mood Disorder NOS and Disruptive or Substance Abuse Disorders and suicide attempt lethality.

The bivariate findings are supported by prior research by Beautrais (2003) which found child, adolescent, and young adult suicide completers to be significantly more likely to have a diagnosis of bipolar disorder than attempters. However, these findings contrast those of Nasser and Overholser (1999) which found no significant differences in the medical lethality of suicide attempts of adolescents with bipolar disorders when compared to those with depressive disorders. The lack of multivariate findings in this study could be related to the relatively small N of Bipolar and Mood Disorder NOS attempters used in OLS regression analysis. It is also possible that combining these two diagnoses into the same category had an impact on the findings.

The bivariate results in this study have important implications for practice and future research with suicidal adolescents, as they suggest attempters with Bipolar or Mood Disorder NOS and either Substance Abuse alone or Substance Abuse and Disruptive Disorders are at greater risk for lethal suicide attempts when compared to attempters without those comorbidity patterns. This finding suggests the importance of the role of impulsivity as a risk factor for medically serious suicide attempts. Many adolescent suicide attempts are unplanned and made impulsively (Brown et al., 1991), and the inability to control aggressive impulses may even be a greater indicator of risk for impulsive suicide attempts than depression (Simon et al., 2001). Because bipolar disorders have an impulsive characteristic distinct from depressive disorders (APA, 2000), it is critical that practitioners take into account the role of impulsivity in assessing for adolescent suicide risk. These findings further suggest the need for depressive and bipolar disorders to be considered separately in future adolescent suicide research, due to the inherent differences in symptomatology and varying implications with respect to risk factors. These differences will be important to investigate in future studies as the knowledge base surrounding bipolar disorder is still underdeveloped and little is known about its relationship with adolescent suicidal behavior (Goldstein et al., 2005).

*Disruptive Disorders.* Just over one-third of the sample had a Disruptive Disorder (N = 135). Depressive and Disruptive Disorder comorbidity did not demonstrate a significant relationship with lethality in either bivariate or multivariate analysis. However, when Disruptive Disorders were combined with Bipolar or Mood Disorder NOS and Substance Abuse, there was a significant positive relationship with lethality when compared to attempters without this comorbidity pattern in bivariate analysis only.

These results differ from the findings of the Nasser and Overholser (1999) study, which found comorbid depression and ADHD to be the only comorbidity pattern predictive of suicide attempts of high lethality.

These contrasting findings from previous research warrant future study on comorbidity patterns with mood and disruptive disorders, and suggest that risk factors for lethal suicide attempts may differ depending on the specific typologies of mood and disruptive disorders that the adolescent carries as a diagnosis. These results also reinforce the need for structured diagnostic interviews to be used in research on the relationship between psychopathology and suicide attempt lethality. Some of the symptoms of disruptive and bipolar disorders are similar (APA, 2000), especially with respect to the impulsivity component of the disorders. Therefore, future research using structured interviews to determine specific diagnostic criteria will be critical to enhancing our understanding of the role of psychopathology and comorbidity patterns in adolescent suicide risk assessment.

*Substance Abuse Disorders.* Slightly less than one-third of the sample had a Substance Abuse Disorder (N = 106), which was always comorbid with at least one other psychiatric diagnosis. In both bivariate and multivariate analysis, investigating psychopathology without comorbidity patterns revealed that adolescents with a Substance Abuse Disorder made suicide attempts of higher lethality than attempters without the diagnosis. This finding adds to the knowledge base surrounding the relationship between adolescent substance abuse and suicide attempts (Epstein & Spirito, 2009; Kelly, Cornelius, & Lynch, 2002; Wu et al., 2004) and suicide completion (Fleischmann et al., 2005; Renaud et al., 2008). In an older study by Brent, Perper, and Allman (1987) it was

estimated that nearly 50% of adolescent suicide completers may have been intoxicated at the time of their death. This study further supports this link and in doing so continues to raise concern about substance abuse as a critical risk factor for suicide in adolescents.

Although research on the impact of psychopathological comorbidity with substance abuse on adolescent suicide attempt lethality is sparse, prior studies do show a positive relationship between comorbid substance abuse and mood disorders and lethal suicide attempts (Brent, 1987) and suicide completion (Portzky et al., 2005). When comorbidity was taken into account in this study, having both a Bipolar or Mood Disorder NOS diagnosis and a Substance Abuse Disorder was predictive of adolescent suicide attempts of higher lethality. Interestingly, this relationship was not found for comorbidity with a Depressive Disorder. This finding suggests that adolescents with a mood disorder with impulsive characteristics that have a comorbid substance abuse diagnosis may be at particularly high risk for a lethal suicide attempt when compared to suicidal adolescents with other diagnoses, and has important implications for suicide prevention practices. Because this is an especially dangerous psychopathological combination for the suicidal adolescent, it is critical that suicide prevention screening programs assess for the presence of this specific comorbidity pattern. The combination of the impulsivity inherent in certain mood disorders such as bipolar, and the impaired judgment caused by substance use, may amplify the risk for lethal suicide attempts in adolescents. Assessing for this psychopathological profile in suicide risk screening tools will help to advance adolescent suicide prevention practices.

## **Lethality and Other Risk Factors**

*Lethality and gender.* In this study, more females (N = 290) than males (N = 85) attempted suicide over a five year period. The average mean for suicide attempt lethality was greater for males ( $\bar{x} = 3.04$ ) than females ( $\bar{x} = 2.83$ ) by a small amount, but this difference was not significant. The frequency findings support prior epidemiological research which show that female adolescents attempt suicide more frequently than males (CDC, 2007), but the bivariate findings do not support prior research which suggests that suicide attempts of male adolescents are more likely to be fatal than those of females (CDC, 2007). In light of recent statistics demonstrating an increase lethal suicide attempt methods by females of hanging, suffocation, and poisoning (CDC, 2007), this study posited that the more violent means of suicide attempts historically adopted by males and the more passive means of self-destruction utilized by females (Portes et al., 2002) may be changing. Therefore, the gap in lethality of adolescent male and female suicide attempts would not be as large. Bivariate findings of this study supported this proposition, as there was no significant relationship between gender and suicide attempt lethality. However, in OLS regression, male gender was found to have a positive relationship with suicide attempt lethality at trend level ( $\beta = 0.53$ ;  $p = .09$ ) in the model testing the comorbidity pattern of Depressive and Disruptive or Substance Abuse Disorders. Additionally, for the older age group regression model, male gender had a significant positive relationship with suicide attempt lethality ( $\beta = 1.06$ ;  $p = 0.02$ ). This finding supports prior research that male adolescents are more likely than females to make lethal suicide attempts (CDC, 2007), and adds knowledge that being an older adolescent male may have an even greater impact on suicide attempt lethality than for



younger adolescent males, suggesting that gender differences may emerge later in adolescence.

When comorbidity regression models were run separately for each gender for the subset of attempters with Depressive Disorders, no significant relationships with lethality were found for either the female or male group. When interaction terms were made between gender and the comorbidity variable, assessment of coefficients showed that females without comorbidity had significantly lower lethality than males ( $\beta = -0.87$ ;  $p = 0.03$ ). This finding suggests the impact of the comorbid mood and disruptive or substance abuse disorders on suicide attempt lethality does not differ by gender. While this specific relationship has not been investigated in prior studies, this finding is somewhat surprising in light of previous research suggesting that the presence of comorbidity has a larger impact on adolescent females than males with respect to the risk for suicide attempts (Brezo et al., 2007; Kelly et al., 2001; Wannan & Fombonne, 1998).

Because disruptive and substance abuse disorders are more frequently identified in males than females (APA, 2000), it was speculated that because the risk factor of substance abuse and disruptive behaviors are not gender-normative for females, these comorbidity patterns would be indicative of more lethal suicide attempts in this population. Prior research has indicated support for this hypothesis, as Brezo and colleagues (2007) found psychiatric comorbidity to have a significant effect on suicide attempts for females but not for males, and Kelly et al. (2001) found female adolescents with comorbid alcohol use and conduct disorders to be three times more likely to have attempted suicide than those with only one of those diagnoses. In further contrast to the findings of this study, Wannan and Fombonne (1998) found depression to have

significant interaction effects with substance abuse and conduct disorders for females only. One potential explanation for this result is that risk factors that are more prevalent in a particular gender group may actually be more likely to emerge as a pathway to lethal suicide attempts for that gender.

*Lethality and age.* Frequencies of suicide attempts by age group were almost equal in this study, as the younger groups accounted for 49% (N = 183) while the older group accounted for 51% (N = 192) of total attempts. Due to the differences in cognitive capacities between younger and older adolescents, this study posited that younger adolescents are at greater risk than older adolescents for making a suicide attempt of high lethality that is unintentional. Findings of this study did not support this hypothesis, and demonstrated no age group effects on suicide attempt lethality. While this finding is not necessarily surprising, it does contrast the results of a study by Nruham, Larsson, and Sund (2008) which found that having a depressive disorder predicts suicidal acts for older but not younger adolescents, suggesting that for younger adolescents there may be a profile of psychopathology other than depression that puts them at greater risk for a suicide attempt. These contrasting results may be partially explained by the lack of specificity of the suicide attempt definition in the Nruham et al. (2008) study, making it difficult to compare the two studies. The lack of support for the age group hypothesis in this study suggests the need to learn more about how developmental issues can impact the lethality of adolescent suicide attempts, and to determine if there are any other developmental factors aside from biological age that play a role in this relationship.

*Lethality and race.* Caucasian/White was the predominant race group represented in the sample (N = 250), followed by Hispanic/Latino (N = 56), African-American/Black

( $N = 36$ ), and Other ( $N = 33$ ). Results from this study showed trend level differences in lethality between the African-American/Black and Caucasian/White groups, with African-American/Blacks having lower lethality than Caucasian/Whites ( $F_{(df=5)} = 3.54$ ;  $p = 0.06$ ). In OLS regression, African-American/Black race had a significant negative relationship with lethality in all psychopathology models tested ( $\beta = -0.52$ ;  $p = .03$ ) when compared to Caucasian/White race. Post-hoc tests for race demonstrated one trend level significant group difference between the African-American/Black and Other race groups ( $F = 3.04$ ;  $p = 0.07$  for Model 1) in all models, with African-American/Blacks having significantly lower lethality than those in the Other race group.

Overall, these findings suggest that being African-American/Black may be a protective factor for lethal suicide attempts in adolescents. There is no prior research that examines the relationship between race and adolescent suicide attempt lethality. However, prior research is inconclusive surrounding race differences in rates of suicide attempts and completion. Data over the years show that African-American/Black adolescents have lower rates of suicide completion than Caucasian/White adolescents (Wagner, 2009), but higher rates of suicide attempts than their Caucasian/White adolescent counterparts (CDC, 2007). The results of this study appear to support prior research, as the lethality of suicide attempts by African-American/Black adolescents were significantly lower than that of other races, except Hispanic/Latino.

One possible explanation for the lower rates of highly lethal suicide attempts and suicide completion by African-American/Blacks may be their potential differences from other races in their cultural beliefs surrounding suicide. A recent study by Richardson-Vejlgaard and colleagues (2009) on mood disordered Blacks, Whites, and Hispanics

found that Blacks reported the least accepting attitudes toward suicide. This lack of suicide acceptance may be related to the finding of Walker, Lester, and Joe (2006) that Blacks are more likely to report the belief that God is responsible for life. It can additionally be related to Maris' (1969) statement that Blacks have typically coped with strain by turning to family, church, and community supports. Knowing this we can postulate that being African-American/Black may be a protective factor for lethal suicide attempts in the adolescent population, but further research is needed to support this notion and to investigate the cultural processes surrounding this finding. Further research in this area would be valuable as it can have important implications for the development of culturally appropriate interventions with suicidal adolescents.

### **Implications**

The findings of this study have important implications for adolescent suicide prevention programs, treatment of suicidal adolescents, and policies affecting adolescents at risk for suicide. Results suggest that improvements in the assessment and treatment of substance abuse in suicidal adolescents can play a critical role in decreasing the adolescent suicide rates. Substance abuse, when comorbid with any other disorder, was the only psychopathological predictor of adolescent suicide attempt lethality in this study. When comorbid with bipolar or mood disorder NOS, substance abuse had a significant positive relationship with lethality in bivariate analyses, demonstrating the importance of identifying and treating substance abuse in suicidal adolescents. In order to further develop prevention and treatment strategies with this population, policies must be initiated that will support their advancement.

*Suicide prevention.* The findings of this study have important implications for suicide prevention practices. Depression alone was not found to be a significant predictor of suicide attempt lethality in this study, suggesting that screening for symptoms other than depression is critical to effective suicide prevention in the adolescent population. As other studies have suggested, a comprehensive suicide prevention strategy with youth should target mental health concerns as a whole, not just depression alone (Fleischmann et al., 2005). Because substance abuse is a critical indicator of suicide attempt lethality, substance use should be routinely assessed in suicide screening tools, and should be viewed as an important factor when determining suicide risk.

Similarly, study results demonstrate the need for advancement of suicide risk assessments for adolescents that are receiving substance abuse treatment. Depressive symptoms may often be overlooked when treating a substance abusing adolescent, as the use of substances can often mask the symptoms. Additionally, adolescents withdrawing from substances may be at heightened risk for suicide, even those without a comorbid mood disorder diagnosis. This implication extends to suicide risk assessment strategies in juvenile detention facilities, as many adolescents in those institutions have significant substance abuse issues. The assessment and treatment of comorbid mood disorders are often overlooked in such facilities, leaving a potentially high-risk population in danger of making unpredicted lethal suicide attempts.

*Treatment.* The findings of this study also have important implications for the treatment of suicidal adolescents with comorbid substance abuse disorders. Primarily, the results suggest the need for further development and implementation of dual diagnosis (comorbid psychiatric and substance abuse disorders) treatment strategies with

this population. While many dual diagnosis treatment programs exist for adults, for adolescents they are sparse. Part of the reason for this is that suicidal adolescents with comorbid substance abuse problems can be especially challenging for clinicians because of their multiple treatment needs (Goldston, Curry, Wells, & Roley, 2011). There is often debate about which disorder to treat first with adolescents with comorbid mood and substance abuse disorders (Hawkins, 2009). Adolescent substance abuse treatment research emphasizes the importance of implementing integrated services (Esposito-Smythers & Goldston, 2008; Hawkins, 2009) rather than conducting serial or parallel treatment for comorbid substance abuse and psychiatric disorders (Hawkins, 2009). The findings of this study emphasize the importance of ending the historical separation of the fields of mental health and substance abuse, and suggest that in adolescents with such comorbidity patterns, both disorders should be treated as primary (Hawkins, 2009).

*Policy.* This study also has important implications for policies affecting the suicidal adolescent. Overall, the findings of this study support others that suggest the need to promote parity for mental health and substance abuse services and advocate for government funding of mental health services (Hawkins, 2009). Current service systems are generally inadequately prepared to meet adolescent substance abuse treatment needs because of multiple clinical, administrative, financial, and policy barriers (Hawkins, 2009), and because the average cost of treating youth with comorbid disorders is more than double what it costs to treat an adolescent with just one disorder (King, Gaines, Lambert, Summerfelt, & Bickman, 2000). Findings from this study suggest the need for the development of more cost-effective treatment techniques for suicidal adolescents with comorbid substance abuse issues. As suggested by Hawkins (2009), creative and flexible

financing strategies need to be implemented to overcome these obstacles in order to support the development of integrated treatment systems. Policies in support of prevention strategies and treatment programs for this population are necessary to make these advancements.

### **Limitations**

There are some methodological limitations in this study, suggesting a cautious interpretation of the results. Specifically, there were some issues with measurement that are important to address. First, it was not possible to use structured interviews to determine psychiatric diagnoses. Instead, diagnoses had already been made by CHB psychiatric clinicians following interviews with the patient, family members, and other collateral contacts. Even though this study was able to account for documented histories of disruptive and substance abuse disorders in an effort to correct for comorbid diagnoses being under-recognized (Nasser & Overholser, 1999), the lack of structured interviews to determine diagnoses contributed to a level of subjectivity in the measurement of psychopathology variables in this study. The second measurement limitation relates to the LSARS-II. It is unclear if the LSARS-II has been tested for cross-cultural equivalence or requires updates to include more scenarios with adolescents. Therefore, it would be helpful to test the measure with focus groups of clinicians that work with suicidal adolescents to determine if further revisions are necessary.

This study had one limitation with respect to the sample; there were 13 repeat attempters. These 13 repeat attempters were not dropped from the study because the psychopathological profile of attempters can look different across time and because it could not be determined if any of the other attempters in the study had multiple suicide

attempts which were previously treated at different hospitals. Another limitation was that the subset of attempters with Bipolar or Mood Disorder NOS was not large enough to examine gender differences. This was unfortunate as bivariate tests demonstrated a significant relationship between these comorbidity patterns and suicide attempt lethality. Similarly, while bivariate tests investigated race differences in lethality, analyses were still somewhat limited as the sample size for all races other than Caucasian/White was not large enough to make more advanced multivariate statistical comparisons with respect to psychopathological comorbidity. An additional limitation was that SES could not be collected in this study. Finally, it was not possible to examine other psychosocial risk factors for suicide attempts of high lethality and suicide completion in adolescents such as precipitating events (Beautrais, 2003), prior suicidal acts (Renaud et al., 2008), and suicidal intent (Nasser & Overholser, 1999), therefore limiting the explanatory power of the regression models in this study.

### **Future Research**

The findings from this study have some important implications for future research with adolescent suicide attempters. First, depressive and bipolar disorders should not be combined into the same mood disorder category, due to the inherent differences in symptomatology and varying implications with respect to risk factors for suicide. Many prior studies on adolescent suicide attempts have excluded subjects with bipolar diagnoses either because they were examining comorbidity with depression alone or because the sample size of bipolar subjects was not large enough to draw conclusions about the population. By ignoring this difference in construct we are missing important



knowledge about the interplay between specific psychopathological and demographic risk factors in predicting the lethality of adolescent suicide attempts.

Future studies on adolescent suicide attempters should use structured diagnostic interviews to measure psychopathology variables, as determining diagnostic criteria can be subjective unless an instrument with good psychometric properties is used. Similarly, it is important that future studies use instruments that measure the nature of the substance abuse and the types of substances used, to see if they have differing effects on suicide attempt lethality, as prior studies have shown some substances to be more predictive of attempted suicide than others (Kelly et al., 2002). For instance, alcohol is a very concerning substance of abuse in the adolescent population with respect to its relationship with suicide attempts. Possible reasons for this are that alcohol can be disinhibiting and can lead to more impulsive suicide attempts, and many adolescents attempt suicide after consuming alcohol as a way to cope with a stressful life event. Additionally, alcohol is the least expensive and most easily accessible substance, often making it the substance of choice among adolescents. Therefore, it would be beneficial for future studies to specifically examine alcohol abuse diagnoses, in comparison to other substance abuse diagnoses, as a predictor of suicide attempt lethality in the adolescent population.

Because the results of this study suggest that adolescents with a substance abuse diagnosis may be at greatest risk for lethal suicide attempts, research involving the development of treatment strategies should focus on this subset of the adolescent population (Esposito-Smythers & Goldston, 2008). Despite the strong association between adolescent substance use and suicidal behaviors, few studies have investigated the effectiveness of combined treatment of these two problems (Conason, Oquendo, &

Sher, 2006). While it is argued that integrated treatment strategies for this population are critical, research in this area is lacking (Goldston et al., 2011). Especially little is known about treatment for adolescents with comorbid bipolar and substance abuse disorders. Because the diagnosis of bipolar disorder typically precedes substance use among youth, there may be a window of opportunity for screening and prevention of substance use with this population (Goldstein & Bukstein, 2010).

It is also recommended that future studies on adolescent suicide attempters follow youth longitudinally, to determine if the lethality of attempts change over time. Unfortunately, this study did not have enough repeat attempters to examine these patterns. It would also be helpful in future studies to examine substance use longitudinally, and to determine the temporal relationship between suicidal ideation, suicide attempts, and substance abuse in the adolescent population. Additionally, in order to generate a more explanatory model of adolescent suicidal behavior, it will be critical that future research investigates the influence of other psychosocial factors.

Findings of this study suggest the importance of future research on the role gender differences in adolescent suicidal behaviors. While a significant relationship between Depressive Disorder comorbidity patterns and suicide attempt lethality did not emerge for females in this study, it is important to recognize that the subset of attempters with Bipolar or Mood Disorder NOS was not large enough to make gender comparisons. Because Bipolar or Mood Disorder NOS comorbidity patterns did demonstrate a significant positive relationship with lethality in the bivariate analysis of this study, we can postulate that having this type of comorbidity pattern may have a positive

relationship with lethality for females. However, more research needs to be done with larger sample sizes to garner support for this proposition.

It is additionally critical to recognize that much of the prior research in this area was conducted over 10 years ago, and it is likely that in the past 10 years there have been significant shifts in gender-normative behaviors. Therefore, the lack of significant findings with respect to comorbidity with Depressive Disorders in females in this study may be better understood in the changing socio-behavioral context of the past decade. Further research needs to be conducted to determine if this emerges as a more consistent gender pattern among adolescent suicide attempters. Similarly, it is recommended that whenever possible, sample sizes need to be large enough to compare results across race groups so that we can better understand if certain races serve as risk of protective factors for medically serious suicide attempts.

## CHAPTER V

### Summary

#### Purpose and Aims

The primary aim of this study was to determine if various typologies of psychiatric diagnoses and patterns of comorbidity are differentially related to the medical lethality of adolescent suicide attempts. The secondary aim was to determine if the relationship between psychopathological comorbidity and suicide attempt lethality is significantly different across gender, age, and race in the adolescent population. Specific hypotheses and findings included:

H1: Adolescents diagnosed with a Depressive Disorder do not make suicide attempts of higher lethality than adolescents without a Depressive Disorder.

Independent *t*-tests and OLS regression showed no significant relationship between Depressive Disorders and suicide attempt lethality. *Hypothesis supported.*

H2: Adolescents diagnosed with a Disruptive Disorder do not make suicide attempts of higher lethality than adolescents without a Disruptive Disorder.

Independent *t*-tests and OLS regression showed no significant relationship between Disruptive Disorders and suicide attempt lethality. *Hypothesis supported.*

H3: Adolescents diagnosed with a Substance Abuse Disorder make suicide attempts of higher lethality than adolescents without a Substance Abuse Disorder.

Independent *t*-tests showed adolescent suicide attempters with a Substance Abuse diagnosis had higher lethality scores than attempters without the diagnosis ( $\bar{x} = 3.22$ ;  $t_{(df=373)} = -2.65$ ;  $p = 0.008$ ). OLS regression showed that adolescent suicide attempters

with a Substance Abuse diagnosis had higher lethality scores ( $\beta = 0.42$ ;  $p = .02$ ) than the rest of the sample. *Hypothesis supported.*

H4: Adolescents diagnosed with a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, make suicide attempts of higher lethality than adolescents with a Depressive Disorder alone.

Bivariate analysis and OLS regression demonstrated no significant relationships between attempters with a Depressive and Disruptive or Substance Abuse Disorders and suicide attempt lethality. *Hypothesis not supported.*

H5: Adolescents diagnosed with a Disruptive or Substance Abuse Disorder, in addition to Bipolar or Mood Disorder NOS, make suicide attempts of higher lethality than adolescents with Bipolar or Mood Disorder NOS alone.

Bivariate analyses showed attempters with comorbidity patterns of Bipolar or Mood Disorder NOS and Substance Abuse ( $\bar{x} = 3.37$ ;  $t_{(df=373)} = -2.14$ ;  $p = 0.03$ ) and Bipolar or Mood Disorder NOS and Disruptive and Substance Abuse ( $\bar{x} = 3.46$ ;  $t_{(df=373)} = -2.16$ ;  $p = 0.03$ ) had suicide attempts of higher lethality than those without those comorbidity patterns. OLS regression showed no significant relationships between attempters with Bipolar or Mood Disorder NOS and Disruptive or Substance Abuse Disorders and suicide attempt lethality. *Hypothesis supported by bivariate analysis; hypothesis not supported by multivariate analysis.*

H6: Having a diagnosis of a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, has a stronger effect on suicide attempt lethality for adolescent females than adolescent males.

When comorbidity regression models were run separately for each gender for the subset of attempters with Depressive Disorders, no significant relationships with lethality were found for either the female or male group. When interaction terms were made between gender and the comorbidity variable, assessment of coefficients showed that females without comorbidity had significantly lower lethality than males ( $\beta = -0.87$ ;  $p = 0.03$ ). *Hypothesis not supported.*

H7: Having a diagnosis of a Disruptive or Substance Abuse Disorder, in addition to a Depressive Disorder, has a stronger effect on suicide attempt lethality for younger adolescents than older adolescents.

OLS regression showed no significant differences in the relationship between comorbidity and suicide attempt lethality either within or between groups of younger and older adolescents. *Hypothesis not supported.*

Race was also investigated for a potential relationship with suicide attempt lethality. *African-American/Black race had a significant negative relationship with lethality in all psychopathology models tested compared to Caucasian/White and Other race.*

## **Methodology**

Psychiatric evaluations were reviewed for all adolescents that presented to Children's Hospital Boston (CHB) from 2006 to 2010 for a suicide attempt (N = 375). The Lethality of Suicide Attempt Rating Scale II (LSARS-II) was used to measure the dependent variable of lethality (Berman, Shepherd, & Silverman, 2003).

Psychopathological comorbidity was measured using *DSM-IV-TR* diagnoses from the psychiatric evaluations. The first step of the data analysis process included a descriptive

analysis of each of the variables via frequency distributions. Second, bivariate tests were used to determine if statistically significant relationships existed between each of the independent variables and the dependent variable of suicide attempt lethality. Third, OLS regression was used to determine the percent of variance in the dependent variable explained by the independent variables and to rank the relative importance of the independents. Additionally, moderating effects were examined by creating interaction terms for gender and psychopathological comorbidity, as well as age group and psychopathological comorbidity.

## **Results**

Bivariate results showed that attempters diagnosed with a Substance Abuse Disorder had higher levels of suicide attempt lethality than those without the diagnosis. Additionally, having Bipolar or Mood Disorder NOS in combination with either Substance Abuse alone or Substance Abuse and Disruptive Disorders had a significant positive relationship with suicide attempt lethality when compared to attempters without those comorbidity patterns. In OLS regression, Substance Abuse was the only significant diagnostic predictor of lethality, and no psychopathological comorbidity patterns were predictive of lethality. Male gender was found to have a positive relationship with suicide attempt lethality at trend level in the model testing the comorbidity pattern of Depressive and Disruptive or Substance Abuse Disorders. Additionally, for the older age group regression model, male gender had a significant positive relationship with suicide attempt lethality. When comorbidity regression models were run separately for each gender for the subset of attempters with Depressive Disorders, no significant relationships with lethality were found for either the female or male group. When

interactions terms were made between gender and the comorbidity variable, assessment of coefficients showed that females without comorbidity had significantly lower lethality than males. OLS regression showed no significant differences in the relationship between comorbidity and suicide attempt lethality either within or between groups of younger and older adolescents. ANOVA postestimation showed trend level differences between the African-American/Black and Caucasian/White groups, with African-American/Blacks having lower lethality than Caucasian/Whites. In OLS regression, African-American/Black race had a significant negative relationship with lethality in all psychopathology models tested when compared to Caucasian/White race. Post-hoc tests for race demonstrated one trend level significant group difference between the African-American/Black and Other race groups in all models, with African-American/Blacks having significantly lower lethality than those in the Other race group.

### **Implications**

While having a Depressive Disorder was the most common psychopathological characteristic of this sample, this diagnosis alone did not predict suicide attempt lethality in either bivariate or multivariate analysis, suggesting that having a Depressive Disorder alone does not distinguish medically serious suicide attempters from other less lethal attempters. However, having a Substance Abuse Disorder was a unique psychopathological predictor of adolescent suicide attempt lethality, suggesting the importance of the identification and treatment of substance abuse in suicidal adolescents. Additionally, having Bipolar or Mood Disorder NOS in combination with either Substance Abuse alone or Substance Abuse and Disruptive Disorders had a significant positive relationship with suicide attempt lethality when compared to attempters without



those comorbidity patterns, demonstrating the critical role of impulsivity as a risk factor for medically serious suicide attempts.

The findings of this study have important implications for adolescent suicide prevention programs, treatment of suicidal adolescents, and policies affecting adolescents at risk for suicide. Results suggest that improvements in the assessment and treatment of substance abuse in suicidal adolescents can play a critical role in decreasing the adolescent suicide rates. Substance abuse disorder was the only unique psychopathological predictor of adolescent suicide attempt lethality in this study, and its comorbidity with bipolar or mood disorder NOS had a significant positive relationship with lethality in bivariate analyses, demonstrating the importance of identifying and treating substance abuse in suicidal adolescents, especially those with an impulsive type of mood disorder. In order to further develop prevention and treatment strategies with this population, policies must be initiated that will support their advancement.

Future research with suicidal adolescents needs to focus on the development of effective treatment strategies with suicidal adolescent substance abusers, and aim for a better understanding of suicidal behaviors of adolescents with comorbid bipolar and substance abuse diagnoses. For future studies of this nature to be effective, mood and substance abuse disorders should be broken down into specific typologies. Gender and race differences must also be investigated whenever possible in future research with adolescent suicide attempters.

In sum, the findings of this study demonstrate the importance of substance abuse as a risk factor for lethal adolescent suicide attempts. Future practice, policy, and research efforts with suicidal adolescents should aim to improve the assessment and

treatment of comorbid substance abuse in suicidal adolescents. By doing so, important steps can be taken towards decreasing the adolescent suicide rate.

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## APPENDIX A

Lethality of Suicide Attempt Rating Scale-Updated. Adapted from Berman, Shepherd, & Silverman (2003) and Smith, Conroy, & Ehler (1984).

Definition of Scale Points:

### 0.0 DEATH IS AN IMPOSSIBLE RESULT OF THE "SUICIDAL" BEHAVIOR.

*Cutting:* Light scratches that do not break the skin: usually done with pop can "pull tabs," broken plastic, pins, paper clips; reopening old wounds also is included at this level. Wounds requiring sutures must be rated at higher level.

*Ingestion:* This includes mild overdoses and the swallowing of objects such as money, paper clips, and disposable thermometers. Examples: Ten or fewer ASA, Tylenol®, "cold pills," laxatives, or other over-the-counter drugs; mild doses of tranquilizers or prescribed medications (usually fewer than 10 pills). Putting broken glass into one's mouth but not swallowing would be rated in this category.

*Other:* Clearly ineffective acts which are usually shown by the patient to staff or others (e.g., going outside in cold weather with only a nightgown on after telling parents she was going to commit suicide by "freezing myself to death").

### 1.0 DEATH IS VERY HIGHLY IMPROBABLE. IF IT OCCURS IT WOULD BE A RESULT OF A SECONDARY COMPLICATION, AN ACCIDENT, OR HIGHLY UNUSUAL CIRCUMSTANCES.

*Cutting:* Shallow cuts without tendon, nerve, or vessel damage. These wounds may require some minor suturing. Cutting is often done with something sharp such as a razor. Very little blood loss. Scratches (as opposed to cuts) to the neck are first rated in this category.

*Ingestion:* Relatively mild overdoses or swallowing of non-sharp glass or ceramics, events usually brought by the parents to staff attention. Examples: Twenty or fewer ASA, laxatives, and/or over-the-counter drugs; mild doses of tranquilizers or prescribed medications (e.g., 15 or fewer Tylenol®). Small doses of potentially lethal medications.

*Other:* Tying a thread, string, or yarn around neck and then showing it to staff.

### 2.0 DEATH IS IMPROBABLE AS AN OUTCOME OF THE ACT: IF IT OCCURS IT IS PROBABLY DUE TO UNFORESEEN SECONDARY EFFECTS. FREQUENTLY THE ACT IS DONE IN A PUBLIC SETTING OR IS REPORTED BY THE PERSON OR BY OTHERS. WHILE MEDICAL AID MAY BE WARRANTED, IT IS NOT REQUIRED FOR SURVIVAL.

*Cutting:* May receive but does not usually *require* medical intervention to survive. Examples: Relatively superficial cuts with a sharp instrument that may involve slight tendon damage. Cuts to the arms, legs, and wrists will require suturing. Cuts to the side of the neck are first rated in this category and should not require suturing.

*Ingestion:* May receive but does not usually *require* medical intervention to survive. Examples: Thirty or fewer ASA and/or over-the-counter pills; fewer than 100 laxatives, 25 or fewer Tylenol®; drinking of toxic liquids (12 ounces or less), shampoo or astringent, lighter fluid or other petroleum-based product (less than 2 ounces). Small doses of potentially lethal medications, greater quantities might be taken when staff is notified within minutes by the

patient. 14 or fewer Lithium carbonate tablets. Patient may swallow small quantities of cleaning compounds or fluids such as Comet® (less than 4 tablespoons).

*Other:* Non-lethal usually impulsive and ineffective methods. Examples: Inhaling deodorant without respiratory distress occurring, swallowing several pieces of sharp glass, evidence of failed attempt to choke self with a pillowcase (e.g., rash-type abrasions).

**3.5 DEATH IS IMPROBABLE SO LONG AS FIRST AID IS ADMINISTERED BY A VICTIM OR OTHER AGENT. VICTIM USUALLY MAKES A COMMUNICATION OR COMMITS THE ACT IN A PUBLIC WAY OR TAKES NO MEASURES TO HIDE SELF OR INJURY.**

*Cutting:* Deep cuts involving tendon damage (or severing) and possible nerve, vessel, and artery damage; cuts to the neck will require sutures but no major vessels were severed. Blood loss is generally less than 100cc. Cuts to neck go beyond scratching but do not actually sever main veins or arteries.

*Ingestion:* This is a significant overdose. Examples: Sixty or fewer ASA and/or over-the-counter pills; over 100 laxatives, 50 or fewer Tylenol®. Potentially lethal overdoses (e.g., 60 Dilantin plus half a fifth of rum) but done in such a way as to ensure intervention (e.g., in front of nursing staff, telling someone within one hour). Signs of psychological distress may be present such as nausea, elevated blood pressure, respiratory changes, convulsions, and altered consciousness stopping short of a coma. Lighter fluid (3 or more ounces); 15-20 Lithium carbonate tablets.

*Other:* Possibly serious actions that are quickly brought by the patient to staff's attention (e.g., tied a shoelace tightly around neck but came to staff immediately).

**5.0 DEATH IS A FIFTY-FIFTY PROBABILITY DIRECTLY OR INDIRECTLY, OR IN THE OPINION OF THE AVERAGE PERSON, THE CHOSEN METHOD HAS AN EQUIVOCAL OUTCOME. USE THIS RATING ONLY WHEN: 1)DETAILS ARE VAGUE; 2)A CASE CANNOT BE MADE FOR RATING EITHER A 3.5 OR 7.0.**

*Cutting:* Severe cutting resulting in sizeable blood loss (more than 100cc) with some chance of death. Cutting may be accompanied by alcohol or drugs, which may cloud the issue.

*Ingestion:* Reports of vague but possibly significant quantities of lethal medications. Unknown quantities of drugs that are lethal in small dosages also belong here. Examples: Took 60 ASA and an undetermined amount of other medications.

*Other:* Potentially lethal acts. Examples: Trying to put two bare wires into an electrical outlet with a nurse present in the room; jumping headfirst from a car driven by staff going 30 miles an hour; unscrewing a light bulb in the lounge and putting finger in socket with patients around.

**7.0 DEATH IS THE PROBABLE OUTCOME UNLESS THERE IS "IMMEDIATE" AND "VIGOROUS" FIRST AID OR MEDICAL ATTENTION BY VICTIM OR OTHER AGENT. ONE OR BOTH OF THE FOLLOWING ARE ALSO TRUE: 1)MAKES COMMUNICATION (DIRECTLY OR INDIRECTLY); 2)PERFORMS ACT IN PUBLIC WHERE HE IS LIKELY TO BE HELPED OR DISCOVERED.**

*Cutting:* Cuts are severe. Examples: Eloping and "slashing neck with razor" (including severing jugular) but returning to hospital on own and asking for help; while alone cut head with shard of glass and "almost bled to death" – called doctor after cutting. Eloping and very severely cutting self in a public restroom or motel – cuts led to hemorrhagic shock with vascular collapse – patient makes direct request for help after cutting.

*Ingestion:* Potentially lethal medications and quantities. This would involve a dose which, without medical intervention, would kill most people. Examples: Eloping and ingesting approximately 2 bottles of ASA and then returning to the hospital; 50 Extra-Strength of Tylenol®, eloping to motel and ingesting large quantities of Inderal, Dalmane, Mellaril, and three quarters of a fifth of bourbon, then making indirect communication of distress; took 23 100mg tablets of Phenobarbital but told roommate immediately who told staff; 16-18 capsules of Nembutal – left note with friend who missed the note resulting in the patient almost dying.

*Other:* Lethal actions performed in a way that maximizes chances of intervention. Examples: Tied towel tightly around neck – airway cut off – tried to untie it but passed out on floor – found cyanotic and in respiratory arrest – had seen staff making rounds before attempt; string wrapped several times around neck and tied to bed – face flushed when found.

8.0 DEATH WOULD ORDINARILY BE CONSIDERED THE OUTCOME TO THE SUICIDAL ACT, UNLESS SAVED BY ANOTHER AGENT IN A “CALCULATED” RISK (e.g., NURSING ROUNDS OR EXPECTING A ROOMMATE OR SPOUSE AT A CERTAIN TIME). ONE OR BOTH OF THE FOLLOWING ARE TRUE: 1)MAKES NO DIRECT COMMUNICATION; 2)TAKES ACTION IN PRIVATE.

*Cutting:* Severe gashes with major and quick blood loss. May be partially hidden from staff, spouse, or friends. Examples: Patient went into bathroom of his room, left the door open and severely cut one wrist resulting in major blood loss; death would have occurred had he not been found 30 minutes later by nursing staff on rounds.

*Ingestion:* Clearly lethal doses and no communication is made. Examples: Taking a lethal overdose of barbituates but vomiting before going into a coma; overdosed on 900mg Stelazine in apartment alone; overdosed on Phenobarbital plus alcohol, found comatose in her bed. Took 20 Tuinal and became very sleepy while visiting friends – the friends became suspicious and took her to emergency room – in coma for 36 hours; took 15 Tuinal – found unconscious at home in tub of warm water.

*Other:* Most common here are hangings and suffocations which may or may not succeed but are performed so that a calculated chance of intervention could interrupt. Examples: Tying belt very tightly around neck and strangling self in shower; tied shoelace lightly around neck and going to bed – found at rounds to be cyanotic; blocked airways with plastic and had tied a stocking tightly around neck – found on top of bed gurgling and pale but not cyanotic; elopes and attempts to drown self in nearby pond but in broad daylight; jumps in front of fast-moving car (over 30 mph); plastic bag over head – found deeply cyanotic; played Russian roulette and drew a “pass.”

9.0 DEATH IS A HIGHLY PROBABLE OUTCOME; “CHANCE” INTERVENTION AND/OR UNFORESEEN CIRCUMSTANCES MAY SAVE VICTIM. TWO OF THE FOLLOWING CONDITIONS ALSO EXIST: 1) NO COMMUNICATION IS MADE; 2)EFFORT IS PUT FORTH TO OBSCURE ACT FROM HELPERS’ ATTENTION; 3)PRECAUTIONS AGAINST BEING FOUND ARE INSTUITUTED (e.g., ELOPING).

*Cutting:* Severe, usually multiple cuts involving severe blood loss. Examples: Severely cutting arm with razor and bleeding into wastebasket then got into bed (it was bedtime so being in bed did not arouse suspicion) – found unconscious and in shock; savagely biting a 2 cm piece of skin out of wrist, losing 4 pints of blood and found in shock under bed covers; cut neck in arts and crafts bathroom (when shop was closed) with three-inch blade, found unconscious; severely cut throat with broken bottle in unit shower – this was done when most patients were away from the unit – difficulty breathing when found; cut neck and wrist in bathtub at home – died by drowning – had “hoped” husband would happen by to discover.

*Ingestion:* Clearly lethal doses. Examples: Drinking several ounces of nail polish remover – found covered in bed gagging, pale with large amount of foaming exudate coming from mouth – mildly comatose; took 30 500mg Doriden tablets right before bedtime – in bed, appeared to be asleep but was actually unconscious in a deep coma.

*Other:* Highly lethal means employed. Examples: Plastic bag tied tightly over head with a scarf – found unconscious with head in toilet; drove head on into a gasoline truck but survived with minor scratches and bruises; stuffed plastic in both nostrils and oral pharynx, completely closing airways – she appeared to be sleeping in bed under covers; eloped to another city in car, tied plastic hose to exhaust and suffocated in parking lot; hanged self in closet with door closed – not breathing when cut down’ jumped from 90 foot bridge into water – was unconscious when found. Gunshot to chest area (if shotgun used, rate 10.0); jumped headfirst from three-story building.

10.0 DEATH IS ALMOST A CERTAINTY REGARDLESS OF THE CIRCUMSTANCES OR INTERVENTIONS BY AN OUTSIDE AGENT. MOST OF THE PEOPLE AT THIS LEVEL DIE QUICKLY AFTER THE ATTEMPT. A VERY FEW SURVIVE THROUGH NO FAULT OF THEIR OWN.

*Cutting:* Just cuts as severe as 9.0, except that the likelihood for intervention is even more remote. Blood loss is severe and quick. Examples: Eloping to empty house and severely cutting wrists and neck with razor – when a policeman happened by the patient was sitting in a large pool of blood, warded off the policeman with the razor.

*Ingestion:* Because of the time usually involved before a toxin can take effect there are very few instances of overdosing that can be considered this serious. Examples: Ingesting furniture polish, paint thinner, and many prescription medications while alone in the house with no one expected by; overdose on large quantities of Dalmane and barbituates with husband out of town and no children or other live-in companions in the household; ingested 60 Nembutal, went into secluded, wooded area in mid-winter, covered self with leaves which caused him not to be found for several days.

*Other:* These are the most common types of attempts at this level. Examples: Jumping off a tall building (four or more floors); jumping in front of cars on a freeway and being hit; eloping and hanging self in gym locker building at night; secretly eloping and drowning self in lake at a time when there was no activity in lake area and when he would not be expected to be on the unit; gunshot to the head and any effort involving a shotgun.

Scoring codes: Number of tablets or ounces required to produce life threatening effects for medications. Nonmedicinal chemicals will be based on signal word from labels for pesticides and household products.

	Med amounts	Signal word	
I	<10	Danger	<50mg/kg
II	10 to 20	Warning	50-250mg/kg
III	21 to 30	Warning	251-500mg/kg
IV	31 to 60	Caution	501-2500mg/kg
V	61 to 100	Caution	2501-5000mg/kg
VI	>100	None	>5000mg/kg

Substance by generic or chemical name	How Supplied (>102)	Patient Weight in Pounds (KG)					
		100 (45)	125 (57)	150 (68)	185 (84)	225 (102)	>225
<b>Medicinal Agents</b>							
Acetaminophen	325mg Tablet	III	IV	IV	IV	V	V
	500mg Tablet	II	III	III	IV	IV	IV
Acyclovir	200mg Tablet	VI	VI	VI	VI	VI	VI
	400mg Tablet	VI	VI	VI	VI	VI	VI
Albuterol	800mg Tablet	VI	VI	VI	VI	VI	VI
	2mg Tablet	VI	VI	VI	VI	VI	VI
	4mg Tablet	VI	VI	VI	VI	VI	VI
Alendronate	12mg/oz Syrup	VI	VI	VI	VI	VI	VI
	5mg Tablet	VI	VI	VI	VI	VI	VI
	10mg Tablet	VI	VI	VI	VI	VI	VI
	40 mg Tablet	VI	VI	VI	VI	VI	VI
Allopurinol	70mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
	300mg Tablet	V	VI	VI	VI	VI	VI
Alprazolam	Various	V	VI	VI	VI	VI	VI
Amitriptyline	10mg Tablet	V	VI	VI	VI	VI	VI
	25mg Tablet	IV	IV	IV	V	V	V
	50mg Tablet	II	III	III	IV	IV	IV
	75mg Tablet	II	II	II	III	III	III
	100mg Tablet	I	II	II	II	II	III
Amlodipine	150mg Tablet	I	I	I	II	II	II
	2.5mg Tablet	VI	VI	VI	VI	VI	VI
	5mg Tablet	VI	VI	VI	VI	VI	VI
Amoxicillin (Penicillins)	10mg Tablet	VI	VI	VI	VI	VI	VI
	Various	VI	VI	VI	VI	VI	VI



		Patient Weight in Pounds (KG)					
Substance by generic or chemical name	How Supplied (>102)	100 (45)	125 (57)	150 (68)	185 (84)	225 (102)	>225
Amphetamine Salts*	5mg Tablet	II	II	II	III	III	III
	10mg Tablet	I	I	I	II	II	II
	20mg Tablet	I	I	I	I	I	I
	30mg Tablet	I	I	I	I	I	I
Aspirin	325mg Tablet	IV	IV	V	V	VI	VI
	650mg Tablet	III	IV	IV	IV	V	V
Atenolol	25mg Tablet	VI	VI	VI	VI	VI	VI
	50mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
Azithromycin	250mg Capsule	VI	VI	VI	VI	VI	VI
	1g Oral Susp.	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
Benzonatate	75mg Tablet	IV	IV	IV	IV	V	V
Bupropion HCL	100mg Tablet	III	III	IV	IV	IV	IV
	150mg Tablet	II	II	III	III	IV	IV
	5mg Tablet	VI	VI	VI	VI	VI	VI
Buspirone	10mg Tablet	VI	VI	VI	VI	VI	VI
	15mg Tablet	VI	VI	VI	VI	VI	VI
	5mg Tablet	VI	VI	VI	VI	VI	VI
Caffeine	Anacin (32mg)	VI	VI	VI	VI	VI	VI
	Excedrin (64mg)	VI	VI	VI	VI	VI	VI
	NoDoz (100mg)	V	V	VI	VI	VI	VI
	Vivarin (200mg)	IV	IV	IV	V	V	V
Captopril (ACE inhibitors)	12.5mg Tablet	VI	VI	VI	VI	VI	VI
	25mg Tablet	VI	VI	VI	VI	VI	VI
	50mg Tablet	VI	VI	VI	VI	VI	VI
Carbamazepine	100mg Tablet	IV	IV	V	V	V	VI
	200mg Tablet	III	IV	IV	V	V	V
Carisoprodol	350mg Tablet	III	IV	IV	IV	V	V
Celecoxib	100mg Tablet	VI	VI	VI	VI	VI	VI
	200mg Tablet	V	V	VI	VI	VI	VI
Cephalexin (cephalosporins)	Various	VI	VI	VI	VI	VI	VI
Cetirizine	5mg Tablet	VI	VI	VI	VI	VI	VI
	10mg Tablet	VI	VI	VI	VI	VI	VI
Chlorpheniramine	4mg Tablet	V	V	VI	VI	VI	VI
	8mg Tablet	V	V	V	V	V	VI
	12mg Tablet	IV	IV	IV	IV	V	V
Cimetidine (H2 antagonists)	100mg Tablet	VI	VI	VI	VI	VI	VI
	200mg Tablet	VI	VI	VI	VI	VI	VI
	300mg Tablet	VI	VI	VI	VI	VI	VI
	400mg Tablet	VI	VI	VI	VI	VI	VI
	800mg Tablet	VI	VI	VI	VI	VI	VI
Ciprofloxacin (flouroquinolones)	300mg/5ml syp	V (65 oz)	V (82 oz)	V (98 oz)	VI	VI	VI
	250mg Tablet	VI	VI	VI	VI	VI	VI
	500mg Tablet	VI	VI	VI	VI	VI	VI
	750mg Tablet	VI	VI	VI	VI	VI	VI
Citalopram	20mg Tablet	VI	VI	VI	VI	VI	VI
	40mg Tablet	V	V	V	VI	VI	VI
	10mg/5mL soln	IV	IV	V	V	VI	VI

		Patient Weight in Pounds (KG)					
Substance by generic or chemical name	How Supplied (>102)	100 (45)	125 (57)	150 (68)	185 (84)	225 (102)	>225
Clarithromycin	250mg Tablet	VI	VI	VI	VI	VI	VI
	500mg Tablet	VI	VI	VI	VI	VI	VI
	125mg/15mL	V	V	VI	VI	VI	VI
	250mg/5mL	IV	IV	IV	V	V	V
Clindamycin	75mg Capsule	VI	VI	VI	VI	VI	VI
	150mg Capsule	VI	VI	VI	VI	VI	VI
	300mg Capsule	V	VI	VI	VI	VI	VI
Clonidine	0.1mg Tablet	IV	IV	V	V	V	V
	0.2mg Tablet	III	III	III	IV	IV	IV
	0.3mg Tablet	III	III	III	III	IV	IV
Clozapine	25mg Tablet	V	V	VI	VI	VI	VI
	100mg Tablet	III	IV	IV	IV	V	V
Colchicine	0.5mg Tablet	I	II	II	II	II	III
	1.0mg Tablet	I	I	II	II	II	II
Cocaine*	200mg Dose	I	I	I	I	II	II
Cyclobenzaprine	10mg Tablet	VI	VI	VI	VI	VI	VI
Dextromethorphan	10mg/5mL syp	II	II	III	III	III	III
	15mg/5mL syp	II	II	II	II	III	III
	10mg Tablet	IV	IV	V	V	V	V
	30mg Tablet	III	III	III	IV	IV	IV
	15mg Capsule	III	IV	IV	IV	V	V
Diazepam (and other benzodiazepins)	Various	V	VI	VI	VI	VI	VI
Diclofenac	25mg Tablet	VI	VI	VI	VI	VI	VI
	50mg Tablet	IV	V	V	V	VI	VI
	75mg Tablet	IV	IV	IV	V	V	V
Digoxin	0.125mg Tablet	V	VI	VI	VI	VI	VI
	0.25mg Tablet	IV	V	V	VI	VI	VI
	0.5mg Tablet	VI	VI	VI	VI	VI	VI
Diltiazem	60mg Tablet	IV	V	V	VI	VI	VI
	90mg Tablet	IV	IV	IV	V	V	V
	120mg Tablet	III	IV	IV	IV	V	V
	180mg Tablet	II	III	III	IV	IV	IV
	240mg Tablet	II	II	III	III	IV	IV
	300mg Tablet	II	II	II	III	III	III
Diphenhydramine	25mg Tab/Caps	IV	IV	V	V	V	V
	50mg Tab/Caps	III	III	IV	IV	IV	IV
	12.5mg/5mL	II	II	III	III	III	IV
Doxazosin	1mg Tablet	VI	VI	VI	VI	VI	VI
	2mg Tablet	V	V	VI	VI	VI	VI
	4mg Tablet	IV	V	V	V	V	V
	8mg Tablet	IV	IV	V	V	V	V
Doxepin	10mg Capsule	VI	VI	VI	VI	VI	VI
	25mg Capsule	V	VI	VI	VI	VI	VI
	50mg Capsule	III	IV	V	V	VI	F
	75mg Capsule	III	III	IV	IV	V	V
	100mg Capsule	III	III	III	III	IV	IV
	150mg Capsule	II	II	III	III	IV	IV
Doxycycline	50mg Tab/Caps	VI	VI	VI	VI	VI	VI
	100mg Tab/Caps	VI	VI	VI	VI	VI	VI

		Patient Weight in Pounds (KG)					
Substance by generic		100	125	150	185	225	
or chemical name	How Supplied	>225	(57)	(68)	(84)	(102)	
	(>102)	(45)					
	25mg/5mL syp	VI	VI	VI	VI	VI	VI
	50mg/5mL syp	VI	VI	VI	VI	VI	VI
Ephedrine	25mg Tablet	II	III	III	III	III	III
	50mg Tablet	II	II	II	III	III	III
Erythromycin	250mg Tablet	VI	VI	VI	VI	VI	VI
	333mg Tablet	VI	VI	VI	VI	VI	VI
	400mg Tablet	VI	VI	VI	VI	VI	VI
	500mg Tablet	V	VI	VI	VI	VI	VI
Estrogens/Birth control	Tablets	VI	VI	VI	VI	VI	VI
Felodipine	5mg Tablet	VI	VI	VI	VI	VI	VI
	10mg Tablet	VI	VI	VI	VI	VI	VI
Fexofenadine	60mg Tablet	VI	VI	VI	VI	VI	VI
Fluconazole	50mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
	200mg Tablet	V	VI	VI	VI	VI	VI
Flunitrazepam	Various	V	V	V	VI	VI	VI
Fluoxetine	10mg Tablet	VI	VI	VI	VI	VI	VI
	20mg Tablet	V	V	V	V	VI	VI
Fluvastatin	20mg Tablet	VI	VI	VI	VI	VI	VI
	40mg Tablet	VI	VI	VI	VI	VI	VI
Folic Acid	0.1mg Tablet	VI	VI	VI	VI	VI	VI
	0.4mg Tablet	VI	VI	VI	VI	VI	VI
	0.8mg Tablet	VI	VI	VI	VI	VI	VI
	1mg Tablet	VI	VI	VI	VI	VI	VI
Fosinopril	10mg Tablet	VI	VI	VI	VI	VI	VI
	20mg Tablet	VI	VI	VI	VI	VI	VI
Furosemide	20mg Tablet	VI	VI	VI	VI	VI	VI
	40mg Tablet	VI	VI	VI	VI	VI	VI
	80mg Tablet	VI	VI	VI	VI	VI	VI
Gabapentin* **	100mg Capsule	VI	VI	VI	VI	VI	VI
	300mg Capsule	VI	VI	VI	VI	VI	VI
	400mg Capsule	VI	VI	VI	VI	VI	VI
Gemfibrozil	300mg Capsule	VI	VI	VI	VI	VI	VI
	600mg Tablet	VI	VI	VI	VI	VI	VI
GHB*	30mg Dose	V	V	VI	VI	VI	VI
Glimepiride	1mg Tablet	III	III	III	III	III	III
	2mg Tablet	II	III	III	III	III	III
	4mg Tablet	II	II	III	III	III	III
Glipizide	5mg Tablet	II	III	III	III	III	III
	10mg Tablet	II	II	III	III	III	III
Glyburide	1.25mg Tab	II	III	III	III	III	III
	2.5mg Tablet	II	II	III	III	III	III
	5mg Tablet	II	II	II	III	III	III
Hydrochlorothiazide	25mg Tablet	VI	VI	VI	VI	VI	VI
	50mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
Hydroxyzine	10mg Tablet	VI	VI	VI	VI	VI	VI
	25mg Tablet	V	V	V	VI	VI	VI
	50mg Tablet	V	V	V	V	V	V

## Patient Weight in Pounds (KG)

Substance by generic or chemical name	How Supplied (>102)	100 (45)	125 (57)	150 (68)	185 (84)	225 (102)	>225
Hyoscyamine	100mg Tablet	IV	IV	IV	IV	IV	IV
	10mg/5mL syp	V	V	V	V	V	V
	0.125mg Tab	VI	VI	VI	VI	VI	VI
	0.15mg Tablet	VI	VI	VI	VI	VI	VI
	0.375mg Tab	V	V	V	V	VI	VI
Ibuprofen	200mg Tablet	V	V	VI	VI	VI	VI
	300mg Tablet	IV	V	V	V	VI	VI
	400mg Tablet	IV	IV	IV	V	V	V
	600mg Tablet	III	IV	IV	IV	IV	V
	800mg Tablet	III	III	III	IV	IV	IV
Iron (elemental)	65mg Tablet	V	V	V	V	VI	VI
Isosorbide Mononitrate S.A.	10mg Tablet	V	VI	VI	VI	VI	VI
	20mg Tablet	IV	IV	V	V	V	VI
	30mg Tablet	III	IV	IV	IV	V	V
	60mg Tablet	III	III	III	III	IV	IV
	120mg Tablet	II	II	II	II	II	II
Levothyroxine	0.025mg Tablet	VI	VI	VI	VI	VI	VI
	0.05mg Tablet	VI	VI	VI	VI	VI	VI
	0.1mg Tablet	VI	VI	VI	VI	VI	VI
	0.15mg Tablet	VI	VI	VI	VI	VI	VI
	0.2mg Tablet	VI	VI	VI	VI	VI	VI
	0.3mg Tablet	VI	VI	VI	VI	VI	VI
	0.5mg Tablet	V	V	VI	VI	VI	VI
Lithium	300mg caps/tab	III	III	III	IV	IV	IV
	450mg Capsule	III	III	III	III	IV	IV
Loratadine	10mg Tablet	VI	VI	VI	VI	VI	VI
Lorazepam	0.5mg Tablet	VI	VI	VI	VI	VI	VI
	1mg Tablet	VI	VI	VI	VI	VI	VI
	2mg Tablet	VI	VI	VI	VI	VI	VI
Losartan (Angiotensin II blockers)	2mg/mL soln.	VI	VI	VI	VI	VI	VI
	25mg Tablet	VI	VI	VI	VI	VI	VI
Lovastatin (HMG-CoA inhibitors)	50mg Tablet	VI	VI	VI	VI	VI	VI
	10mg Tablet	VI	VI	VI	VI	VI	VI
LSD	20mg Tablet	VI	VI	VI	VI	VI	VI
	40mg Tablet	VI	VI	VI	VI	VI	VI
	0.6mg Blotter	VI	VI	VI	VI	VI	VI
MDMA-Ecstasy	,100mg dose	I	I	II	II	II	II
Meclizine	12.5mg Tablet	IV	V	V	V	V	V
	25mg Tab/Caps	IV	IV	IV	IV	IV	IV
	50mg Tablet	III	III	IV	IV	IV	IV
	100mg Tablet	III	III	III	III	III	IV
Metformin	50mg/5mL syp	II	II	II	II	III	III
	500mg Tablet	V	V	VI	VI	VI	VI
	850mg Tablet	V	V	V	V	VI	VI
Methadone*	5mg Tablet	III	III	III	III	III	III
	100mg Tablet	I	I	I	I	I	I
	5mg/5mL soln.	II	II	II	II	II	II
Methocarbamol**	500mg Tablet	V	V	V	V	V	V
	750mg Tablet	V	V	V	V	V	V

		Patient Weight in Pounds (KG)					
Substance by generic or chemical name	How Supplied (>102)	100 >225 (45)	125 (57)	150 (68)	185 (84)	225 (102)	
Methylphenidate	5mg Tablet	IV	IV	V	V	V	V
	10mg Tablet	III	III	IV	IV	IV	IV
	20mg Tablet	II	II	II	III	III	III
Methylprednisolone	4mg Tablet	VI	VI	VI	VI	VI	VI
	10mg Tablet	VI	VI	VI	VI	VI	VI
	5mg/5mL syp	VI	VI	VI	VI	VI	VI
Metoprolol	50mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
Metronidazole	250mg Tablet	IV	IV	IV	V	V	V
	500mg Tablet	II	III	III	IV	IV	IV
Minocycline	50mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
	50mg/5mL susp	VI	VI	VI	VI	VI	VI
Mirtazapine	15mg Tablet	VI	VI	VI	VI	VI	VI
	30mg Tablet	VI	VI	VI	VI	VI	VI
Montelukast	5mg Tablet	VI	VI	VI	VI	VI	VI
	10mg Tablet	VI	VI	VI	VI	VI	VI
Multivitamins (no Iron)	Tablets	VI	VI	VI	VI	VI	VI
Nabumetone	500mg Tablet	IV	IV	IV	IV	V	V
	750mg Tablet	III	III	IV	IV	IV	IV
Naproxen	200mg Tablet	VI	VI	VI	VI	VI	VI
	250mg Tablet	V	VI	VI	VI	VI	VI
	375mg Tablet	V	V	V	VI	VI	VI
	500mg Tablet	IV	IV	V	V	VI	VI
Nefazodone	100mg Tablet	V	V	V	VI	VI	VI
	150mg Tablet	IV	V	V	V	V	V
	200mg Tablet	IV	IV	V	V	V	V
	250mg Tablet	IV	IV	IV	IV	IV	IV
Nifedipine	10mg Capsule	III	III	IV	IV	IV	IV
	20mg Capsule	II	III	III	III	III	IV
	30mg SR Tablet	II	II	III	III	III	III
	60mg SR Tablet	II	II	II	III	III	III
	90mg SR Tablet	I	II	II	II	II	II
Nitrofurantoin	50mg Capsule	V	VI	VI	VI	VI	VI
	100mg Capsule	IV	IV	V	V	VI	VI
	25mg/5mL susp	IV	IV	IV	IV	V	V
Nitroglycerin	0.3mg sublingual	VI	VI	VI	VI	VI	VI
	0.4mg subling	VI	VI	VI	VI	VI	VI
	0.6mg subling	VI	VI	VI	VI	VI	VI
	2.5mg Capsule	VI	VI	VI	VI	VI	VI
	6.5mg Capsule	VI	VI	VI	VI	VI	VI
	9mg Capsule	VI	VI	VI	VI	VI	VI
	13mg Capsule	VI	VI	VI	VI	VI	VI
Nortriptyline	10mg Capsule	V	V	VI	VI	VI	VI
	25mg Capsule	IV	IV	IV	V	V	V
	50mg Capsule	II	III	III	IV	IV	IV
	75mg Capsule	I	II	II	III	III	III
Olanzapine	5mg Tablet	V	V	V	V	V	V
	7.5mg Tablet	V	V	V	V	V	V
	10mg Tablet	IV	IV	V	V	V	V

Substance by generic or chemical name	How Supplied (>102)	Patient Weight in Pounds (KG)					
		100 (45)	125 (57)	150 (68)	185 (84)	225 (102)	>225
Omeprazole (proton pump inhibitors)	20mg capsule	VI	VI	VI	VI	VI	VI
Oxycodone* **	5mg Tablet	II	III	III	III	III	III
	10mg Tablet	II	II	II	III	III	III
	20mg Tablet	II	II	II	II	II	II
	40mg Tablet	I	II	II	II	II	II
	80mg Tablet	I	I	I	II	II	II
Paroxetine	10mg Tablet	VI	VI	VI	VI	VI	VI
	20mg Tablet	V	VI	VI	VI	VI	VI
	30mg Tablet	V	V	V	V	V	V
	40mg Tablet	V	V	V	V	V	V
Phenazopyridine	100mg Tablet	V	V	V	V	V	V
	200mg Tablet	V	V	V	V	V	V
Phenelzine	15mg Tablet	I	II	II	II	II	III
Phenobarbital* **	8mg Tablet	V	V	V	V	V	V
	16mg tab/caps	III	IV	IV	IV	V	V
	32mg Tablet	II	II	II	III	III	III
	65mg Tablet	I	I	I	II	II	II
	100mg Tablet	I	I	I	I	I	I
Phenytoin	30mg Capsule	VI	VI	VI	VI	VI	VI
	50mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Capsule	V	V	VI	VI	VI	VI
	30mg/5mL syp	IV	IV	IV	V	V	V
Pioglitazone	15mg Tablet	V	V	V	V	V	V
	30mg Tablet	IV	IV	IV	IV	IV	IV
	45mg Tablet	IV	IV	IV	IV	IV	IV
Potassium Chloride	8mEq Capsule	III	III	IV	IV	IV	IV
	10mEq Capsule	II	III	III	IV	IV	IV
Promethazine	12.5mg Tablet	VI	VI	VI	VI	VI	VI
	25mg Tablet	VI	VI	VI	VI	VI	VI
	50mg Tablet	IV	V	V	V	VI	VI
	25mg/5mL syp	II	III	III	IV	IV	IV
Propoxyphene**	65mg	II	II	III	III	III	IV
Propranolol	10mg Tablet	V	V	V	V	V	V
	20mg Tablet	IV	V	V	V	V	V
	40mg Tablet	III	IV	IV	IV	IV	V
	60mg Tablet	II	III	III	IV	IV	IV
	80mg Tablet	II	II	II	III	III	D
	90mg Tablet	II	II	II	III	III	III
	120mg Capsule	I	II	II	II	II	III
	160mg Capsule	I	I	II	II	II	II
Pseudoephedrine	60mg Tablet	IV	IV	IV	IV	IV	IV
	120mg Capsule	III	III	III	III	III	IV
	240mg Capsule	II	II	II	II	II	III
	30mg/5mL syp	II	II	II	II	III	III
Quetiapine	25mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	V	V	V	VI	VI	VI
	200mg Tablet	IV	IV	IV	IV	V	V
Quinine	200mg Capsule	II	III	III	IV	IV	IV

		Patient Weight in Pounds (KG)					
Substance by generic or chemical name	How Supplied (>102)	100 (45)	125 (57)	150 (68)	185 (84)	225 (102)	>225
	260mg Tab/Caps	II	II	III	III	IV	
	325mg Capsule	II	II	II	II	III	III
Risperidone	0.25mg Tablet	V	VI	VI	VI	VI	VI
	0.5mg Tablet	V	V	VI	VI	VI	VI
	1mg Tablet	V	V	V	VI	VI	VI
	2mg Tablet	V	V	V	V	VI	VI
	3mg Tablet	V	V	V	V	V	VI
	4mg Tablet	IV	IV	V	V	V	V
Salmeterol	100mg Tablet	VI	VI	VI	VI	VI	VI
Sildenafil Citrate	25mg Tablet	VI	VI	VI	VI	VI	VI
	50mg Tablet	V	V	V	V	V	V
	100mg Tablet	V	V	V	V	V	V
Spironolactone	25mg Tablet	VI	VI	VI	VI	VI	VI
	50mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
Sumatriptan	25mg Tablet	IV	IV	IV	V	V	V
	50mg Tablet	V	V	V	V	V	V
Tamoxifen	10mg Tablet	V	V	V	V	V	V
	20mg Tablet	V	V	V	V	V	V
Terazosin (alpha 1 Blockers)	1mg Tab/Caps	VI	VI	VI	VI	VI	VI
	2mg Tab/Caps	VI	VI	VI	VI	VI	VI
	5mg Tab/Caps	V	V	VI	VI	VI	VI
	10mg Tab/Caps	V	V	V	V	VI	VI
Theophylline	100mg Tab/Caps	I	I	II	II	II	II
	200mg Tab/Caps	I	I	I	I	I	I
	250mg Tablet	I	I	I	I	I	I
	300mg Tablet	I	I	I	I	I	I
Tolterodine	1mg Tablet	VI	VI	VI	VI	VI	VI
	2mg Tablet	VI	VI	VI	VI	VI	VI
Tramadol	50mg Tablet	II	III	III	IV	IV	IV
Trazodone	50mg Tablet	VI	VI	VI	VI	VI	VI
	100mg Tablet	VI	VI	VI	VI	VI	VI
	150mg Tablet	VI	VI	VI	VI	VI	VI
	300mg Tablet	V	V	VI	VI	VI	VI
Triazolam	Various	V	V	VI	VI	VI	VI
Triamterene/HCTZ	Various	V	V	V	V	V	V
Trimeth/Sulfameth	Various	V	V	V	V	V	V
Valproic Acid	250mg Tab/Caps	V	V	VI	VI	VI	VI
	500mg Tablet	IV	IV	V	V	V	V
Venlafaxine	25mg Tablet	V	V	V	VI	VI	VI
	37.5mg Tablet	V	V	V	V	V	V
	50mg Tablet	V	V	V	V	V	V
	75mg Tablet	IV	IV	V	V	V	V
	100mg Tablet	IV	IV	IV	IV	IV	IV
Verapamil	40mg Tablet	IV	IV	IV	IV	IV	IV
	80mg Tablet	IV	IV	IV	IV	V	V
	120mg Tablet	III	III	IV	IV	IV	IV
	180mg Caplet	II	III	III	III	IV	IV
	240mg Caplet	II	II	II	III	III	III

## Patient Weight in Pounds (KG)

Substance by generic or chemical name	How Supplied (>102)	100 (45)	125 (57)	150 (68)	185 (84)	225 (102)	>225
Warfarin	1mg Tablet	VI	VI	VI	VI	VI	VI
	2mg Tablet	V	V	VI	VI	VI	VI
	2.5mg Tablet	V	V	V	V	V	V
	5mg Tablet	IV	V	V	VI	VI	V
	7.5mg Tablet	IV	IV	IV	IV	V	V
	10mg Tablet	III	III	III	IV	IV	IV
Zolpidem	5mg Tablet	VI	VI	VI	VI	VI	VI
	10mg Tablet	VI	VI	VI	VI	VI	VI

\*Patients with a history of abuse/chronic use will be able to tolerate higher doses

\*\*Co-ingestion of ethanol increases toxicity significantly

## Nonmedicinal chemicals

Acids (pH < 2)	Liquid/solid	I	I	I	I	I	I
Alkalines (pH > 12)	Liquid/solid	I	I	I	I	I	I
Arsenic (organic and inorganic)	Liquid/solid	I/II	I/II	I/II	I/II	I/II	I/II
Bleach (hypochlorite)	Liquid	IV	IV	IV	V	V	V
Cosmetics	Liquid/solid	VI	VI	VI	VI	VI	VI
Cyanide	Liquid/solid	I	I	I	I	I	I
Ethylene glycol	Liquid	I	I	I	I	I	I
Fertilizers	Liquid/solid	VI	VI	VI	VI	VI	VI
Gasoline	Liquid	III	III	III	III	III	IV
Herbicide, Chlorphenoxy	Liquid/solid	IV/III	IV/III	IV/III	IV/III	IV/III	
	IV/III						
Herbicide, Paraquat	Liquid	I	I	I	I	I	I
Hydrofluoric acid (>5%)	Liquid	I	I	I	I	I	I
Insecticides, Carbamates	Liquid/solid	I	I	I	I	I	I
Insecticides, Organophosphate	Liquid/solid	I	I	I	I	I	I
Insecticides, Pyrethrins	Liquid/solid	IV	IV	IV	IV	V	V
Mercury (elemental)	Liquid	III	III	III	III	IV/III	
	IV/III						
Mercury, Chloride (inorganic)	Liquid/solid	I	I	I	I	I	II
Mercury, Methyl (organic)	Liquid/solid	I	I	I	I	II	I
Methanol	Liquid	I	I	I	I	I	I
Mushroom, Amanita Sp.	Solid	I/II	I/II	I/II	I/II	I/II	I/II
Mushroom, Psilocybin	Solid	V	V	V	V	V	V
Mushroom, Other	Solid	III/IV	III/IV	III/IV	III/IV	III/IV	
	III/IV						
Rat poison (brodifacoum)	Solid Pellets	II	II	II	II	II	III
Silica Gel	Solid	VI	VI	VI	VI	VI	VI
Solvents	Liquid	II-IV	II-IV	II-IV	II-IV	II-IV	II-
	IV						
Strychnine	Liquid/solid	I	I	I	I	I	I



## APPENDIX B

### Data Entry Form

<i>Variable</i>	<i>Value</i>	<i>Level of Measurement</i>
Case ID		nominal (#001 to #362)
<i>Demographic variables:</i>		
Gender – Male, Female		nominal (Male=1, Female=0)
Race – Caucasian/White, African-American/Black, Hispanic/Latino, Asian, Other		nominal (Caucasian/White=1, African-American/Black=2, Hispanic/Latino=3, Asian=4, Biracial=5, Other=6)
Age – 13 years to 18 years		interval (13-18)
Age Group – Younger (13-15), Older (16-18)		nominal (Younger=1, Older=0)
<i>Psychopathology variables:</i>		
Depressive Disorder		dichotomous (Y=1, N=0)
Bipolar Disorder		dichotomous (Y=1, N=0)
Mood Disorder NOS		dichotomous (Y=1, N=0)
Disruptive Disorder		dichotomous (Y=1, N=0)
Substance Abuse Disorder		dichotomous (Y=1, N=0)
Anxiety Disorder		dichotomous (Y=1, N=0)
Other Disorder		dichotomous (Y=1, N=0)
<i>Diagnostic History variables:</i>		
Disruptive Disorder		dichotomous (Y=1, N=0)
Substance Abuse Disorder		dichotomous (Y=1, N=0)
<i>Method variable:</i>		
Suicide Attempt Method Used		nominal (ingestion/poisoning=1, cutting=2, suffocation=3, strangulation=4, jumping=5, hanging=6, firearm=7, swallowing of object=8, electrocution=9, drowning=10)
<i>Lethality variable:</i>		
LSARS-II Score		ratio (0.0-10.0)