Examining the Relationships Between Suicidal Ideation, Substance Use, Depressive Symptoms, and Educational Factors in Emerging Adulthood

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Abstract

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Suicide is the third leading cause of death in the United States in emerging adulthood (Centers for Disease Control and Prevention [CDC], 2012). Young people who die from suicide often show symptoms of other mental health problems, such as depression and substance abuse or dependence. Additionally, educational variables have emerged as promising risk factors for suicidal thoughts and behaviors. The present study builds on existing research by examining the impact of substance use variables, educational factors, and depressive symptoms on suicidal ideation in a community-based sample of young adults.

Secondary analysis was conducted using data from the Raising Healthy Children Project, a longitudinal study of students drawn from 10 public schools in a suburban Pacific Northwest school district. The current study utilized data from four time points during emerging adulthood (ages 19 to 23). Hierarchical linear modeling was used to analyze initial levels, change over time, and within-individual changes in suicidal ideation with respect to substance use, depressive

symptoms and numerous educational variables.

Results indicated that suicidal ideation decreased over time during the four time points. Chronic depressive symptoms predicted initial suicidal ideation levels and also predicted the trajectory of suicidal ideation over time. This suggests that higher depressive symptoms are related to a slower decline in suicidal ideation. In addition, the findings point to episodic associations between suicidal ideation and both substance use and depressive symptoms. Particularly, the results suggest that short-term increases in marijuana use, heavy drinking and depressive symptoms may signal episodic increases in suicidal ideation, and there were unique findings based on educational status. Findings also indicated that attending 4-year college was predictive of higher suicidal ideation compared to their non-college counterparts. Higher grades also emerged as a unique predictor of suicidal ideation among those in college.

The findings of the current study highlight the need for clinicians to look beyond the presence or absence of depressive symptoms and substance use when assessing suicidal ideation. Changes in individuals' depression and substance use may be important indicators of heightened risk of suicidal thoughts. In addition, educational variables may also play an important role in suicidal ideation in young adults.

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DEDICATION

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Chapter I: Introduction

Suicide is currently the third leading cause of death in the United States for people between the ages of 15 and 24 (Centers for Disease Control and Prevention [CDC], 2012). In some states such as Washington, suicide is the second leading cause of death for young people (Washington Youth Suicide Prevention Program, 2004). With so many teens and young adults affected, suicide is a problem in need of attention by researchers and clinicians. Examining predictors of suicidal behavior is vital in combating the crisis of suicide in young people.

A large body of research has examined risk factors related to suicidality in adolescents and young adults (Brent, Baugher, Bridge, Chen, & Chiappetta, 1999; Hallfors et al., 2004). Young people who think about, attempt, and die from suicide often show symptoms of other mental health problems, such as depression and substance abuse or dependence (Brent et al., 1999; Gould et al., 1998; Hallfors et al., 2004; Shaffer et al., 1996;). Depression is one of the strongest correlates of suicidal behavior, while misuse of drugs and alcohol have been also identified as risk factors (Brent et al., 1999; Gould et al., 1998; Shaffer et al., 1996).

In addition to psychopathology, educational variables have emerged as critical factors to consider in the development of suicidal thoughts and behaviors. Learning disabilities, dropping out of high school, and post-high school education status have each been linked to suicidality in young people (Bender, Rosenkrans, & Krane, 1999; Daniel et al., 2006; Gould et al., 1996; Hooven et al., 2012; Kessler et al., 1999; Lewinsohn et al., 1993; Huntington & Bender, 1993; Schwartz, 1990; Schwartz & Whitaker, 1990; Silverman, Meyer, Sloane, Raffel, & Pratt, 1997; Svetaz et al., 2000). Additionally, school failure and suicide share many common risk factors, including substance use, delinquency, and depression, and research suggests that environmental and social factors may play an important role in the relationship between education and suicide

(Brent et al., 1999; Garlow et al. 2007; Kandel, Raveis, & Davies, 1991; Langhinrichsen-Rohlin, Arata, Bowers, O'Brien, & Morgan, 2004; Lewinsohn et al., 1993; Mazza & Reynolds, 1998; Miller et al., 2007; Schaffer, Jeglic, & Stanley, 2008; Simons & Murphy, 1985; Swahn & Bossart, 2007; Shaffer et al., 1996).

In trying to understand the relationships between the various psychological (e.g., depression and substance use) and educational (e.g., school failure and learning disabilities) risk factors for suicide, there are several theoretical models presented in the literature that shed light into these complex relationships (Catalano & Hawkins, 1996; Joiner, 2005; Oxford, Harachi, Catalano, Haggerty, & Abbott, 2001; Van Orden et al., 2008). For example, both the Interpersonal Theory of Suicide and the Social Development Model provide unique theoretical underpinnings as well as empirical information regarding the development of problematic behavioral and emotional outcomes, including suicidal thoughts and behaviors, in young people (Catalano & Hawkins, 1996; Joiner, 2005; Oxford et al., 2001; Van Orden et al., 2008).

There is also a smaller body of literature examining suicidality over time during adolescence and emerging adulthood, and this research provides important insight into how suicidal thoughts and behaviors change during this important developmental time frame (Boeninger et al., 2010; Dugas et al., 2012; Lewinsohln et al., 2001; Mazza & Reynolds, 1998). In particular, several studies examining the developmental trajectories of suicidal ideation and behaviors have found gender differences in these trajectories (Boeninger et al., 2010; Lewinsohln et al., 2001). In addition, changes in psychological constructs, such as depression, have been found to be related to changes in suicidal ideation (Mazza & Reynolds, 1998). These studies highlight the importance of examining risk factors for suicidality over time to better inform our understanding of the development of suicidal ideation.

Despite the large amount of research on the topic of suicide and its risk factors, more research is warranted about how suicidal ideation changes over time during emerging adulthood and about the relationships between suicidal ideation and known risk factors such as depression, substance use, and educational variables during this developmental timeframe. Examining suicidal ideation and these risk factors over time may provide important information about normative developmental trends in suicidal ideation. Therefore, the aim of the proposed study is to examine the change in suicidal ideation over time during emerging adulthood in a large community-based sample. The study will examine how suicidal ideation changes during emerging adulthood and will also test the relationships between suicidal ideation and education status, cigarette smoking, marijuana use, heavy drinking, and depressive symptoms.

This dissertation will examine suicidal ideation in a longitudinal sample of young adults. Specifically, depressive symptoms, substance use (i.e., heavy drinking, marijuana use, and cigarette smoking), educational status (no college, 2-year college, 4-year college) and various educational factors (i.e., grades, educational bonding, educational aspiration, and number of months enrolled in school) will be examined in a cohort of young adults ages 19 to 23 years old. The dissertation begins with a review of the literature in the area of suicide including suicidal ideation, attempts, and deaths focusing on psychological and educational risk factors. Next, specific research questions and hypotheses are proposed, followed by the methods, statistical analyses, and results. The dissertation concludes with a discussion of the findings in the context of the literature, along with limitations to the study, and directions for future research.

Chapter II: Literature Review

Prevalence

Suicide is a serious public health problem. Every year nearly 1 million people die from suicide (World Health Organization [WHO], 2012). Suicide costs society approximately $34.6 billion a year in combined medical and work loss costs, which translates into an average cost of $1,061,170 for each death from suicide (CDC, 2012). Suicide rates have increased globally by 60% over the past 45 years and it has been estimated to represent 1.8% of the total burden of disease in 1998 (WHO). In the United States, suicide is the third leading cause of death in adolescents and emerging adults (CDC, 2012). According to the CDC, there were 4,688 deaths due to suicide in 2011 for those between the ages of 15 and 24 (CDC, 2012). Suicide incidence increases in the late teens and continues to rise until the early twenties (Anderson, 2002).

Suicidal ideation. Death from youth suicide is clearly an enormous concern; however, deaths due to suicide are only part of a larger problem (Mazza & Reynolds, 2008). Suicide is at the extreme end of the suicidal behavior continuum (Mazza & Eggert, 2001). The number of deaths due to suicide does not capture the far greater number of young people that contemplate and attempt suicide. Suicidal ideation is considered by some to be the first step toward suicide (Gili-Planas et al., 2001). Suicidal ideation ranges from thoughts that life is not worth living to intense, delusional preoccupation (Gili-Planas et al., 2001). In addition, it is one of the strongest predictors of a future suicide attempt in adolescents and is related to risk of suicide (Brent et al., 1993; Lewinsohn, Rohde, & Seeley, 1996; Reinherz et al., 1995). Therefore, it is important to examine the entire spectrum of suicidal thoughts and behaviors, as this can provide valuable information not only for understanding the development of suicidal behavior, but also for developing research-driven preventive programs and strategies.

National rates. The rates of youth and young adults who consider and attempt suicide are quite alarming (CDC, 2012). The CDC developed the Youth Risk Behavior Surveillance System to monitor health risk behaviors in young people across the United States. The Youth Risk Behavior Survey (YRBS) is administered biennially to a nationally representative sample of students in grades 9 through 12. For the 2011 national YRBS, 15,503 questionnaires were completed in 158 schools. Results of the 2011 survey indicate that 15.8% of youth reported seriously considered attempting suicide at some point during 2011. In addition, 12.8% made a plan about how they would attempt suicide, 7.8% attempted suicide, while 2.4% attempted suicide resulting in treatment by doctor or nurse (CDC, 2012).

Alarming rates of suicidal thoughts and behaviors are also present in young adults. The National College Health Assessment Survey conducted by Kisch, Leino, and Silverman (2005) examined depression, suicidal ideation and suicide attempts in 15,977 college students across the United States. Results of this survey estimated that 9.5% of college students seriously considered attempting suicide in the past year and 1.5% made an attempt.

Washington State rates. The Washington Youth Suicide Prevention Program (YSPP) is an organization dedicated to reducing suicide attempts and deaths among Washington State youth (YSPP, 2004). They reported that an average of two young people die due to suicide and another 14 youth make a suicide attempt resulting in hospitalization each week. On a survey of Washington middle and high school students, the Washington State Healthy Youth Survey, 1 out of 10 students indicated they had made a suicide attempt in the past 12 months. Additionally, 1 out of 5 indicated that they had seriously thought about attempting suicide, and 1 out of 6 sixth graders admitted to seriously considering suicide (YSPP, 2004). These results indicate higher

levels of suicidal ideation in young people in Washington State as compared to the national YRBS data (CDC, 2012).

The problem of suicide in adults locally is also of great concern, as the rates in Washington State have historically been higher than those reported nationally. According to a recent report from the CDC, Washington has one of the highest rates of suicidal thoughts in the country (CDC, 2011). This report indicated that the rate of suicide in Washington adults was 4.7%, which is higher than the national rate of 3.7%. The rates of seriously contemplating suicide was highest in young adults in Washington (6.2%) compared to those over 30 (4.2%) and compared to other young people across the U.S. (5.7%). Additionally, females appear to be particularly at risk in Washington State with a rate of 5.8% compared to the national average for females of 3.9% (CDC, 2011). As another example, Chelan county has had more suicides in 2011 and 2012 than in any previous year, and the county's suicide rate is nearly double the national average (Mehaffery, 2012; Robbins, 2012). Although caution with rural counties needs to be considered, nonetheless these numbers suggest that emerging adults in the state of Washington are at increased risk for suicidal behavior.

Impact of school attendance on rates. When examining data on the prevalence of suicidal ideation and behavior, it is important to recognize that data from sources, such as the YRBS and other school- and university-based surveying approaches may actually underestimate the extent of these thoughts and events among young people because these approaches only capture data from students attending school. Gould et al. (1996) completed a case-control study that examined the psychological autopsy of 120 adolescents and young adults who died due to suicide and compared them to 147 age-, sex- and ethnically-matched control group. Psychological autopsies involve interviewing the parents, siblings, and friends of the person who

died due to suicide in an effort to determine the person's psychological well-being prior to their death. Questions used in the psychological autopsy pertain to the circumstances of the suicide, stressors, and current and past psychopathology, with parents also providing information on family history of psychopathology and availability of firearms (Brent et al.,1999). One important finding from the Gould et al. (1996) study was that youth who died due to suicide were more likely to not be currently attending school than those in the control group. Similarly, results from the Big Ten Student Suicide Study (detailed results from this study are on page 27) demonstrated that the rate of death due to suicide on university campuses over the course of 10 years was approximately one half of the national computed suicide rate for young people (Silverman et al., 1997).

Because many of the studies examining suicide in young people comes from high school- and university-based surveys, it is important to be cautious when interpreting the findings to ensure the research is truly capturing the continuum of suicidal thoughts and behaviors and the true prevalence amongst all young people.

Demographic Risk Factors

Gender. In the United States, there are marked differences in suicide attempts and deaths between males and females; five times more 15- to 19-year old boys die from suicide than girls in the same age range (Anderson, 2002; CDC, 2012). Similarly, in young adults, males are more likely to die from suicide than are females (CDC, 2012). Though death due to suicide is more common among males, suicidal ideation and attempts are more common among females (CDC, 2011; Gould et al., 2003). The 2011 YRBS results indicated that girls were significantly more likely to have seriously considered attempting suicide than boys (19.3% versus 12.5 %)(CDC, 2011). Girls were also more likely than boys to have made a specific plan (15.0% versus 10.8%),

attempted suicide (9.8% versus 5.8%), and made medically serious attempts (2.9 % versus 1.9%). There are several reasons cited in the literature as contributing to these marked discrepancies. First, females tend to utilize methods in their suicide attempts that are typically less lethal whereas males tend to use more lethal methods (e.g., guns) (Brent et al., 1999; Gould et al., 2003). Second, death from suicide is often associated with aggressive behavior and substance abuse, which are both more common in young males (Gould et al., 2003).

Race and Ethnicity. Rates of suicide vary widely among individuals from different racial and ethnic groups (CDC, 2011). During 2005–2009, the highest suicide rates were among American Indian/Alaskan Native males with 27.61 suicides per 100,000 and Non-Hispanic White males with 25.96 suicides per 100,000. Of all female race/ethnicity groups, the American Indian/Alaskan Natives and Non-Hispanic Whites had the highest rates with 7.87 and 6.71 suicides per 100,000, respectively. The Asian/Pacific Islanders had the lowest suicide rates among males while the Non-Hispanic Blacks had the lowest suicide rate among females. Several reasons have been hypothesized for Native Americans historically higher rate of suicide, including a higher prevalence rate of owning firearms, high use of alcohol and drugs, and lack of social integration (Middlebrook, LeMaster, Beals, Novins, & Manson, 2001). Additionally, cultural protective factors, such as religiosity, family support, and community-held attitudes that suicide is unacceptable have been suggested as contributing to the historically lower levels of suicide in African Americans (Marion & Range, 2003; Neeleman, Wessely, & Lewis, 1998). In addition, African American youth report lower substance use disorders than other ethnic groups (Wu, Woody, Yang, Pan, & Blazer, 2011), which may contribute to their lower suicide rates.

Age. Data from the CDC (2012) indicates that suicide rates for females are highest among those aged 45-54, whereas for males they are highest among those aged 75 and older.

However, the prevalence of suicidal thoughts, planning and attempts is significantly higher among young adults aged 18-29 than among adults 30 years of age and older (CDC, 2012). Additionally, several longitudinal studies have examined the developmental trajectories of suicidal thoughts and behaviors during adolescents and emerging adulthood and found that there are differences in girls' and boys' trajectories. Specifically, results of these studies suggest that girls' are at the most risk for suicidal attempts during mid-adolescence, whereas boys' risk does not decline in the same way, and may continue to rise into early adulthood (Boeninger et al., 2010; Lewinsohln et al., 2001).

Socioeconomic status and other demographic variables. Socioeconomic status (SES) and other demographic variables are also related to suicidal thoughts and behaviors (Denney, Rogers, Krueger, & Wadsworth, 2009; Goodman, 1999). Goodman (1999) used data from the National Longitudinal Study of Adolescent Health to examine the relationship between SES using multiple predictors (i.e., parental income, parental education, and parental occupation) and adolescent health in 15,483 high school students. Findings indicated that parental education and occupation were not directly related to suicide attempt, though they were strongly related to depression. However, parental income was related to suicide attempt, with individuals from families with lower incomes reporting more suicide attempts.

In a prospective longitudinal study in a sample of 490,092 males and 565,851 females aged 18 and older, Denney et al. (2009) found that marital status and family size predicted risk of suicide. Specifically, compared to married individuals, those who were divorced or separated, those who never married, and those who were widowed had a significantly higher risk of suicide. Additionally, they found that larger family size was related to a reduced risk for suicide. They also found low levels of education and employment predicted individuals' risks of suicide.

However, income was not associated with the risk of suicide after adjusting for other markers of socioeconomic status. The authors suggested that although poverty may be important for predicting aggregate suicide rates, it may be less capable of predicting individuals' risks of suicide.

Psychological Risk Factors

It is generally agreed upon that suicidal behavior is multiply determined (Hendin et al., 2005). The literature on suicidal behavior is vast and many factors have been found to contribute risk for suicidal thoughts and behaviors (Hendin et al., 2005), including demographic characteristics (Denney et al., 2009; Goodman, 1999), hopelessness (Mazza & Reynolds, 1998), parental psychopathology (Brent et al., 1999), stressful life events (e.g., abuse and sexual abuse) (Brent et al., 1999; Fergusson, Horwood, & Lynskey, 1996; Johnson et al., 2002) and bullying (Klomek, Marrocco, Schonfeld, & Gould, 2006). However, there is overwhelming evidence that psychopathology is the strongest risk factor for suicide attempts and death (Brent et al., 1999; Shaffer et al., 1999).

In a well-cited examination of suicide risk factors in adolescents, Brent et al. (1999) employed a psychological autopsy protocol to compare 140 adolescent suicide victims with 131 community controls. Findings of this study showed that more than 90% of those youth who died due to suicide had at least one major psychiatric disorder defined by DSM-III criteria, the most common being mood disorders, substance abuse, and conduct disorder (Brent et al., 1999). In a similar study, Shaffer and colleagues compared 120 adolescent suicides under the age of 20 to 147 community-matched controls in New York, reported that having a DSM-III psychiatric disorder was the strongest risk factor for suicide (Shaffer et al., 1996). Specifically, Shaffer et al.

found that mood disorders were predictive of suicide for both genders, whereas substance abuse was only predictive of suicide in males.

The initial onset of psychopathology has been shown to precede the suicide by several years (Hendin et al., 2005; Shaffer et al., 1996). For example, Shaffer et al. (1996) found that symptoms of the youth's psychiatric diagnosis were present for more than three years prior to their suicide. Additionally, the risk of suicide has been shown to increase with the number of psychiatric diagnoses (Shaffer et al., 1996). It has been argued that the elimination of psychopathology could prevent 78%-87% of youth suicide (Gould et al., 2003).

Depression. Depression, one form of psychopathology, has been repeatedly shown to predict suicidal ideation, attempts and deaths (Brent et al., 1999; Garlow et al. 2007; Lewinsohn et al., 1993; Mazza & Reynolds, 1998; Shaffer et al., 1996). As mentioned previously, in psychological autopsy studies, depressive disorders are often present in young people who commit suicide (Brent et al., 1999; Shaffer et al., 1996). Additionally, both of these studies found mood disorders were more predictive of suicide in females than in males.

Lewinsohn and colleagues (1993) examined suicidal ideation and attempts in a large sample of 1,710 high school students. They found that depression was one of the strongest predictors of past and future suicide attempts. Similar results have been demonstrated in college samples. In a sample of 729 undergraduate college students at Emory University, students with suicidal ideation had significantly higher depression symptom severity based on DSM-IV criteria than those without suicidal ideation (Garlow et al., 2007). Additionally, in the study by Gould et al. (1998), the relationship between suicidal ideation, suicide attempts, and psychiatric disorders was examined in 1,285 randomly selected young people ages 9 to 17 years old. Results indicated that depressive disorders independently increased the risk of suicide attempts after controlling for

sociodemographic factors. Furthermore, they found that the rate of suicide attempts increased from 3.3% to 22% in the presence of major depression. Finally, Mazza and Reynolds (1998) examined suicidal ideation over a 1-year period in a sample of 374 high school students and found that changes in depression were related to changes in suicidal ideation for both males and females.

Depression as a mediator. Depression also has been found to fully and partially mediate the relationship between other common risk factors and suicidal ideation and behaviors (Lewinsohn et al., 1993). In the Lewinsohn et al. (1993) study of approximately 1,700 high school students, the authors reported that when depression was statistically controlled, other psychological variables, including hopelessness and low self-esteem, were no longer predictive of suicidal behavior.

Depression also has been found to mediate the relationship between negative life events and suicidal ideation (Dube et al., 2001; Konick & Gutierrez, 2005). In an examination of suicidal ideation in 345 undergraduate college students, Konick and Gutierrez (2005) found that the relationship between negative life events and suicidal ideation was fully mediated by depression. Similarly, Dube et al. (2001) conducted a retrospective study of over 17,000 adults who attended a primary care clinic in San Diego to examine childhood abuse, household dysfunction, suicide attempts, and other health related behaviors. They found that depression and substance abuse partially mediated the relationship between adverse childhood events (i.e., physical abuse, sexual abuse, domestic violence, household substance abuse, mental illness in the household, parental separation or divorce, incarcerated household members) and suicide attempts. They posited that children who experienced traumatic events are more likely to have problems with emotional and behavioral regulation later in life (Dube et al., 2001).

Finally, Thompson, Mazza, Herting, Randell, and Eggert (2005) explored the roles of anxiety, depression, and hopelessness as mediators between known risk factors and suicidal behaviors among 1,287 potential high school dropouts using structural equation modeling. Results indicated that depression and hopelessness had direct effects on suicidal behaviors for males. Hopelessness, but not depression, had direct effects on suicidal behaviors for females. As hypothesized, lack of family support showed indirect influences on suicidal behaviors through anxiety for both males and females and through depression for males. In addition, depression fully mediated the relationship between anxiety and suicidal behaviors in adolescent males, but not in females.

Complexity of depression and suicidality. It is clear that depression plays and important role in the development and maintenance of suicidal behaviors; however, the relationship between depression and suicide is complex (Arria et al., 2009; Cukrowicz, 2011; Levy & Deykin, 1989; Miranda et al., 2008). There is evidence indicating that depression does not differentiate between those who think about suicide and those who go on to make an attempt (Miranda et al., 2008). Two hundred twenty-eight teens who reported recent ideation or a lifetime suicide attempt in a screening of 1,729 high school students completed the Adolescent Suicide Interview, which provided information on attempt number and characteristics and mood, anxiety, and substance use disorder modules of the Diagnostic Interview Schedule for Children. Results indicated that youth who had made multiple suicide attempts versus those who made only one and those with suicidal ideation only, were more likely to meet criteria for a psychiatric diagnosis, whether mood, anxiety, substance use, or a combination. However, when each disorder was examined independently, they found that depressive disorders did not differentiate

between suicide ideators, single attempters and multiple attempters. Therefore, depression alone may not differentiate at-risk youth who go on to make a suicide attempt versus those who do not.

There is also research indicating that many young people who attempt suicide may not display signs of depression (Arria et al., 2009; Cukrowicz, 2011; Levy & Deykin, 1989). For example, Arria et al. (2009) examined suicide ideation in a sample of 1,249 first-year college students as part of an ongoing prospective study of college student health behaviors. Results indicated that only 40% of those with suicidal ideation were classified as depressed by having a score of 16 or higher on the Beck Depression Inventory, a 21-item self-report measure of depressive symptoms (Arria, 2009). The authors theorized that suicidal ideation in young college students may have a unique etiology because of developmental transitions that occur in young adulthood, including changes in family relationships, peer contexts, and increase opportunities for alcohol and drug use. In another study of 424 college students, nearly half of the suicide attempters failed to meet lifetime criteria for depression (Levy & Deykin, 1989).

Finally, Cukrowicz (2011) conducted a series of three studies to examine the relationship between self-reported suicidal ideation and the severity of depressive symptoms. In each study, a sample of college students was utilized; study 1 had 222 undergraduate students, study 2 had 309 undergraduate students, and study 3 had 914 undergraduate students. Participants in studies 1 and 2 were from the same university, whereas participants from study 3 were from a university in a different geographic location and was a more ethnically diverse sample that the other 2 studies. The results of all three studies indicated that although the greatest elevation in suicidal ideation occurred at the highest level of depressive symptoms, significant suicidal ideation was also experience by college students with mild and moderate levels of depression. The authors concluded that elevated suicidal ideation is not limited to college students with severe depression

and that suicide assessments should be conducted with all students experiencing any depressive symptoms

Substance use and abuse. Substance use and abuse also have been examined in relation to suicidal ideation, suicide attempts and suicide in young people. These studies have consistently shown that substance abuse is a risk factor for suicide (Brent, 1999; Shaffer et al., 1996), as well as for suicide attempts and ideation (Gould et al., 1998; Levy & Deykin, 1989). Gould et al. (1998) examined the relationship between suicidal ideation, suicide attempts, and psychiatric disorders in a large, ethnically and socioeconomically diverse community sample of adolescents. In addition to mood disorders and anxiety, meeting criteria for any substance use disorder (i.e., alcohol abuse, alcohol dependence, marijuana abuse, marijuana dependence, other substance abuse, other substance dependence) independently increased the risk of suicide attempts after controlling for sociodemographic factors. Similarly, the results of the Brent et al. (1999) psychological autopsy study found that substance abuse was strongly related to adolescent suicide. This study also found that substance abuse comorbid with mood disorder conveyed an extraordinarily high risk for suicide. Additionally, Gould et al. (1998) found that substance use/abuse differentiated between suicide ideators and attempters in their sample of 9 to 17 year olds. Interestingly, Gould et al. (1998) found that substance use/dependence was independently associated with an increased risk of a suicide attempt for males but not for females. Similarly, Shaffer et al. (1996) found that substance abuse was predictive only in males who died by suicide.

Each of these studies (Brent et al., 1999; Gould et al., 1998; Shaffer et al., 1996) provide important information regarding the relationship between substance abuse and suicidality. However, their generalizability is somewhat limited because they collapsed all substance abuse

disorders together when analyzing their data. Other research has examined various substance use disorders separately, which may provide more useful information regarding the relationship between specific substances and suicide.

Alcohol. Alcohol use also has been found to be a strong predictor of suicidal ideation and other suicidal behavior. The relationship between alcohol and suicide has been examined in numerous ways. Early age of alcohol initiation (Swahn & Bossart, 2007; Swahn, Bossarte, & Sullivent, 2008; Swahn, Bossarte, Ashby, Meyers, 2009), heavy episodic (binge) drinking (Brener, Hassan & Barrios, 1999; Miller et al., 2007; Schaffer et al.,2008; Windle, Miller-Tutzauer, & Domenico, 1992), and alcohol abuse and dependence (Arria et al., 2009; Wu et al., 2011) have all been associated with suicidal thoughts and behaviors.

Early alcohol initiation. In a study by Swahn and Bossart (2007), the association between preteen (prior to the age of 13) alcohol use initiation and subsequent suicidal ideation and attempts were examined in a nationally representative sample of high school boys and girls. They found that preteen alcohol use initiation was statistically significantly associated with suicidal ideation and suicide attempts relative to non-drinkers and in relation to those who do not begin drinking until their teen years. Similar finding have been demonstrated in several other studies (Swahn et al.,, 2008; Swahn et al., 2009). Swahn and colleagues (2008) advocated for early alcohol use to be viewed as a health risk behavior that has a direct impact on suicidal behavior but also can work indirectly. They also stated that "early alcohol use is likely an indicator of the complex interactions between sociocultural, developmental, psychiatric, psychological, and family/environmental factors that can contribute to suicidal and violent behaviors" (p. 302).

Alcohol abuse and dependence. Alcohol abuse and dependence are also predictive of suicidal behaviors (Arria et al., 2009; Wu et al., 2011). For example, in a community sample of 1,458 youths ages 9 to17, meeting clinical criteria for alcohol abuse and dependence was significantly associated with a suicide attempt, but not suicidal ideation, after controlling for depression (Wu et al., 2011). Arria and colleagues (2009) investigated suicidal ideation in a sample of 1,249 first-year college students. Results of this study suggested that alcohol use disorders were related to suicidal ideation. However, they found that this relationship was true only in the absence of depressive symptoms. The authors suggest that alcohol use disorders may be an indicator of a non-depressed subtype of suicide attempters. This study is important because it highlights the importance of alcohol use as a risk factor for suicidal ideation when other risk factors, such as depression, are not present.

Heavy episodic (binge) drinking. Heavy episodic (binge) drinking also has been found to be associated with suicidal ideation and attempts (Brener et al., 1999; Miller et al., 2007; Schaffer et al., 2008; Windle et al., 1992). Windle et al. (1992) examined heavy drinking in a cross-sectional examination of middle and high school youth and found that those who drank more frequently were twice as likely to report attempting suicide than those who did not drink. Similarly, Miller and colleagues (2007) examined binge drinking in a sample of 12 to 20 year-olds and found that those with the highest rates of binge drinking, which was defined as 5 or more drinks on one occasion, were more likely to seriously consider and attempt suicide. Similar findings have been also found in college samples. In a nationally representative study of college students, Brener et al. (1999) found that those who considered suicide were significantly more likely to report heavy episodic drinking.

Acute alcohol use is also associated with suicide. High rates of blood alcohol concentrations have been found among those who died by suicide completers (Hufford, 2001). Alcohol intoxication increases suicide risk up to 90 times, in comparison with abstinence. There is also evidence that alcohol intoxication predicts the use of more lethal means (e.g., a firearm) in the suicide (Brent & Perper, 1987; Hufford, 2001).

Gender differences. There is also some indication of gender differences in the relationship between substance use and suicide, but the research is not conclusive (Ohberg, Vuori, Ojanper, & Lonngvist, 1996; Schaffer, Jeglic, & Stanley, 2008). Some studies have found that males are more likely to be intoxicated at the time of suicide than females (Ohberg, Vuori, Ojanper, & Lonngvist, 1996). However, Schaffer et al. (2008) found that binge drinking was related to suicide attempts for females but not for males. Further, Wu et al. (2011) found that the significant relationship between alcohol and suicide attempts was similar in both males and females. Thus, the effect of gender on the alcohol-suicide relationship are not straightforward and represents an important area for future study.

Mechanisms of alcohol. Alcohol clearly plays an important role in suicidal ideation and suicide attempts (Wu et al., 2011), so it is important to examine the mechanism through which alcohol use and suicide are related. A recent review by Brady (2006) on the association between alcohol misuse and suicidal behavioral provides several theories for understanding the role of alcohol in suicidal behaviors. According to Brady (2006), alcohol predisposes individuals in several ways. First, alcohol predisposes people to suicide through its comorbidity with other health factors, such as depression. The author speculates that suicidal ideation may be the result of the depressogenic effect of alcohol. This hypothesis is at least partially based on research demonstrating that alcoholic suicide attempters are more likely to be depressed than nonalcoholic

attempters (Chignon et al., 1998). Brady (2006) also contends that alcohol misuse predisposes people to suicide through its association with various adverse life events such as relationship- and work-related problems. These problems can lead to social isolation and may therefore increase the risk of suicidal behavior. Additionally, alcohol misuse and suicidal behavioral can be partially explained by a potential shared and underlying common genetic predisposition to both behaviors. The author also presents evidence that alcohol can be a precipitating risk factor for suicidal behavior. That is, the effects of alcohol may contribute to intoxication and psychological distress, constricted thinking and impaired problem solving, aggression, impulsivity and other biochemically based effects that can precipitate suicidal behaviors (Brady, 2006).

Suicide and other substance use. In addition to alcohol use, other substances, including smoking, marijuana and other illicit drugs, have been examined in their relationship to suicidal thoughts and behaviors. Specifically, young people who report using tobacco, marijuana, cocaine, and other illegal drugs have been found to be more likely to report suicidal ideation (Brener et al., 1999; Burge et al., 1995; Garrison, McKeown, Valois, & Vincent, 1993; Thompson, Moody, & Eggert, 1994) and suicide attempts (Woods et al., 1997). Several studies, in particular, are useful in understanding the relationships between these substances and suicide.

Data from the 1990 Youth Risk Behavior Survey were used to examine the interrelationship of drug use and suicidal behavior in U.S. high school students (Burge et al., 1995). Findings from this study indicated that adolescents who engaged in substance use were more likely to experience suicidal ideation and behavior than those who abstained from such activities. Specifically, data analysis revealed a significant and positive relationship between cocaine use and marijuana use and severity of outcomes of suicide attempts (Burge et al., 1995).

Similarly, after adjusting for sociodemographic factors, Kung, Pearson, and Liu (2003), found that marijuana use was independently associated with suicides for males and females in both youth and adults.

In a nationally representative study of 4,838 college students, Brener et al. (1999) examined the association between suicidal ideation and the use of various substances. Findings of this study indicated that each type of substance use examined (i.e., cigarette smoking, heavy drinking, marijuana use, cocaine or other illegal drug use, and combine illegal drug use and alcohol use) was independently related to suicidal ideation after controlling for demographic characteristics. Specifically, the odds of engaging in current cigarette smoking were nearly twice as high among students who considered suicide than among those who had not considered suicide; episodic heavy drinking was nearly double in students who considered suicide versus those who had not considered suicide; and the odds of engaging in current marijuana use, cocaine or other illegal drug use, and combined alcohol and illegal drug use were more than double among students who had considered suicide than among those who had not.

In a community sample of 1,458 youths ages 9-17, the association between adolescent substance abuse and suicidal behaviors was examined (Wu et al., 2001). The unique relationships between alcohol, smoking, and illicit drugs, and suicidal ideation and attempts were examined. Results of this study demonstrated that alcohol abuse and dependence were strongly associated with suicide attempts even after controlling for depression. Smoking was also found to be significantly associated with suicide attempt, even after controlling for alcohol and drug abuse/dependence. Surprisingly, drug abuse/dependence was not significantly associated with suicide attempt in this study. Additionally, the associations between any substance use/abuse and suicidal ideation were no longer significant after controlling for depression (Wu et al., 2011).

Cigarettes. Numerous research studies have focused more specifically on the unique relationship between cigarette smoking and suicide (Bronisch, Hofler, & Lieb, 2008; Oquendo et al., 2004). Bronisch and colleagues (2008) examined the temporal relationship between cigarette smoking and suicidality in a community sample of 3,021 participants ages 14-24 in Germany. They found that suicidal ideation and suicide attempts were strongly associated with occasional and regular smoking and found that nicotine and nicotine dependence increased the risk for new onset of suicidal ideation. Bronisch et al. (2008) also found that prior regular smoking and nicotine dependence increased the risk for onset of suicide attempts. In a clinical sample of 208 patients who presented for treatment of major depressive episode, Oquendo and colleagues (2004) examined the relationship between depression, cigarette smoking and suicide attempts at 3 months, 1 year, and 2 years after discharge. Individuals with substance or alcohol abuse were excluded. They found that past suicide attempts, severity of depression and cigarette smoking were the strongest predictors of future suicide attempts.

Several mechanisms have been explored to explain the relationship between cigarette smoking and suicide (Angst & Clayton, 1998; Balfour & Riley, 2000; Lerman et al., 2001; Malone et al 2003; Reuter & Henning, 2005; Riberiro et al., 1993; Whitefield et al 2000; Wu et al., 2011). It has been suggested that there may be genetic vulnerability within the serotonergic system predisposing smokers to suicidality (Lerman et al., 2001; Reuter & Henning, 2005). It also has been posited that suicidality may be the consequence of smoking during a psychological disorder such as depression or substance abuse or dependence (Malone et al 2003; Whitefield et al 2000). Because smoking has a short-term effect on raising serotonin levels in the frontal cortex, individuals may smoke in order to relieve depressive symptoms (Riberiro et al., 1993). Furthermore, tobacco might be used for “self-medication” by some people with depressive

symptoms, including suicidal behaviors (Wu et al., 2011). Additionally, Balfour and Riley (2000) found that tobacco smoke contains antidepressant components, for instance MAO-A and B inhibitors, which in may encourage depressed people to smoke. Finally, common personality traits such as aggression and impulsivity that predispose people to smoking also may be at play in suicidal behaviors (Angst and Clayton, 1998).

Marijuana. There are some inconsistent finding in regards to marijuana and suicide (Arria, 2009; Brener et al., 1999; Burge et al., 1995; Greenblatt, 1998; Lynskey et al., 2004; Kung, Pearson, & Liu, 2003; Petronis, 1990). Several studies, as previously discussed, have found that marijuana use is positively associated with suicidal thoughts and behaviors (Brener et al., 1999; Burge et al., 1995; Lynskey et al., 2004; Kung, Pearson, & Liu, 2003). Additionally, data from the National Household Survey on Drug Abuse found that those who used marijuana at least once in the past year were nearly 3 times as likely as nonusers to report suicidal ideation and attempts (Greenblatt, 1998). However, other research has found little or no relationship between marijuana and suicidal ideation once other demographic variables are taken into account (Arria, 2009; Petronis, 1990). For example, Arria (2009) found that cannabis use disorder was not related to suicidal ideation in college students. However, this study examined whether individuals met criteria for cannabis use disorder, so it is unclear whether any use of cannabis or frequency of cannabis use would be related to suicidal ideation.

There is little empirical data explaining the mechanisms through which marijuana use may be contributing specifically to suicidality. Marijuana use has been discussed more in its relationship to depression (Patton et al., 2002; Lynskey et al., 2004; Marmorstein & Iacono, 2011; Van Laar, Van Dorsselaer, Monshouwer, & De Graaf, 2007). Heavy and/or frequent cannabis use in adolescence is associated with increased risk for later major depressive disorder

(Patton et al., 2002; Van Laar, Van Dorsselaer, Monshouwer, & De Graaf, 2007). It has been argued that the comorbidity between marijuana use and depression arises through shared genetic and environmental vulnerabilities predisposing to both outcomes (Lynskey et al., 2004). Additionally, it has been proposed that adverse psychosocial consequences of marijuana use may explain the relationship between marijuana use and depression, which has been partially supported in the literature (Marmorstein & Iacono, 2011). In general, there appears to be a paucity of research on the relationship between marijuana use and suicidality, and on the mechanisms that might explain this relationship. This is an area in need of research, particularly in light of recent legislation legalizing marijuana in several states.

Educational Risk Factors

In addition to depression and substance abuse, educational risk factors have been identified as important variables to consider when examining suicidal thoughts and behaviors in young people. Specific educational factors that have been shown to impact suicidality include school failure, the presence of learning disabilities, dropping out of high school, and post-high school education attainment and status (Bender, Rosenkrans, & Krane, 1999; Daniel et al., 2006; Gould et al., 1996; Hooven et al., 2012; Huntington & Bender, 1993; Kessler et al., 1999; Lewinsohn et al., 1993; Schwartz, 1990; Schwartz & Whitaker, 1990; Silverman et al., 1997; Svetaz et al., 2000). In addition, school failure and suicide share many common risk factors, including substance use, delinquency, and depression, and research suggests that environmental and social factors may play an important role in the relationship between education and suicide (Brent et al., 1999; Kandel, Raveis, & Davies, 1991; Langhinrichsen-Rohlin, Arata, Bowers, O'Brien, & Morgan, 2004; Garlow et al. 2007; Lewinsohn et al., 1993; Mazza & Reynolds, 1998; Miller et al., 2007; Schaffer, Jeglic, & Stanley, 2008; Simons & Murphy, 1985; Swahn &

Bossart, 2007; Shaffer et al., 1996).

School attendance and educational attainment. As mentioned earlier, the YRBS is used to monitor health risk behaviors in a nationally representative sample of young people in grades 9 to 12 across the United States. Data from the 2011 survey indicated that 15.8% of youth seriously considered attempting suicide during the past 12 months. In addition, 12.8% made a plan about how they would attempt suicide, 7.8% attempted suicide, while 2.4% attempted suicide resulting in treatment by doctor or nurse (CDC, 2012). Similarly, concerning rates are also found in young adults. Results of the National College Health Assessment Survey conducted by Kisch, Leino, and Silverman (2005) estimated that 9.5% of college students seriously considered attempting suicide in the past year and 1.5% made an actual attempt (Kisch et al.).

Data from the YRBS and the National College Health Assessment Survey provide helpful information regarding the prevalence of suicidal behaviors; however, the ability to identify a discernable relationships is limited because the samples are comprised only of individuals attending school and may actually underestimate the extent of these thoughts and events among young people, particularly those not attending school either by way of dropping out of high school or by not going on to higher education. Therefore, it is important to explore research comparing young people in school with those who are not, and to examine educational factors that may be related to suicidality in young people. Education status and level of education have emerged as important risk factors related to suicidal ideation and behavior (Gould et al., 1996; Kessler, Borges, & Walters, 1999).

In the Gould et al. (1996) psychological autopsy study on 120 young people who died due to suicide and 147 matched control participants, those individuals who were not currently attending school were at a heightened risk of dying due to suicide compared to the young people

attending school. In the National Comorbidity Study, lower educational attainment was found to be a primary risk factor for suicide attempts in people ages 15 to 54 after controlling for psychiatric disorders (Kessler, Borges, & Walters, 1999). In contrast, Petronis, Samuels, Moscicki, and Anthony (1990) found that not having a college degree did not predict suicide risk compared to having a bachelor's degree or higher. In fact, their findings were actually trending towards significance in the opposite direction indicating that having a college degree may be related to a higher risk of a suicide attempt.

Other research has examined the rates of suicide on college campuses and compared these numbers to national averages, which has demonstrated that that the rate of suicides on college campuses is lower than the national average (Schwartz, 1990; Schwartz & Whitaker, 1990; Silverman et al., 1997). The most comprehensive study to date on the incidence of suicide among undergraduate and graduate students compared to a matched national sample is the Big Ten Student Suicide Study (Silverman et al., 1997). Results from this study sought to determine the suicide rates on Big Ten University campuses over a 10-year period and to address many of the statistical and epidemiological flaws identified in previous studies of university students. The study collected demographic and correlational data on 261 suicides of registered students at 12 universities.

The Big Ten Student Suicide Study's most salient finding was that the rate of suicides on university campuses over the course of 10 years was approximately one half of the national computed suicide rate for a matched sample by age, gender and race. Furthermore, they found that the largest number of suicides for both males and females were in the 20-24 year old age group and amongst graduate students. Additionally, depending on student age and gender, the

rates fluctuated from 30% of the national rates for 17-19 year old male and female students to 169% of the nation rate for women ages 25-29 (Silverman et al., 1997).

It should be noted that there were several inherent weakness of this study. First, they did not examine suicidal thoughts or attempts, which are important markers for suicidal risk. Additionally, the student suicide rates reported by some institutions in the study were well below the national average, whereas at other schools with similar student bodies were higher. Haas and colleagues (2003) speculated that the rates reported in the Big Ten study might be correlated with institutional characteristics such as the presence and availability of psychiatric services on campus, variables that were not considered in the study.

School difficulties. In addition to examining education status, variables reflective of school difficulties have been found to be associated with past suicide attempts (Hooven, Snedker, & Thompson, 2012; Lewinsohn et al., 1993). In their study examining psychosocial variables related to adolescent suicide in 1,710 adolescents, Lewinsohn and colleagues (1993) found that number of days missed in school, lack of homework completion, and dissatisfaction with school grades were associated with a greater likelihood of past suicide attempts. Additionally, they found academic aspiration (i.e., estimated future education, grade average from the previous term, self-perceived adequacy of school performance, perceived ability to complete college, and items assessing the importance of future educational goals) was associated with previous suicide attempts (Lewinsohn et al., 1993).

A more recent study examined suicide risk in a sample of 759 high-risk young adults (Hooven et al., 2012). Participants were surveyed at two time points: once in high school and once during young adulthood. School problems (i.e., problems with grades, attendance, progress, likelihood of dropping out) predicted young adult suicide risk after controlling for prior suicidal

behavior and emotional distress, particularly among young adults who were not at suicide risk as youth.

In contrast, Thompson et al. (2005) examined suicidal behaviors in 1,287 youth at high risk for school dropout. They found that poor school performance did not have a direct effect on suicidal behaviors for males or females. However, the authors' explanation for this finding was that the sample was restricted to youth at high-risk of school failure and dropout, thereby limiting the variation in school performance.

Learning disabilities. Youth with learning disabilities have been empirically noted to be at increased risk for suicidal behaviors (Bender, Rosenkrans, & Krane, 1999; Daniel et al., 2006; Huntington & Bender, 1993; Svetaz, Ireland, & Blum, 2000). In the National Longitudinal Study of Adolescent Health, which examined risk and protective factors associated with emotional distress in a sample of 20,780 adolescents, youth with a learning disability attempted suicide more often than youth without (Svetaz et al., 2000). Svetaz and colleagues also found that connectedness to parents and school were strongly associated with diminished emotional distress, suicide attempts, and violence involvement among adolescents with learning disabilities (Svetaz et al., 2000).

McBride and Siegel (1997) investigated the relationship between learning disabilities and suicide in a sample of adolescents aged 11 to 21. They analyzed all of the suicide notes available (n = 27) from the total sample of 267 suicides in Ontario. They compared the spelling and handwriting errors of the youth who died from suicide to controls with and without learning disabilities. Results showed that 89% of the adolescents who committed suicide had significant deficits in spelling and handwriting that were similar to adolescents with learning disabilities. The authors postulated that youth with untreated learning disabilities may be at heightened risk

of developing behavioral and psychiatric problems due to inadequate support. Additionally, underlying neurological deficits related to learning difficulties may also account for the increased psychiatric symptoms. Finally, the authors noted that the social skills deficits often seen in children with learning challenges might lead to social isolation and a higher risk of suicide (McBride & Siegal, 1997).

A more recent study examined the risk of suicidal ideation and suicide attempts and school dropout among youth with poor reading in comparison to youth with typical reading recruited from public schools at the age of 15 (Daniel et al, 2006). Results implied that those with poor reading were more likely to experience suicidal ideation or attempts, and more likely to drop out of school than youth without reading difficulties after controlling for sociodemographic and psychiatric variables. Specifically, the rate of suicidal thoughts or attempts in poor readers was 25.2% compared to 8.5% in typical readers. Additionally, there was a strong association between suicidality and school dropout. The stresses associated with reading difficulties may add to or interact with other risk factors and/or stresses to significantly increase the likelihood of outcomes such as suicidality and not completing high school (Daniel et al., 2006).

Understanding the link between education and suicide. It is clear that educational variables, including years of education, school failure, school attendance, and the presence of a learning disability are important risk factors for suicidal thoughts and behavior in young people (Bender, Rosenkrans, & Krane, 1999; Daniel et al., 2006; Gould et al., 1996; Hooven et al., 2012; Huntington & Bender, 1993; Kessler et al., 1999; Lewinsohn et al., 1993;; Schwartz, 1990; Schwartz & Whitaker, 1990; Silverman et al., 1997; Svetaz et al., 2000). There are several ways in which the relationship between suicidal behavior and education can be examined. The first is

to examine the common risk factors that have been identified for both school failure and suicide. Many of the variables related to school failure also have been examined in the suicide literature highlighting a possible underlying propensity for both suicidality and educational failure. Second, factors related to the school environment as well as family, peer and school relationships have been proposed as contributors to suicidal behavior in young people. Finally, examining theoretical explanations for school failure may provide valuable information to help explain why youth who struggle in school are also at heightened risk for suicide.

Common risk factors. To better understand the relationship between suicidality and school difficulties, it is important to examine the large body of research on the risk factors for high school dropout and educational attainment. Many of the factors identified as contributing to school failure, such as delinquency, substance use, and depression, have been also found to be predictive of suicide (Brent et al., 1999; Kandel, Raveis, & Davies, 1991; Langhinrichsen-Rohlin et al., , 2004; Garlow et al. 2007; Lewinsohn et al., 1993; Mazza & Reynolds, 1998; Miller et al., 2007; Schaffer et al., 2008; Simons & Murphy, 1985; Swahn & Bossart, 2007; Shaffer et al., 1996). Examining shared risk factors may point to possible shared psychosocial or psychopathological risk factors that underlie propensity for negative outcomes, such as school failure, and suicidal feelings or action (King & Apter, 1996).

Delinquency. Past research has indicated that prior delinquency predicts dropping out of high school (Battin-Pearson et al., 2000; Newcomb et al., 2002). Furthermore, delinquency is predictive of high school dropout even when academic achievement (Battin-Pearson et al., 2000; Newcomb et al., 2002) and other variables such as gender and family factors (Newcomb et al., 2002) are taken into account. Deviant behaviors also have been found to have direct effects on

suicidal ideation in adolescents (Kandel et al., 1991; Simons & Murphy, 1985) and on suicidal ideation and attempts in college students (Langhinrichsen-Rohlin et al., 2004).

Substance use. As discussed previously, substance use is strongly related to suicidal ideation and behavior (Arria et al., 2009; Brener et al., 1999; Swahn & Bossart, 2007; Miller et al., 2007; Schaffer et al., 2008; Thompson et al., 1994; Windle, Miller-Tutzauer, & Domenico, 1992; Wu et al., 2011), but it has also been strongly linked to failure to graduate from high school (Ellickson et al., 1998; Garnier et al., 1997; Mensch & Kandel, 1988; Newcomb et al., 2002; Weng, Newcomb, & Bentler, 1988). Garnier et al. (1997) studied factors related to dropout in a sample of 194 European American families and found that teen drug use uniquely predicted dropout. However, other researchers have found that tobacco use, but not other types of drug involvement, had a direct effect on dropout once other variables such as gender, family background, and academics were controlled (Ellickson et al., 1998; Mensch & Kandel, 1988; Newcomb et al., 2002; Weng et al., 1988). Other research has found that individuals who fail to complete high school have higher rates of alcohol use, illicit drug use, and cigarette smoking compared to high school graduates, and rates of illicit substance use and cigarette smoking in those who fail to graduate remain elevated into adulthood (Bachman et al., 2008; Gfroerer et al, 1997). Additionally, a comprehensive review of the research on marijuana use and educational outcomes found that in both cross-sectional and prospective research studies, cannabis use was related to poor educational performance and early school leaving after controlling for a wide range of covariates (Lynskey & Hall, 2000).

Depression. Depression has been linked to both suicide (Dube et al., 2001; Konick & Gutierrez, 2005; Lewinsohn et al., 1993l; Thompson, Mazza, Herting, Randell, & Eggert, 2005) and educational attainment (Fletcher, 2007; Ou & Reynolds, 2008). For example, Ou and

Reynolds (2008) used data from the 20-year Chicago Longitudinal Study to examine economic, physical and mental health, and substance use among high school dropouts, GED recipients, and high school graduates in a sample of inner-city youth. Those with a high school diploma had significantly lower levels of depression and substance use than both those with a GED and high school dropouts.

Environmental and relationship factors. In addition to shared risk factors such as depression, substance use, and delinquency, environmental and relationship factors have been posited to play a role in the disparate rates of suicide among those attending school and those who are not. In particular, the unique attributes of the campus environment, social support, family support, and school bonding have been identified in the literature as being important variables to consider in adolescent and young adult suicidality (Arria et al., 2009; Brener et al., 1999; Lazarus & Folkman, 1984; Randell et al., 2006; Resnick et al., 1997; Silverman et al., 1997; Svetaz, Ireland, & Blum, 2000; Van Orden et al., 2008).

Campus environment. Factors unique to universities have been hypothesized to protect young people from developing suicidal thoughts and behaviors (Lazarus & Folkman, 1984; Silverman et al., 1997). For example, it has been suggested that the decrease in suicide rate among university students may be due to the general campus prohibitions on the availability and use of firearms, the careful monitoring and control of the abuse of alcohol, the stated prohibition on the possession and use of illicit drugs, the clear message of the purpose of a college education and the relative degree of protection from the daily hassles of day-to-day life that may occur in nonacademic settings (Lazarus & Folkman, 1984; Silverman et al., 1997). Silverman et al. (1997) also postulated that the lower level of suicide rates on college campuses versus national

rates could be partially attributed to the more readily available student support services, including easy and low cost access to health and mental health services.

Social Support. Low levels of social support and belongingness have also emerged as a significant environmental factor that may contribute to suicidal thoughts and behaviors in young people. The Big Ten Student Suicide Study was one of the first well-controlled studies highlighting the discrepant rates of suicide on college campuses compared to national rates (Silverman et al., 1997). The authors suggest college campuses provide a more supportive peer and mentor environment than can easily and safely found in the general community. The authors posited that the peer support, peer companionship and compatibility, and availability of student support services all contributed to the lower rate (Silverman et al., 1997). Similarly, Haas and colleagues (2003) speculated that the variable rates reported in the Big Ten study might be correlated with institutional characteristics such as the presence and availability of psychiatric services on campus, variables that were not considered in the study.

Work by Arria et al. (2009) lends some supports this idea. In their study, suicidal ideation was examined in a sample of 1,249 first year college students. Results indicated that lack of perceived social support was a prominent risk factor for suicidal ideation, irrespective of the presence of high depressive symptoms.

Other research also supports the notion that social support plays an important role in suicidal ideation (Brener et al., 1999; Van Orden et al., 2008). Data from the National College Health Risk Behavior Study, a nationally representative investigation of suicidal ideation, indicated that college students who were members of a sorority or fraternity were less likely to report suicidal ideation (Brener et al., 1999). Brener et al. also found that students living with a spouse or partner were less likely to report suicidal ideation than those living alone, also lending

support to the idea that social support is a protective factor against suicidal thoughts. Additionally, Van Orden and colleagues (2008) suggest that the higher suicidal ideation found during the summer term in college students could be due to changes in the social college campuses and belongingness during this time.

Family Support. Family support for school has been suggested as a protective factor related to suicide risk (Randell et al., 2006). Randell and colleagues (2006) examined a selected sample of 1,083 high school students identified at being at risk for dropping out of high school. Students were identified as being at risk using academic performance, attendance, and prior dropout status data from their school. Family risk and protective factors were compared in this sample of potential dropouts to examine differences between those with and without suicide-risk behaviors. Results indicated that increased levels of suicide risk were associated with perceived conflict with parents, unmet family goals, and family depression. Decreased levels of risk were associated with perceived parental involvement and family support for school. The authors suggest that, among those at increased risk for dropping out of high school, increasing connections to school through parental collaboration with available school-based support resources may be an important step in reducing suicide risk (Randell et al., 2006).

School Bonding. School bonding has been examined in the educational literature as an important variable not only for school success, but also for youth's behavioral, social and emotional development (Finn, 1989; Hawkins, Catalano, & Miller, 1992; Murray & Greenberg, 2001; Resnick et al., 1997; Simons-Morton et al., 1999; Svetaz, Ireland, & Blum, 2000). The seminal article by Finn (1989) describes two developmental models of understanding dropping out of high school. The two models both posit dropping out as a developmental process that begins long before the decision to drop out. Each of these models emphasizes the relationship

between the student and the school. In the failure-self esteem model, school failure leads to low self-esteem, which in turn exacerbates problem behavior and eventually leads to the student withdrawing from school. The second model, the participation-identification model, suggests that poor school bonding can lead to unsuccessful school outcomes and possibly complete withdraw from school (Finn, 1989).

In addition to protecting youth from school failure, feeling bonded and connected with school may deter social deviance because inappropriate social behaviors can jeopardize continued membership within schools (Hawkins, Catalano, & Miller, 1992). Further, feeling connected with school may enhance social and emotional development because students learn appropriate social and behavioral skills through social interactions (Hawkins et al., 1992) Additionally, bonds with social institutions, such as schools, can help to buffer the effects of stressful life events and promote normative adjustment (Hawkins & Catalano, 1992).

Several studies have examined school bonding in relation to various social and emotional factors and to various negative behavioral outcomes, such as drinking and drug use. Research by Murray and Greenberg (2001) investigated student-teacher relationship and school bonding in a sample of 289 fifth- and sixth- grade students and found that children's perceptions of the quality of their relationships with teachers and bonds with school were associated with indicators of social, emotional, and school-related adjustment. Moreover, they found that youth with disabilities, including emotional disturbances had poorer bonds with school than those without disabilities. Simons-Morton and colleagues (1999) conducted a survey of 4263 students from seven middle schools in a US school district. One of the main findings of this study was that school bonding, perceived school climate and school adjustment were negatively associated with problem behavior including smoking, drinking, other substance use, bullying, fighting, stealing,

vandalism and weapons carrying. Finally, Bond et al. (2007) examined associations between social relationships and school engagement in early secondary school and mental health, substance use, and educational achievement 2 to 4 years later in a school-based sample of 2768 students. They found that those with low school and social connectedness were at heightened risk for anxiety/depression symptoms and marijuana use in later years. Though none of these studies examined suicide in particular, many of the negative outcomes (e.g., drinking, smoking, delinquency, psychopathology), have been repeatedly linked to suicide in the literature (Brent et al., 1999; Garlow et al. 2007; Hendin et al., 2005; Kandel et al., 1991; Langhinrichsen-Rohlin et al., 2004; Lewinsohn et al., 1993; Mazza & Reynolds, 1998; Shaffer et al., 1996; Simons & Murphy, 1985).

Several studies have specifically examined the relationship between school bonding and suicidality (Resnick et al., 1997; Svetaz, Ireland, & Blum, 2000). Resnick et al. (1997) studied the relationship between school connectedness and various measures of social and emotional health in a sample of 12,000 youths from the National Longitudinal Study of Adolescent Health. Findings revealed that school connectedness was negatively associated with suicidality in addition to alcohol and substance use, violence and emotional distress after controlling for social class, family structure, race and gender. Similarly, Svetaz, Ireland, & Blum (2000) also analyzed data from the National Longitudinal Study of Adolescent Health, which included 20,780 adolescents. Of these adolescents, 1,301 were identified as having a learning disability. Emotional distress, suicidal behaviors, and violence involvement were compared among those adolescents with and without learning disabilities. The results of this work indicated that youth with learning disabilities were at heightened risk for suicide attempts while connectedness to

school was strongly related to diminished emotional distress, suicide attempts, and violence involvement among these students (Svetaz et al., 2000).

Theoretical Explanations

Several theoretical models have been posited in the literature that may help understand the complex relationship between many of the aforementioned risk factors (e.g., delinquency, substance use, belongingness, school bonding, and school failure) and suicide. For example, both the Interpersonal Theory of Suicide and the Social Development Model provide unique theoretical underpinnings as well as empirical information regarding the development of problematic behavioral and emotional outcomes, including suicidality, in young people (Joiner, 2005; Van Orden et al., 2008; Catalano & Hawkins, 1996; Oxford, Harachi, Catalano, Haggerty, & Abbott, 2001).

Interpersonal Theory of Suicide. The most comprehensive theory explaining the relationship between social support and belongingness and suicide is the Interpersonal Theory of Suicide (Joiner, 2005). The Interpersonal Theory of Suicide was first proposed by Joiner in 2005 and expanded by Van Orden and colleagues (2008). According to this theory, the most dangerous form of suicidal desire is caused by the simultaneous presence of two interpersonal constructs—thwarted belongingness and perceived burdensomeness—and further that the capability to engage in suicidal behavior is separate from the desire to engage in suicidal behavior.

There are several recent studies that support the Interpersonal Theory of Suicide. In a sample of 309 undergraduate students, thwarted belongingness and perceived burdensomeness predicted suicidal ideation (Van Orden et al., 2008). In addition, the interaction of these two constructs explained even more of the variance after controlling for depression. In a large sample

of young adults, Joiner et al. (2009) also found that perceived burdensomeness and thwarted belongingness interacted to predict suicide ideation. Finally, results from a community-based cohort of 6,133 individuals in their 20's, 40's and 60's also lend support to the Interpersonal Theory of Suicide (Christensen, Batterham, Soubelet, & Mackinnon, 2012). Specifically, the interactions between perceived burdensomeness and thwarted belongingness predicted suicidal ideation. However, there were age and gender differences in this study. The models of burdensomeness and belongingness accounted for less variance in the older groups, and thwarted belongingness was a stronger predictor of ideation in males than for females. One particularly important finding from this study was that the Interpersonal Theory explained more variance than the epidemiological models using demographic factors and mental disorders (i.e., recent divorce, depression, anxiety, traumatic and stressful events, physical health, and alcohol use disorders) as predictors (Christensen et al., 2012).

Social Development Model. The Social Development Model (SDM) is another theory that can be used to examine the development of positive and negative outcomes in young people (Catalano & Hawkins, 1996). The SDM is a theory of positive and problem behavior that specifies hypotheses about the relationships among risk and protective factors in the etiology of both prosocial and antisocial behavior (Catalano & Hawkins, 1996). The theory states that children are socialized through processes involving perceived opportunities for involvement and interactions with others, the degree of involvement or interaction, the skills to participate in these involvements or interactions, and the reinforcement for participation in these involvements or interactions. These opportunities, involvements, skills, and recognition build commitment to a social unit such as school, which in turn provides motivation to live up to the standards and expectations of the social unit. The SDM suggests that involvement in various prosocial and

antisocial activities and skills necessary for positive interaction with others may have important implications for various developmental outcomes. The SDM also posits that social, emotional, and cognitive skills contribute to prosocial outcomes (Oxford et al., 2001).

Based on the theoretical assumptions of the SDM, it could be argued that poor mental health outcomes, such as suicidal ideation, may be related to poor social outcomes including school failure or visa-versa. Though no research has examined suicide or school failure using the SDM, other related variables have been examined using the SDM. For example, Catalano et al. (1996) used data from 590 youths in the Seattle Social Development Project using structural equation modeling and found that the SDM provided an acceptable fit to predict drug use at ages 17 to 18.

Longitudinal Research on Suicidal Ideation

As mentioned previously, suicidal ideation is one of the strongest predictors of a future suicide attempt and is related to risk of death by suicide (Brent et al., 1993; Lewinsohn, Rohde, & Seeley, 1996; Mazza & Reynolds, 2008; Reinherz et al., 1995). Additionally, those with persistent suicidal ideation in the context of other risk factors such as plans, intent, or prior attempts, are often deemed by clinicians to be at high risk for suicidal behaviors. Because suicidal ideation is a frequent precursor to suicide attempts and death, it is important to understand the course and development of suicidal thoughts, as this can help drive the development of appropriate and targeted prevention and intervention approaches. Additionally, examining the longitudinal relationships of psychological and social-environmental factors may enhance our understanding of the nature and development of suicidal behavior in young people (Mazza & Reynolds, 1998).

There are several key studies that have examined suicidal ideation longitudinally. Mazza and Reynolds (1998) examined the longitudinal relationship of psychological (i.e., depression and hopelessness) and social-environmental factors (i.e., social support, daily hassles, and negative life events) with adolescent suicidal behavior over a 1-year period in a sample of 375 high school students. Participants were interviewed two times over a 1-year period. Multiple regression analyses were conducted to examine the unique contribution of each predictor to suicidal ideation at each time point. Additionally, regression analyses using change scores were conducted to examine how the variables changed over time.

Results of the Mazza and Reynolds (1998) study indicated that daily hassles and negative life events at time 1 were predictive of suicidal ideation levels one year later for males. For females, they found that social support and depression were significant factors related to suicidal ideation levels one year later. In addition, the change-score analyses provided evidence that, for both genders, changes in depression and hopelessness were related to changes in suicidal ideation, after controlling for the other social-environmental factors. This study highlights the differences in predictors for males and females as well as the importance of examining changes in psychological constructs such as depression and hopelessness, rather than just examining the presence or absence of these symptoms. There are several limitations of this study that should be noted. First, the study was limited by the relatively low levels of suicidal ideation in the sample. Specifically, 91% of their sample did not manifest a clinical level of suicidal ideation, which reduces the amount of variability. Second, they only examined the constructs at two time points.

Other research has examined early predictors of suicidal ideation using longitudinal designs (Dougas et al., 2012). In a sample of 877 participants using a prospective design, Dugas and colleagues (2012) examined specific time-varying determinants of later suicidal ideation.

Time-varying covariates included depressive symptoms, family stress, other stress, alcohol use, cigarette use, and team sports. Data was collected beginning when participants were in 7th grade and was collected every three months through 11th grade, and then again at one point when participants were 18 to 24 years old. Among the wide range of potential predictors investigated in this study, only depression and team sport participation were statistically significant predictors of suicidal ideation in the multivariate analyses. Specifically, team sport participation in grade 8 was protective of suicidal ideation in early adulthood, and depressive symptoms in grades 9, 10, and 11 were predictive of later suicidal ideation. This is consistent with other research that has found depression to predict later suicidal ideation (Garrison et al., 1991; Mazza & Reynolds, 1998).

Other studies have specifically examined the developmental trajectory of suicidal behavior to determine when young people are most at risk (Boeninger, Masyn, Feldman, & Cogner 2010; Lewinsohn, Rohde, Seeley, & Baldwin, 2001). Lewinsohn and colleagues (2001) examined the associations of age, gender, and psychosocial factors during adolescence with risk of later suicide attempt during the ages 19 and 23 years. Initial assessments were conducted with 1,709 adolescents (aged 14-18). One year later, 1,507 participants completed a second assessment, and a selected subset of participants (n = 941) had a third diagnostic assessment after turning 24. Information on suicidal behavior, psychosocial risk factors, and lifetime DSM-III-R psychiatric diagnosis was collected at each assessment. Life table survival methods were used to calculate annual hazard rates for suicide attempt and for major depression.

Results of this study (Lewinsohn et al., 2001) indicated that beginning at age 13, the suicide attempt annual hazard rates of first suicide attempts increased rapidly for girls, who appeared to be at the most elevated risk between the ages of 15 and 18. Additionally, the annual

hazard rate decreased during the period of 19 to 23 years of age for females. For males, rates of first attempt for boys reach their highest levels at age 15 and were maintained until age 20. By age 19, the hazard rates for both genders were similar. For depression, rates for both genders increased markedly by age 15, with the hazard rate for girls approximately twice that of boys. In contrast to the suicide attempt hazard rates, the hazard rates for major depression did not significantly decrease in young adulthood for either gender. Thus, the disappearance of the gender difference for suicide attempts by young adulthood was not paralleled by a decrease in the gender difference for major depression (Lewinsohln et al., 2001).

Several important limitations of this study should be noted. First, suicide attempts (rather than ideation) were examined, and suicide attempts are a low-base rate phenomena compared to suicidal ideation and occurred with relatively low frequency in this sample. This likely reduced the statistical power to detect differences. Additionally, 4 to 6 years lapsed between time 2 and time 3, which may have affected the individuals' ability to accurately remember and report on their levels of depression and suicide attempts.

A second study examining the developmental trajectories in relation to suicidal thoughts and behaviors was conducted by Boeninger and colleagues (2010). Specifically**,** they examined developmental trends of suicidal ideation, plans and attempts in a sample of 1,248 rural European American youths. They examined how suicidality changes over time in adolescence and whether suicidal thoughts and behaviors peak at different times for boys and girls using multiple-group ordinal logistic growth models. Data was collected from individuals between the ages of 11 and 19 twice yearly and each participant in the study completed at least 3 waves of data. Results of the study found that for boys, levels of serious suicidal ideation and suicide plans increased linearly through age 19, whereas the girls' prevalence rates followed an inverted U

pattern, which peaked around age 16. However, for suicide attempts, yearly prevalence for both boys and girls followed the inverted U pattern, with girls' levels peaking at age 16 and then declining, and levels for boys peaking between 16 and 17 and then beginning to decline (Boeninger et al., 2010).

Findings from the Boeninger et al. (2010) study revealed that adolescent girls' vulnerability to suicidal episodes peaked during mid-adolescence. The authors highlighted the need for early intervention and the identification of girls at risk during the middle teenaged years. Additionally, they noted that adolescent boys appeared to be most vulnerable to suicidal episodes later in adolescence, right as they were preparing to leave high school and enter the world of emerging adulthood, which entails new challenging situations. Finally, the authors noted, as did Lewinsoln et al. (2001), that developmental trends in suicide-related outcomes are not simply mirroring the course of psychopathology, and that gender differences in these trends may indicate different processes of vulnerability between girls and boys. Mazza and Reynolds (1998) also highlighted examining gender specific risk factors.

Each of these longitudinal studies (Boeninger et al., 2010; Dugas et al., 2012; Lewinsohln et al., 2001; Mazza & Reynolds, 1998) provides important information on how suicidal behaviors changes during adolescents and how changes in psychological constructs (e.g., depression) are associated with suicidality. Based on the work of Mazza and Reynolds (1998), it is clear that examining changes, rather than just levels, of psychological variables such as depression can help inform our understanding of the development of suicidal ideation. In addition, studies examining the developmental trajectories of suicidal behaviors indicate that there are differences in girls' and boys' trajectories of suicidal thoughts and behaviors (Boeninger et al., 2010; Lewinsohln et al., 2001). Specifically, results of these studies suggest

that girls' are at the most risk for suicidal behavior during mid-adolescence, whereas boys' risk does not decline in the same way, and may continue to rise into early adulthood. However, there is little research examining how suicidal ideation changes in the developmental period just after adolescence, when young people, particularly males, continue to be at risk. A review of the literature indicated that little research has explored how suicidal ideation changes over time using longitudinal data in young adulthood.

Young adulthood marks a significant developmental time in which many changes are occurring (Schulenber & Maggs, 2002). Some of the aforementioned risk factors for suicidal behaviors increase significantly during this time. For example, binge drinking and drug use begin to increase during late adolescence and into early adulthood (Schulenber & Maggs, 2002). Given these prominent risk factors increase during this developmental time frame, it is important to examine suicidal ideation during this time as well. Examining suicidal ideation and correlates over time may provide important information about normative developmental trends in these serious problems.

Current Study

Statement of the problem. The need for future research in the area of suicide is paramount. In the National College Health Assessment Survey (Kisch et al., 2005), of those students who reported having seriously attempting suicide, only 13.4% indicated currently being in therapy and only 15.0% reported being on medication. For those that had made a suicide attempt in the previous year, only 19% were currently in therapy and only 20.7% were on medication. Clearly, there are many young people at risk for suicide that are not currently receiving the help they need.

A large body of literature on the risk factors for suicidal thoughts and behaviors exists.

Research thus far has demonstrated that psychopathology, including depression and substance use/abuse, is the strongest risk factors for suicide attempts and death (Brent et al.,, 1999; Shaffer et al., 1999). However, it is clear from the research that relationships between depression, substance use and suicide are not straightforward. In particular, research on the relationship between marijuana use and suicidal ideation is lacking.

In addition to psychopathology, educational variables have emerged as important factors to consider in the development of suicidal thoughts and behaviors. For example, the Big Ten Student Suicide Study found that the rate of suicides on college campuses was one half of the reported national rate (Silverman et al., 1997).

There is also a smaller body of literature examining how suicidal thoughts and behaviors change over time during adolescence and emerging adulthood, which highlights the importance of examining how changes in psychological constructs over time can inform our understanding of suicidal ideation. However, this research is limited, and there is a need for additional research on community, rather than school-based, samples during this developmental time frame. In particular, more information is needed about the effects of depressive symptoms, substance use, and education status on the growth in suicidal ideation in young adults.

Purpose of the study. The purpose of this study is to examine suicidal ideation over time during emerging adulthood in a large community sample. The study will explore how suicidal ideation changes during emerging adulthood and test the relationships between suicidal ideation and substance use, educational variables, and depressive symptoms. There are eight primary research questions this study aimed to address:

1. *Research question:* How does suicidal ideation change during emerging adulthood?

Hypothesis: It is hypothesized that suicidal ideation will decrease over time. This hypothesis was based on data from the CDC (2012) and Brener et al. (1999) who found that in their cross-sectional research of young adults, higher suicidal ideation was reported by the younger adults compared to those that were slightly older.

2. *Research question:* What is the effect of gender on the initial level of suicidal ideation and the growth trajectory?

   Hypothesis: Given the large body of research indicating that females generally report more suicidal ideation than males (Arria et al., 2009; Gould et al., 2003; CDC, 2011), it is hypothesized that female gender will predict higher initial suicidal ideation. It is also hypothesized that females gender will predict a more steep downward trajectory over time based on the work of Lewinsohn et al. (2001) and Boeninger et al. (2010).

3. *Research question:* What is the relationship of each substance use variable (i.e., average heavy drinking, marijuana use, and cigarette smoking) to suicidal ideation?

   Hypothesis: It is hypothesized that higher levels of each of the three substance use variables will predict higher suicidal ideation. Previous research has found that marijuana use (Brener et al., 1999; Greenblatt, 1998), heavy drinking (Brener et al., 1999; Miller et al., 2007; Schaffer et al., 2008; Windle et al., 1992; Wu et al., 2011), and cigarette smoking (Bronish et al., 2008) are associated with higher suicidal ideation. It is also hypothesized that changes in heavy drinking, marijuana use and cigarette smoking will predict fluctuations in suicidal ideation away from an individual's trajectory.

4. *Research question:* What is the relationship between depression and suicidal ideation, and what are the relationships between each of the substance use variables (i.e., average

heavy drinking, marijuana use, and cigarette smoking) and suicidal ideation once depression is controlled for in the analyses?

Hypothesis: It is hypothesized that depressive symptoms will predict initial levels of suicidal ideation, the trajectory, and within-individual variations in suicidal ideation. It is also hypothesized that heavy drinking, cigarette smoking and marijuana use and suicidal ideation will continue to predict suicidal ideation outcomes above and beyond the impact of depressive symptoms. Many of the past studies on substance use and suicidal ideation did not control for depressive symptoms (Brener et al., 1999; Bronish et al., 2008; Greenblatt, 1998; Schaffer et al., 2008), so this question was designed to extend this work.

5. *Research question:* What is the difference in initial level of and growth in suicidal ideation based on education status (i.e., completed some 4-year college, completed some 2-year college, no post-high school education)?

   Hypothesis: It is hypothesized that educational status will predict initial suicidal ideation. Specifically, it is hypothesized 2-year college attendance and 4-year college attendance will predict lower suicidal ideation compared to no college. Also, it is hypothesized that 4-year college will predict lower suicidal ideation than 2-year college. This hypothesis is based on the work of Gould et al. (1996) and the Big Ten study (Silverman et al., 1997) suggesting those attending school are at a lower risk of suicide or suicide attempts.

6. *Research question:* Do heavy drinking, marijuana use, cigarette smoking and depressive symptoms have different effects on suicidal ideation based on education status?

Hypothesis: This question is exploratory in nature, though is hypothesized that there may be unique relationships between the substances and suicidal ideation based on education group given research indicating unique substance use patterns based on educational trajectories (Fleming, White, Haggerty, Abbott, & Catalano, 2012).

7. *Research question:* Among participants attending some 2- or 4-year school, do educational factors including grades, educational aspiration, educational bonding and number of months in school predict suicidal ideation?

   Hypothesis: It is hypothesized that these educational factors will be related to initial level of suicidal ideation. More specifically, it was hypothesized that lower grades, lower educational aspiration, lower educational bonding and fewer months in school will predict higher suicidal ideation. These hypotheses are based on research suggesting that school bonding (Resnick, 1997), educational aspiration (Lewinsohn et al., 1993) and school problems (Hooven et al., 2012) are related to suicidal thoughts or behaviors.

8. *Research question:* What are the relationships between each of the educational factors and suicidal ideation once depressive symptoms are accounted for?

   Hypothesis: It is hypothesized that the educational factors will have unique effects on suicidal ideation once depressive symptoms are accounted for in the analyses.

Chapter III: Methods

Participants

Participants are from the Raising Healthy Children (RHC) Project, a longitudinal study of students drawn from 10 public schools in a suburban Pacific Northwest school district. RHC is a study of the etiology of problem behaviors as well as a test of a multi-component preventive intervention. The intervention included instructional staff development for teachers, parenting workshops for parents, summer camps and study clubs for students, and home-based case management services for high-risk students who exhibited academic or behavioral problems. For additional details regarding RHC and the intervention, see (Brown, Fleming, Catalano, Abbott, & Haggerty, 2005; Catalano et al., 2003; Haggerty, Cummings, Harachi, & Catalano, 2004).

After being matched on variables known to be associated with drug use (low-income status, ethnicity, single-parent family, low reading scores, high absenteeism, and mobility), schools were randomly assigned to either the intervention or control condition. Eligibility criteria for student participation in data collection included: being in first or second grade, attending a mainstream classroom, remaining in the project school from baseline (fall of 1993) through the completion of the first student survey by June 1994, and having a parent who spoke English, Spanish, Korean, or Vietnamese.

In 1993 and 1994, 1,040 students and their parents (76% of those eligible) consented to participate in the RHC project. At recruitment, 52% were in first grade (younger cohort) and 48% were in second grade (older cohort). With the exception of the education status variable, the current study used data from 2006, 2007, 2008 and 2009. Participants in the younger cohort were assessed at 19, 20, 21, and 22 years of age, and participants in the older cohort were assessed at 20, 21, 22, and 23. In addition to these 4 years of data, the education status variable will utilize

data from 2005 (age 19) for the older cohort and 2010 (age 23) for the younger cohort (discussed below).

Prior to baseline data collection, parents provided written consent for their children's participation. After age 18, youth participants provided written consent for subsequent data collection. All procedures were approved by a University of Washington Institutional Review Board. Through age 19/20 (younger/older cohort), surveys were administered in person between March and August. Participants self-administered sensitive questions, including those on suicidal ideation. After age 19/20, about two thirds of the sample completed the survey over the Internet, and one third was interviewed in person. A randomized trial of this multimode survey administration indicated no differences in rates of responses for sensitive questions such as sexual behaviors and drug use (McMorris et al., 2009).

Attrition and exclusion accounted for the reduction in sample size from the available 1040 respondents to the 902 respondents included here. To be included in the current study, participants were required to have data on depressive symptoms and each of the substance use variables from at least 3 out of the 4 time points. Of the analysis sample, 53% were males, 52% were in the experimental condition, 48% were in the older cohort. Additionally, 8% self-reported their ethnicity as Hispanic. The racial composition of the sample was 76% white, 3% black, 2% Native American, 6% Asian or Pacific Islander, and 13% mixed race. Compared to the 138 participants from the original sample of 1040 who were excluded, the analysis sample did not differ with respect to gender, race, ethnicity, or cohort (young/older). The sample did differ on experimental condition with more participants in the experimental condition being excluded due to missing data ($p < .05$).

Participants from both conditions (experimental and control) were included in the current

study. Preliminary analyses were run to examine possible group differences in the mean levels of all variables. Prior analyses using RHC data have found little evidence of level difference or non-invariance in outcome such as substance use, mental health, and other behaviors (Bailey, Haggerty, White, & Catalano, 2011; Fleming, White, Oesterle, Haggerty, & Catalano, 2010; Fleming, White, & Catalano, 2010).

Measures

Suicidal ideation. Suicidal ideation was measured using the Suicidal Ideation Questionnaire-Junior (SIQ-Junior; Reynolds, 1988), which has 15 questions about the participants' thoughts and feelings over the last 30 days (e.g., "In the past month, I have thought about killing myself"). Response options were on a seven-point scale (1 = 'almost every day', 7 = 'never had this thought'). Items were reverse coded ('never had this thought'=0, 'almost every day' = 6). A suicidal ideation score with a range from 0 to 90 was created at each of the four time points by summing the scores from each item. The alpha reliability of the scale ranged from .92 to .94 across the time points.

Depressive symptoms. The short form of the Hamilton Depression Inventory (Reynolds et al., 1995) was administered at each time point, from which a measure of depressive symptoms, was derived. The measure was based on the presence and severity of nine depressive symptoms (e.g., "How often do you cry or feel like crying?"). Depressive symptoms scores at each time point range from 0 to 30 and the alpha reliability of the scale ranged from .83 to .86. In addition to the scores at each time point, an average depressive symptom score was calculated by taking the mean across the four time points. Participants were required to have a depressive symptom score from at least 3 of the 4 time points to get an average depressive symptom score.

Substance use. Frequency of heavy drinking, marijuana use, and cigarette smoking were assessed at each time point based on participant's report of use in the prior month. Heavy drinking was defined as "5 or more drinks in a row" for males and "4 or more drinks in a row" for females. The questions were scored on a 7-point scale. For heavy drinking and marijuana use the scale was: 1 = never, 2 = 1 or 2 times, 3 = 3 to 5 times, 4 = 6 to 9 times, 5 = 10 to 19 times, 6 = 20 to 39 times, and 7 = 40 or more times. For cigarette smoking, the scale was: 1 = not at all, 2 = less than 1 cigarette a day, 3 = 1 to 5 cigarettes a day, 4 = about half a pack a day, 5 = about 1 pack a day, 6 = about one and a half pack a day, and 7 = 2 packs or more a day. In addition to the substance use scores at each time point, average heavy drinking, average marijuana use, and average cigarette smoking variables were calculated by taking the mean across the four time points. Participants were required to have data on each substance use from at least 3 of the 4 time points to get an average score for each substance.

Education status. Education status was assessed at each of the 4 time points (ages 19/20, 20/21, 21/22, 22/23), plus one year prior at age 19 for the older cohort and one year later at age 23 for the younger cohort to ensure that the time frame for educational attainment was the same across cohorts. Education status was assessed by the question "Which of the following best describes your current school situation?" Response options were: 1 = GED preparation course, 2= high school, 3 = military training or school, 4 = job corps, 5 = trade school, 6 = technical or vocational school, 7 = community college seeking 2 year degree, 8 = university or college seeking 4 year degree, 9 = graduate school. A three-category variable for education status was created to capture highest amount of education reported by each individual across time points. The three groups created include 'no college', '2-year college', and '4-year college'. The 4-year college group includes individuals who reported seeking a 4-year degree at a university or

college during at least one of the time points. The 2-year college group includes individuals who reported seeking a 2-year degree at community college during at least 1 time point, and the no college group includes individuals who never reported attending community college or a 4-year university during any of the time points.

Grades. Grades were assessed at each time point that a participant was attending school using the question: "In general, what were your grades like this past year?" This item offered a five-point response option that was coded to range from 0 ("mostly E's or F's") to 4 ("mostly A's"). A mean grades score was calculated for each individual who had data during at least one time point.

Educational bonding. An index of educational bonding was created based on 9 items assessing commitment to school (e.g., "How important is it to you to complete the academic program you are enrolled in?"), opportunities for participation (e.g., "At my school or college, students have lots of chances to help decide and plan things like school policies, activities and events") and opportunities for peer relationships (e.g., "It easy to make friends at school"). Items were selected based on previous research using items in similar domains to assess school bonding (Bond et al., 2007; Murray & Greenberg, 2001; Resnick et al., 1997; Simons-Morton et al., 1999). Response options were recoded to reflect a 5-point scale with higher scores reflecting higher bonding. Items were summed to create an educational bonding at each time point. The alpha reliability of the scale ranged from .62 to .76 across assessments. A mean across time points was created for each individual who had at least one data point.

Educational aspiration. Educational aspiration was assessed for each individual at the first time point (age 19/20) based on the participant response to the question "Eventually, how much schooling do you want to get?" Response options were: 1 = some high school, 2= high

school graduate, 3 = GED, 4 = some trade or business school, 5 = some college, 6 = college graduate, 7 = graduate or professional degree.

Months in school. The amount of months participants were in school was assessed at each time point. Participants were asked how many months in the last year they were enrolled in school full-time and how many months they were enrolled part time. At each time point, responses to these two questions were summed, with the number of months part-time divided by 2. The number of months were summed across all four time points to get a total number of months in school for each participant.

Data Analytic Plan

In order to address the research questions, hierarchical linear modeling (HLM) using HLM version 6.08 (Congdon, Raudenbush, & Bryk, 2005-2009) will be employed. HLM is a preferred method to use when analyzing "nested" data (Raudenbush & Bryk, 2002). This statistical procedure is common in educational research, in which students are grouped, or nested, in classrooms. These classes are nested within schools, which are nested within school districts. There may be variables that describe the classroom, school or school district (teaching styles, school building, neighborhood, and so on). HLM makes it possible to incorporate variables from all levels (Raudenbush & Bryk, 2002).

In addition, HLM is a useful tool for analyzing longitudinal data. "The development of hierarchical linear models has created a powerful set of techniques for research on individual change" (Raudenbush & Bryk, 2002; p. 161). If we follow individuals over time, then the measurements for any particular individual are a group, in the same way as the school class is a group. Repeated measures on the same individual can be thought of as being "nested" within that individual (Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). In this sense, HLM can be

used to study changes in individuals' outcomes over time, with several advantages over other commonly used methods such as univariate and multivariate repeated measures and pre-test, post-test differences (Raudenbush & Bryk, 2002). Growth curve analyses in HLM describe each participant's growth trajectory and its relationship with the individual's own baseline performance and allows for the examination of within-individual variations.

When using HLM with longitudinal data with multiple data points for each individual, a two-level hierarchical linear model is appropriate to use (Raudenbush & Bryk, 2002). At level 1, each person's development is represented by an individual growth trajectory that depends on a unique set of parameters, which become the outcome variables in a level-2 model where they depend on person-level characteristics. For the current study, a 2-level poisson growth model was employed to answer the research questions. There were four time points of data (Level 1) nested within each of the 902 individuals (Level 2). The suicidal ideation outcome variable was examined using a series of poisson models (rather than linear models) because of its non-normal distribution (see Table 1). In a HLM growth curve model, Level 1 refers to each participant's growth over time, and at Level 2, the individual growth parameters (i.e., the dependent variables) of the intercept and slope from the Level 1 equation become the outcome variables. In a poisson model, the estimated equation predicts the log of the outcome variable.

Steps to Analyzing Data

In order to answer the research questions, the data were arranged into Level 1 and Level 2 files in SPSS version 19.0.2. Some of the variables were coded or centered in SPSS, whereas others were centered in HLM. The coding and centering processes are described first, followed by the set-up of the Level 1 and Level 2 files.

Coding and centering the variables. First, the time variable for the Level 1 file was

centered. Determining the center point for time is an important first step when conducting HLM analyses because it determines how each coefficient will be interpreted (Raudenbush & Bryk, 2002). In the Level 1 model, the intercept for the analyses will be defined as the first observation of suicidal ideation (i.e., age 19/20). This decision was made in order to facilitate interpreting the results in relation to the research questions. As such, the first time point will be coded as Time 0, the second time point (age 20/21) as Time 1, the third time point (age 21/22) as Time 2, and the fourth time point (age 22/23) as Time 3.

The Level 2 continuous predictor variables (average depressive symptoms, average heavy drinking, average marijuana use, average cigarette smoking, grades, educational bonding, educational aspiration, months in school) were grand mean centered when entered into the models HLM. Grand mean centering yields an intercept equal to the expected value of the outcome variable (i.e., suicidal ideation) for an individual with an "average" level of the dependent variable (e.g., depressive symptoms).

The Level 1 predictor variables, also referred to as time-varying variables, include depressive symptoms, heavy drinking, marijuana use, and cigarette smoking at each of the 4 time points. These variables were group mean centered in HLM when entered into the models. Group mean centering yields an intercept equal to the expected value of the outcome variable (i.e., suicidal ideation) for an individual whose value on the dependent variable (e.g., depressive symptoms) is equal to their own mean across time points. This allows for the assessment of how fluctuations in the dependent variables for an individual (e.g., an increase in heavy drinking) are related to changes in the outcome variable (i.e., suicidal ideation).

The categorical variables were re-coded into dummy variables in order to facilitate the interpretation of the results. When using dummy coding, a reference group must be chosen. The

results are then interpreted in relation to that reference group (Tabachnick & Fidell, 2007). Gender was coded so that females were 0 and males were 1. Experimental condition was coded so that the control group was 0 and experimental condition was 1. The education status groups were re-coded as multiple dummy variables because there were three groups. A dummy variable was created for each of the three groups (i.e., no college, 2-year college, and 4-year college). For example, for the category of no-college, all participants who endorsed no college were coded 1, and those in the 2-year or 4-year college groups were coded 0. Because a dummy variable was created for each of the three education status groups, each of the groups was able to be used as the reference category in HLM.

Creating Level 1 and Level 2 files. The Level 1 file was made by creating a stacked SPSS data file with the time variable, the dependent variable (i.e., suicidal ideation scores), and the time-varying depression and substance use variables. In other words, the data were arranged such that each participant had four rows of data (i.e., suicidal ideation, depressive symptoms, heavy drinking, marijuana use, and cigarette smoking) at each of the 4 time points. Two Level 2 files were created. In the first, all 902 participants were included. The independent variables were arranged by participant and included gender, the average substance use variables, average depressive symptoms, and the education status variables. The second Level 2 file included data for only those participants in the 2-year or 4-year college groups. The same variables included in the first Level 2 file were also included in the second file along with the education variables including grades, educational bonding, educational aspiration, and months in school.

After arranging the data into Level 1 and Level 2 files in SPSS, preliminary analyses were conducted using SPSS. Next the research questions were analyzed using the Hierarchical Linear Modeling 6.08 Software (Raudenbush et al., 2004). The results are provided in the following

chapter.

Chapter IV: Results

Several phases of analyses were conducted in order to answer the research questions. The first phase involved preliminary analyses using SPSS version 19.0.2. First, a set of analyses were run to assess whether the independent or dependent variables differed based on experimental or control condition. Next, means and standard deviations were obtained for each of the variables and Pearson correlations were examined among the different variables. The remaining phases involved growth modeling analyses using the Hierarchical Linear Modeling 6.08 software package (Raudenbush et al., 2004). The results of the preliminary analyses are described first, followed by the results of the growth modeling analyses.

Preliminary Analyses

Because participants from both conditions (experimental and control) were included in the current study, preliminary analyses were run to examine whether there were group differences in the mean levels of all variables. A series of 28 independent samples t-tests were run for all continuous variables. No significant differences were found between the experimental and control group on any of the 28 continuous variables. For all categorical predictor variables, crosstabulation was used to examine group differences. No group differences existed on any of the categorical variables. These results provided reasonable assurance for including participants from both conditions in the current study.

Means and standard deviations of the outcome variable, suicidal ideation, along with the time-varying predictor variables (depressive symptoms, heavy drinking, marijuana use, and cigarette smoking) at each of the four time points are summarized in Table 1. Skewness and Kurtosis of the outcome variable are also presented in Table 1. As can be seen in Table 1,

suicidal ideation at each of the 4 time points was non-normally distributed. For example, at Time 0, the skewness was 4.42 (*SE* = 0.09) and kurtosis of 27.70 (*SE* = 0.17).

Descriptive statistics were also obtained for the level-2 predictor variables and are presented in Table 2. Means and standard deviations are presented for the education status group (i.e., no college, 2-year college, and 4-year college), average depressive symptoms, average heavy drinking, average marijuana use, and average cigarette smoking for the entire sample of 902 participants. In addition, means and standard deviations are presented for the educational factors (i.e., grades, educational bonding, educational aspiration and months in school) for the college subsample. Participants were included in the college subsample if they were in the 2-year or 4-year education group and had non-missing data on the four education factors. This resulted in a subsample of 461 participants. Finally, Pearson correlation coefficients were analyzed to examine the strength and direction of the relationships among variables. These correlations are summarized in Table 3, Table 4, and Table 5.

Hierarchical Models of Suicidal Ideation

Following the recommendations of Raudenbush and Bryk (2002), the unconditional model was analyzed first before examining the more complex models. Variables were added to the unconditional model step-by-step to analyze the research questions. The results of the models are presented in the order of the research questions and are summarized in Tables 6-9.

Unconditional model. The first model was an unconditional poisson model representing initial level and growth rate of suicidal ideation. Estimation for the unconditional model allows for investigating the psychometric characteristics of the estimated individual growth parameters (Raudenbush & Bryk, 2002). In addition, the unconditional model provided the answer to research question 1: How does suicidal ideation change over time during emerging adulthood?

The results of the baseline model are summarized in column 1 of Table 6. Results from unconditional poisson model suggest there were significant differences in initial suicidal ideation and growth of suicidal ideation across time points, t (901) = 7.88, $p < .001$. In other words, individuals varied significantly from one another on their initial levels of suicidal ideation. In addition, there was a negative growth rate in suicidal ideation over time, t (901) = -4.36, $p < .001$.

Gender and suicidal ideation. The second research questions asked about the effect of gender on the initial level of suicidal ideation and the growth of suicidal ideation over time. In order to analyze this research question, gender was added into the Level 2 equation of the unconditional model. The results are presented in column 2 of Table 6. Gender did not significantly predict initial suicidal ideation scores or growth in suicidal ideation.

Substance use and suicidal ideation. The third research question asked about the relationship of each substance use variable to initial level of suicidal ideation and changes in suicidal ideation over time. To analyze this question, the three average substance use variables were added into the model at Level 2 and the time-varying substance use variables were added at Level 1. The results are presented in column 3 of Table 6. At the intercept, model results suggest that there were significant differences in initial level of suicidal ideation based on average marijuana use. That is higher levels of average marijuana predicted higher suicidal ideation scores, t (897) = 2.45, $p < .05$. Neither heavy drinking nor cigarette smoking significantly predicted initial suicidal ideation. When analyzing the slope, none of substance use variables were related to changes in suicidal ideation over time. In other words, there was no evidence that suicidal ideation scores declined more or less rapidly over time based on substance use.

At the within-individual level, fluctuations in heavy drinking and marijuana use, but not cigarette smoking, predicted corresponding changes in suicidal ideation away from an individual's trajectory, t (3405) = 2.17, $p < .05$; t (3405) = 2.63, $p < .01$. This suggests that changes in marijuana use and cigarette smoking above or below an individual's average use were related to changes in suicidal ideation in the same direction.

Substance use, depression and suicidal ideation. The fourth research question asked about the relationship between depressive symptoms and suicidal ideation, and whether the associations between the substance use variables remained significant once depressive symptoms were added into the model. To answer this research question, the average depressive symptoms variable was added into the model at Level 2, and time-varying depressive symptoms were added at Level 1. Results are presented in column 4 of Table 6.

Results indicated that average depressive symptoms were significantly predictive of initial suicidal ideation, t (896) = 13.81, $p < .001$. That is, higher levels of average depressive symptoms were significantly associated with higher suicidal ideation. There was also a significant effect for average depressive symptoms on the slope, t (896) = 2.19, $p < .05$. Specifically, higher levels of average depressive symptoms were related to a less steep decline in suicidal ideation over time. When examining within-individual effects, fluctuations in depressive symptoms were strongly associated with fluctuations in suicidal ideation, t (3402) = 8.92, $p < .01$. This suggests that changes in depression are related to analogous changes in suicidal ideation.

Once depressive symptoms were added into the model, the association between average marijuana use and initial level of suicidal ideation became non-significant. The time-varying relationship between marijuana use and depressive symptoms was also fully accounted for by

depressive symptoms. Conversely, within-individual variations in heavy drinking and suicidal ideation remained significant with depressive symptoms in the model, t (3402) = 2.22, $p < .05$.

Education status and suicidal ideation. The fifth research question asked about whether there were differences in initial level and growth of suicidal ideation for participants based on educational status. To analyze this research question, the 2-year and 4-year college dummy variables were added into the unconditional poisson model at Level 2. The reference group was the no college group. Gender was also included at this step. Findings are presented in Table 7. Findings of this model indicate that individuals in the 4-year college group reported more suicidal ideation than those in the no college group, t (898) = 2.06, $p < .05$. Suicidal ideation scores for those in the 2-year college group did not differ significantly from those in the no college group. When analyzing the slope, there was not a significant difference in change over time for the 2-year or 4-year college group compared to the no college group.

Education status, substance use, depression, and suicidal ideation. The sixth research question asked whether heavy drinking, marijuana use, cigarette smoking and depressive symptoms had unique effects on suicidal ideation based on education status. To examine this question, suicidal ideation was modeled separately for the three education groups. First, an unconditional model was run for each education group. For the no college group, the intercept from the unconditional models was not significant. This indicates individuals in the no college group did not differ significantly from one another on their initial levels of suicidal ideation. The slope of suicidal ideation was significant for those in the no college group indicating a decline in suicidal ideation over time, t (354) = -2.88, $p < .001$. Results of the unconditional model for those in the 2-year college groups were similar to the unconditional model for the full sample. Findings suggested significant differences in initial suicidal ideation and growth of suicidal

ideation for individuals across time points, t (225) = 5.34, $p < .001$; t (225) = -3.45, $p < .01$. In other words, for those in the 2-year college group, individuals varied significantly from one another on their initial levels of suicidal ideation and there was a negative growth rate in suicidal ideation over time. Interestingly, for those in the 4-year college group, the intercept was significant for initial suicidal ideation, t (320) = 7.64, $p < .001$, but not for the slope. That means that for those reporting 4-year college, individuals varied significantly from one another on their initial levels of suicidal ideation, but there was no significant decrease over time, unlike those in the no college and 2-year college groups.

Next, the average substance use variables and average depressive symptoms were added at Level 2 and the time-varying substance use variables and depressive symptoms were added at Level 1 for each of the three education groups. Results of these three models are presented in Table 8.

For the no college group, depressive symptoms were significantly predictive of initial suicidal ideation, t (1312) = 8.15, $p < .001$. None of the average substance use variables predicted initial suicidal ideation for this group. In regards to the slope, neither depressive symptoms nor substance use variables predicted changes in suicidal ideation over time. At the within-individual level, changes in marijuana use and depressive symptoms were related to changes in suicidal ideation, t (1312) = 8.15, $p < .001$; t (1312) = 2.80, $p < .01$. This suggests that for those in the no college group, short-term fluctuations in heavy drinking and depressive symptoms away from an individual's trajectory were related to changes in suicidal ideation.

When the substance use variables and depressive symptoms were included in the model for the 2-year college group, there was a somewhat surprising association between heavy drinking and suicidal ideation. Average heavy drinking was significantly associated with suicidal

ideation t (220) = -3.19, p > .001. However, this association was not in the expected direction. Lower reported heavy drinking was predictive of higher initial suicidal ideation. Higher depressive symptoms were also associated with higher suicidal ideation in the 2-year college group, t (220) = 5.89, p < .001. In addition, within-individual variations in heavy drinking and depressive symptoms were positively and uniquely related to fluctuations in suicidal ideation away from an individual's trajectory, t (842) = 2.08, p > .001, t (842) = 3.07, p > .001. These associations were in the expected direction and indicate that that short-term changes in heavy drinking and depression were related to changes in suicidal ideation in the same direction for those in the 2-year college group.

For those in the 4-year-college group, there were no associations between any of the substance use variables on initial suicidal ideation, the slope, or within-individual change in suicidal ideation. Interestingly, once the substance use variables and depressive symptoms were added to the model, the intercept of the slope became significant and reflected a decline in suicidal ideation over the 4 time points, t (315) = -2.11, p < .05. Similar to the no-college and 2-year college groups, higher depressive symptoms predicted higher suicidal ideation, and changes in depressive symptoms were predictive of fluctuations in suicidal ideation away from an individual's trajectory, t (315) = 8.60, p < .001; t (1216) = 5.86, p < .05.

Educational factors and suicidal ideation. The seventh research question asked to what extent educational factors such as grades, educational aspiration, educational bonding and number of months in school were related to suicidal ideation among those attending 2-year or 4-year college. The college subsample, rather than the whole sample, was utilized to answer this question. First, using the college subsample, an unconditional poisson model was run. Results of the unconditional model (column 1, Table 9) were similar to unconditional model with the full

sample. Suicidal ideation varied among individuals and decreased over the four time points, t (460) = 8.21, $p < .001$; t (460) = -2.65, $p < .01$.

The next step was to examine the relationship between educational factors and suicidal ideation. To do this, all four of the educational factors were simultaneously entered into the model at Level 2. In addition, the 2-year college variable was also entered into the model (the reference group was the 4-year college group). Results indicated that grades and educational bonding were significantly associated with suicidal ideation, t (460) = 2.85, $p < .01$; t (460) = -3.60, $p < .001$. More specifically, higher reported grades were predictive of higher initial suicidal ideation. Conversely, lower educational bonding was uniquely predictive of higher initial suicidal ideation. Education aspiration and months in school were not predictive of initial suicidal ideation, and those in the 2-year group did not statistically differ from those in the 4-year group. In addition, none of the educational factors were related to the slope.

Educational factors, depressive symptoms, and suicidal ideation. The final research question examined whether the effects of educational factors remain significant once depressive symptoms are accounted for. To answer this question, depressive symptoms were added to the model to examine whether the effects of grades and bonding remained significant. Results are presented in column 4 of Table 9. Results of the model with depressive symptoms at Level 2 and Level 1 revealed that, similar to the models with the full sample, depressive symptoms predicted suicidal ideation, changes in suicidal ideation over time, and within-individual variations in suicidal ideation, t (453) = 8.35, $p < .001$; t (453) = 2.24, $p < .05$; t (1761) = 5.10, $p < .001$. In addition, grades continued to predict initial suicidal ideation, t (453) = 2.18, $p < .05$. That is, even when depression is accounted for, higher grades were uniquely predictive of higher suicidal

ideation. The relationship between bonding and suicidal ideation was no longer significant when depressive symptoms were added to the model, $p = .06$.

Chapter V: Discussion

Suicidal ideation is one of the strongest predictors of a future suicide attempt and is related to risk of death by suicide (Brent et al., 1993; Lewinsohn et al., 1996; Mazza & Reynolds, 2008; Reinherz et al., 1995). Individuals with persistent suicidal ideation in the context of other risk factors are often deemed by clinicians to be at high risk for suicidal behavior, including attempts and death. Thus, the purpose of the current study was to examine suicidal ideation over time during emerging adulthood to enhance the current understanding of the nature and development of suicidal ideation in young people. Specifically, suicidal ideation was examined over four years during emerging adulthood and specific dimensions of the relationships between suicidal ideation and education status, cigarette smoking, marijuana use, heavy drinking, depressive symptoms, and numerous educational factors were tested. The present study expands the literature by examining factors that may be important predictors of suicidal thoughts and behaviors in a large community sample (rather than a university-based sample) over time.

Suicidal Ideation Trajectories and Effect of Gender

It was hypothesized that suicidal ideation would decrease over the four years of young adulthood. Data from the CDC indicates that suicidal ideation is higher in young adults aged 18-29 than among adults over age 30, suggesting a decrease during emerging adulthood (CDC, 2012). Similarly, Brener et al. (1999) found that college students aged 18 to 24 years were more like than those aged 25 years or older to have considered suicide in the previous 12 months, and that freshmen and sophomores were more likely than seniors to have considered suicide. Consistent with this literature, the current study revealed that suicidal ideation decreased over the four time points during young adulthood.

In contrast to previous research, gender was not predictive of suicidal ideation or its trajectory over time. It was hypothesized that female gender would predict higher suicidal ideation as females have generally reported higher levels of suicidal ideation than their male counterparts in previous research (Arria et al., 2009; CDC, 2011; Gould et al., 2003). It was also hypothesized that females would experience a faster decline in suicidal ideation over time. Previous longitudinal studies have suggested that gender plays an important role in the developmental trajectories of suicidal thoughts and behaviors during adolescents and emerging adulthood. Lewinsohn et al. (2001) found that the risk of suicide attempts was highest for females between ages 15-19 and their risk decreased significantly during the period of 19 to 23 years. Boys risk during adolescents was about half that of the girls, but by age 19, their risk was similar but did not decline over time through age 23. Similarly, Boeninger et al. (2010) found that in a sample of 11 to 19 year old adolescents, boys' serious suicidal ideation and plans increased linearly thorough age 19, whereas the girls' levels peaked around age 16 and then began decreasing.

It is unclear why the data from the present study demonstrated no differences in suicidal ideation between males and females. One possible reason for no gender effect on the trajectory was that the Lewinsohn et al. (2001) and Boeninger et al. (2010) studies examined serious suicidal ideation, plans and attempts, whereas the current study examined suicidal ideation as a continuous variable capturing very few symptoms of suicidal ideation all the way through more frequent and intense thoughts of suicide. Moreover, the generally low mean level of suicidal ideation found in the present study suggests that this study may have captured the lower end of the suicide continuum. These findings may indicate that, despite the gender differences in the trajectories of more severe levels of suicidality (e.g., seriously considering suicide and attempts),

differences in suicidal ideation may not be as prevalent when the full spectrum of suicidal ideation, including the lower end, is considered.

Suicidal Ideation and Depressive Symptoms

Consistent with previous research, higher depressive symptoms were related to higher levels of suicidal ideation in the current study (Garlow et al., 2007; Lewinsohn et al., 1993; Mazza & Reynolds). Moreover, a unique finding in the current study was that higher depressive symptoms predicted a less steep decline in suicidal ideation over time. Past research suggests that higher depressive symptoms predict higher later suicidal ideation (Douglas et al., 2012; Garrison et al., 1991; Mazza & Reynolds, 1998), but there is limited research examining how depression is related to the trajectory of suicidal ideation. This study adds to the literature by suggesting that individuals experiencing a high number of depressive symptoms may not experience the decline in suicidal ideation that would be expected during this developmental time frame. The findings from this study imply that high depression symptoms may lead an individual to maintain higher levels of suicidal ideation. It should be noted that depressive symptoms did not predict suicidal ideation trajectories when the three education groups were examined independently, which is likely due to reduced sample size in the educational groups compared to the full sample. Another important finding from the current study was that short-term changes in depressive symptoms were related to changes in suicidal ideation away from an individual's trajectory. This finding extends the work of Mazza and Reynolds (1998) who found that changes in depressive symptoms were related to changes in suicidal ideation.

Suicidal Ideation and Substance Use

The current study assessed whether heavy drinking, marijuana use, and cigarette smoking predicted initial levels of suicidal ideation, suicidal ideation trajectories, and within-individual changes in suicidal ideation. It also examined whether there were unique substance use patterns based on education group. Overall, the findings suggest that marijuana use and heavy drinking are important markers for changes in suicidal ideation, particularly for those not attending college or in 2-year college. In contrast, in the 4-year college group, none of the substance use variables had unique effects on suicidal ideation suggesting substance use may be a better predictor of suicidal thoughts in those not attending college or attending community college.

Marijuana use. In the full sample, higher reported marijuana use was predictive of higher initial suicidal ideation, and changes in marijuana use were predictive of changes in suicidal ideation away from an individual's trajectory in the same direction. However, once depressive symptoms were accounted for, these relationships were no longer significant. When the education groups were examined independently, for individuals reporting no college, changes in marijuana use were related to changes in suicidal ideation, and this finding was significant when depressive symptoms were accounted for.

Previous research has found that marijuana use is related to suicidal ideation (Brener et al., 1999; Greenblatt, 1998), suicide attempts (Burge et al., 1995; Greenblatt, 1998), and deaths (Kung et al., 2003), but none of these studies controlled for depressive symptoms. Moreover, other studies have found no association between suicidal ideation and cannabis use disorder (Arria, 2009) and cannabis dependence (Lynskey et al., 2004). The current study extends these findings by suggesting that chronic marijuana use is related to suicidal ideation but only in the context of higher depressive symptoms. However, a unique and important contribution from the

current study is the finding that short-term changes in marijuana use strongly predicted corresponding fluctuations in suicidal ideation beyond the impact of increased depressive symptoms for those in the no college group. Thus, for individuals not attending college, a sudden increase in marijuana use appears to be an important indicator of heightened risk for suicidal thoughts that may not be captured through depressive symptoms. These finding is especially important given that individuals who do not go on to college have been shown to report higher overall marijuana use compared to individuals going on to 2- or 4-year college (Fleming et al., 2012).

Heavy drinking. In the full sample, higher reported heavy drinking was not predictive of initial suicidal ideation or the slope. However, changes in heavy drinking predicted changes in suicidal ideation in the same direction, and this finding remained even when depressive symptoms were accounted for. When the education groups were examined independently, this finding was also true for the 2-year college group. Interestingly, lower average heavy drinking predicted higher suicidal ideation in the 2-year college group. Heavy drinking was not uniquely predictive of any of the suicidal ideation outcomes for those in the no college or 4-year college groups.

It was surprising to find that lower heavy drinking predicted higher suicidal ideation for the 2-year college group given previous research demonstrating a relationship between higher heavy drinking and suicidal ideation and attempts (Brener et al., 1999; Miller et al., 2007; Schaffer et al., 2008; Windle et al., 1992; Wu et al., 2011). One possible explanation for this unexpected finding is that heavy drinking may be a proxy for social engagement or support. That is, heavy drinking among young people is often in the context of social events and activities. Therefore, this finding of increased suicidal ideation for those with lower heavy drinking may represent a

lack of social support for those attending community college, such as the absence of fraternities or sororities. Lack of social support is an important risk factor for suicidal ideation (Arria et al., 2009), and research shows that student members of a sorority or fraternity are less likely to report suicidal ideation (Brener et al., 1999). In addition, residence in a fraternity or sorority is strongly correlated with heavy drinking among college students (Wechsler, Dowdall, Davenport, & Castillo, 1995). Compared to those attending 4-year universities, those attending community colleges may have less social opportunities (e.g., sororities/fraternities, student organizations, sporting events), and therefore they report less heavy drinking and more suicidal ideation.

No known studies have examined how changes in heavy drinking are related to suicidal ideation. The finding that changes in heavy drinking predict changes in suicidal ideation for the full sample and for the 2-year college group irrespective of high depressive symptoms adds to the current literature on impact of alcohol use on suicidal thought and behaviors. This finding implies that individuals attending community college who experience an increase in the frequency of their heavy drinking may experience intensified thoughts of suicide not captured solely through an increase in reported depressive symptoms. This finding also underlines the importance of examining individual's binge drinking patterns, such as recent increases in heavy drinking, when assessing suicide risk.

Cigarette smoking. Cigarette smoking did not uniquely predict any of the suicidal ideation outcomes in the present study. Cigarette smoking has previously been identified as an important risk factor for suicidal ideation (Bronish et al., 2008) and attempts (Bronish et al., 2008; Oquendo et al., 2004). However, findings from the current investigation provide evidence to the contrary and posit that depressive symptoms, marijuana use, and heavy drinking are better markers for suicidal ideation.

Suicidal Ideation and Educational Status

It was hypothesized that individuals in the 2-year and 4-year college groups would report lower suicidal ideation than those in the no college group and that those in the 4-year group would report lower suicidal ideation than those in the 2-year group. These hypotheses were based on literature demonstrating that low educational attainment is a risk factor for suicide attempts after controlling for psychiatric disorders (Kessler et al., 1999). Additionally, young people not attending school have been shown to be at heightened risk for suicide compared to those attending school (Gould et al., 1996) and rates of suicide have been shown to be lower in college students than national rates (Silverman et al., 1997). In the current study, those attending 4-year colleges reported significantly more suicidal ideation than those reporting no college.

It is somewhat unclear why attending 4-year college compared to no college would predict higher initial suicidal ideation, and why 4-year college did not predict a downward slope similar to the other two education groups. Similar to the findings with gender, previous literature in this area has focused on deaths from suicide, whereas the present study examined suicidal ideation on a continuum. Some additional possibilities that might explain the higher suicidal ideation among those attending 4-year college include increased stress due to academic pressures, changes in environment (e.g., moving away from home or to a new state), and changes in substance use patterns. Arria et al. (2009) theorized that suicidal ideation in young college students may have a unique etiology because of developmental transitions that occur in young adulthood, including changes in family relationships, peer contexts, and increase opportunities for alcohol and drug use. In addition, a recent studying utilizing the same sample as the current study examined substance use trajectories for different educational pathways (Fleming et al., 2012). Findings indicated that those who did not go on to college had the highest levels of

substance use in high school and maintained their use during the post-high school time period, whereas those who went from high school to a 4-year university experienced the biggest increases in heavy drinking and marijuana use during this time and their substance use rates actually caught up to the other groups. Drastic increases in substance use as individuals move from high school to a 4-year university such as those identified by Fleming et al. (2012), along with other environmental changes and stressors specific to the university context, could possibly account for the higher suicidal ideation in the 4-year college group.

Suicidal Ideation and Additional Educational Factors

Additional educational variables beyond school status were examined in the current investigation as well. It was hypothesized that higher grades, educational bonding, and educational aspiration, and more months enrolled in school would predict lower suicidal ideation. Consistent with this hypothesis, lower educational bonding predicted higher initial suicidal ideation. However, once depressive symptoms were accounted for, this relationship was no longer significant. Previous research has indicated that lower educational bonding is related to higher emotional problems (e.g., anxiety and depression symptoms), substance use (Bond et al., 2007; Resnick et al., 1997), suicidal thoughts and behaviors (Resnick et al., 1997), and suicide attempts (Svetaz et al., 2000). However, these studies examined school bonding and connectedness in high school students, and it appears that no studies have examined the relationship between school bonding and suicidal ideation in a college sample. Additionally, none of these studies controlled for depressive symptoms. Thus, the current study extends the literature by examining the effect of school connectedness on suicidal ideation taking depressive symptoms into account in a sample of college students. Findings suggest that while lower educational bonding at the post-high school level may be an important marker for suicidal

ideation, this relationship is fully accounted for by depressive symptoms. It may be that individuals that experience poor bonds with their school system develop thoughts of suicide, but these suicidal thoughts are primarily in the context of increased depressive symptoms.

In addition to educational bonding, grades were also predictive of suicidal ideation but not in the expected direction. Specifically, higher grades predicted higher suicidal ideation and this finding remained significant even once depressive symptoms were taken into account. This relationship between grades and suicidal ideation was surprising given previous literature demonstrating that school problems, including dissatisfaction or problems with grades, are related to suicide attempts and suicide risk (Hooven et al., 2012; Lewinsohn et al., 1993). However, no known studies have specifically examined the relationship between reported grades (versus problems or dissatisfaction with grades) and suicidal ideation in college students. It may be that individuals reporting higher grades at the college level experience more academic stress or anxiety related to achievement. Additionally, anxiety has been shown to be associated with higher grades in college students (Svanum & Zody, 2001) and to be an independent risk factor for subsequent onset of suicidal ideation and attempts (Sareen et al., 2005). Moreover, those with higher grades may be more perfectionistic, and there is some evidence that perfectionism is related to depression (Hewitt et al., 2002) and suicidal ideation (Beevers & Miller, 2011; Hewitt, Newton, Flett, & Callander, 1996).

Educational aspiration did not predict suicidal ideation in the current study. A plausible explanation for this failure to support the hypothesis was that the college subsample used in this analysis was restricted to young adults attending college, thereby limiting the variation in educational aspiration and likely restricting it to those with high aspiration. Additionally, number of months in school did not predict suicidal ideation. This was the first time duration in school

was examined in relation to suicidal ideation and this finding suggests that it is not an important risk factor for suicidal thoughts.

Limitations and Future Research

Despite this study's many strengths including a large sample size with a community-based sample of young adult participants, strong experimental research design, and carefully collected data, there are several important limitations that must be addressed. This study examined suicidal ideation, trajectories of suicidal ideation, and within-individual changes in suicidal ideation in 19 to 23 year olds only. Therefore, the results cannot be generalized to children, adolescents, or older adults. Another limitation is that there were only four time points in this study. While four time points is sufficient to analyze change over time, additional time points would have provided more opportunities for analysis, such as testing for a quadratic association. Additionally, had suicidal ideation data had been collected during adolescence for this sample, it could have been included in the analyses to examine a broader developmental time frame.

Another limitation in the current study is the demographic composition of the sample. The RHC participants were recruited from the suburbs in the Pacific Northwest region of the United States and were primarily white. Additionally, demographic factors such as race, ethnicity, and socioeconomic status, were not taken into account in the current study. Caution must be taken in generalizing the findings to specific ethnic, racial, socioeconomic, or regional groups.

The participants in the current sample reported low suicidal ideation, which may have affected the ability to detect effects of the research variables on suicidal ideation. In addition, in the current study, suicidal ideation was examined as a continuous variable using poisson

modeling techniques. In retrospect, given the large number of participants reporting very little to no suicidal ideation, it may have been beneficial to model suicidal ideation as a binomial outcome. It is recommended that future research using the data set examine suicidal ideation as a dichotomous variable to allow for a more straightforward interpretation of the data, including the use of odds ratios.

Another major limitation of the current studies lies in the way the educational status variable was established and the heterogeneous nature of each of the status groups. For example, the no college group includes participants who reported no high school diploma, a GED, a high school diploma and those in trade and vocational programs. There may be meaningful differences among individuals reporting different levels of education that were not well captured in the current study. Additionally, participants only had to indicate attending 2- or 4-year college at one time point to be in included in the respective 2-year college or 4-year college groups. Thus, an individual reporting 2-year college at one time point would be included in the same group as an individual reporting 2-year college at all four time points. Changes in educational status, such dropping out of school or moving from community college to a four-year college, could have important implications on individual's mental health including their substance use, depressive symptoms and suicidal ideation. Finally, in the college subgroup analyses, the 2-year and 4-year college groups were examined together. Examining the groups independently to examine whether factors such as bonding may be more or less related to suicidal ideation based on the type of school a participant is attending may be an area for future research.

Finally, the current study examines suicidal ideation and does not address the extent to which individuals are at risk for an actual suicide attempt, which is an important consideration for clinical practice. Despite research showing that suicidal ideation is an important risk factor

for later attempts, there are likely other factors that are strongly related to suicide risk. For example, suicide completion rates actually increase with age (CDC, 2012) and the current analyses along with past findings (Brener et al., 1999; CDC, 2012) show declining suicidal ideation during adolescence and young adulthood. Therefore, it is important for future research to examine what factors may be related to this possible discrepancy in trajectories as well as factors contributing to individuals moving from ideation to attempts.

Implications

Despite these limitations, results from the current study show great promise for clinical applications moving forward. As rates of suicidal ideation, attempts and deaths in young adults continue to remain high (CDC, 2012), it seems more crucial than ever to understand important educational, social, and environmental influences to improve youth health outcomes.

For mental health professionals working with young adults, the findings from this study suggest that when assessing suicide risk, determining levels of depression and substance use is indicated. Furthermore, this study's findings highlight the important of practitioners not only assessing the levels of depressive symptoms, marijuana use and heavy drinking, but also examining whether individuals have experienced recent changes in their depressive symptoms or substance use patterns. Furthermore, for those attending college, examining grades and educational bonding may also be important. The findings are also relevant for prevention programming. Including information on the importance of changes in substance use patterns as a risk factor for suicidal ideation may be beneficial for suicide reduction initiatives. Additionally, prevention work could include providing more information to young adults about the benefits and risks of marijuana use and heavy drinking as well as information on the importance of seeking help when substance use patterns increase.

In conclusion, the current study serves as initial step in developing a better understanding of suicidal ideation during the developmental period of emerging adulthood. This study suggests that suicidal ideation decreases during emerging adulthood and that males and females have similar rates and trajectories. Given the fact that rates of death due to suicide increase throughout the lifespan, this finding highlights a discrepancy between the trajectories of suicidal thoughts and deaths from suicide. This study provides a foundation and impetus for investigating suicidal ideation over time and underlines a need to assess the association between thoughts of suicide and actual suicide risk. Also supported by the current study's findings is the understanding that suicidal thoughts are complex and are impacted by numerous psychological and educational risk factors including depressive symptoms, substance use, grades, educational bonding, and college status. These findings have important implications for mental health professionals treating young adults, prevention programming aimed at reducing suicidal thoughts in young adults, and future research in this area.

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Table 1
Descriptive Statistics for Dependent Variable and Level 1 Variables

				Skewness		Kurtosis	
	N	**M**	**SD**	**Statistic**	**SE**	**Statistic**	**SE**
Suicidal Ideation							
Time 0	812	4.61	8.71	4.42	.09	27.70	.17
Time 1	878	4.16	9.48	5.36	.08	37.35	.17
Time 2	888	4.30	8.84	4.56	.08	29.81	.17
Time 3	888	4.03	8.56	5.09	.08	36.98	.16
Depressive Symptoms							
Time 0	866	3.20	3.50				
Time 1	869	3.32	3.88				
Time 2	884	3.26	3.96				
Time 3	882	3.00	3.79				
Heavy Drinking							
Time 0	866	1.87	1.29				
Time 1	878	1.94	1.29				
Time 2	888	1.97	1.32				
Time 3	888	1.96	1.30				
Marijuana Use							
Time 0	866	1.94	1.42				
Time 1	877	2.00	1.47				
Time 2	888	1.96	1.41				
Time 3	888	1.88	1.39				
Cigarette Smoking							
Time 0	867	1.93	1.80				
Time 1	878	1.96	1.85				
Time 2	888	1.90	1.77				
Time 3	888	1.90	1.82				

Table 2
Descriptive Statistics for Level 2 Variables for Full Sample and College Subsample

Dichotomous/Categorical Variables	**N**	**% of sample**	**N**	**% of sample**
Education Status				
No College	355	39.4%	355	39.4%
2-Year College	226	25.1%	226	25.1%
4-Year College	321	35.5%	321	35.5%

	Full Sample			**College Subgroup^**		
Continuous Variables	**N**	**M**	**SD**	**N**	**M**	**SD**
Average Depression	902	3.20	2.07	461	3.02	2.79
Average Heavy Drinking	902	1.94	1.01	461	1.85	.94
Average Marijuana Use	902	1.95	1.28	461	1.63	1.23
Average Cigarette Smoking	902	1.92	1.54	461	1.50	.92
Grades^	--	--	--	461	3.16	.61
Educational Bonding^	--	--	--	461	4.09	.44
Educational Aspiration^	--	--	--	461	6.16	.85
Months in School^	--	--	--	461	18.78	9.43

^College subgroup includes those in “2-year college’ or “4-year college’ groups included

Table 3
Pearson Correlations Among Level 2 Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Gender (male)	1											
(2) No College	.06	1										
(3) Some 2-Year College	.00	--	1									
(4) Some 4-Year College	-.06	--	--	1								
(5) Grades^	-.19**	--	-.10*	.10	1							
(6) Educational Bonding^	-.01	--	.04	-.04	.27**	1						
(7) Educational Aspiration^	-.09	--	-.27**	.27**	.07	.09	1					
(8) Months in School^	-.01	--	-.57**	.57**	.07	-.06	.34**	1				
(9) Average Depression	-.20**	.05	-.02	-.04	.03	-.27**	-.04	-.03	1			
(10) Average Heavy Drinking	.14**	.08*	-.00	-. 08*	-.09	.03	.01	.02	.05	1		
(11) Average Marijuana Use	.14**	.19**	-.02	-.18**	-.08	.00	-.17**	-.19**	.14**	.39**	1	
(12) Average Cigarette Smoking	.06	.33**	-.01	-.32**	-.06	-.05	-.22**	-.28**	.16**	.31**	.45**	1

^only those in "2-year college' or "4-year college' groups included, those in 'no college' group not included
**p < .01, *p < .05

Table 4
Pearson Correlations Among Level 2 and Level 1 Variables

	Gender (male)	No college	2-yr. college	4-yr. college	Grades^	Bonding^	Aspire^	Months^	Depression	Heavy	Marijuana	Cigarette
S1	-.04	.01	.07*	-.05	0.02	-0.15*	-0.05	0.01	.44**	.07	.05	.04
S2	-.01	.02	.00	-.02	0.15*	-0.05	0.01	-0.06	.43**	.02	.12**	.07*
S3	.00	-.02	.03	-.00	0.03	-0.13**	0.00	-0.06	.46**	-.03	.08*	.07*
S4	-.01	-.03	-.02	.05	0.13**	-0.08	-0.02	-0.03	.45**	.00	.05	.05
D1	-.17**	.06	-.00	-.06	0.00	-0.21**	-0.08	-0.02	.78**	.04	.13**	.14**
D2	-.17**	.06	-.03	-.04	0.04	-0.18**	0.00	-0.04	.83**	.05	.12**	.12**
D3	-.16**	.02	.00	-.02	0.04	-0.24**	-0.02	-0.03	.82**	.01	.10**	.14**
D4	-.14**	.05	-.04	-.01	0.02	-0.23**	-0.04	-0.01	.78**	.05	.09*	.12**
H1	.05	.06	-.01	-.05	-0.12*	0.04	-0.05	-0.07	.03	.74**	.30**	.23**
H2	.11**	.060	.01	-.07*	-0.08	0.05	0.02	-0.07	.04	.80**	.36**	.28**
H3	.11**	.07*	-.01	-.06	0.02	0.05	-0.02	0.03	.04	.79**	.28**	.26**
H4	.14**	.04	-.00	-.04	-0.11*	-0.02	0.01	0.07	.02	.77**	.26**	.19**
M1	.11**	.18**	-.01	-.17**	-0.08	-0.01	-0.14**	-0.16*	.13**	.37**	.81**	.39**
M2	.13**	.15**	-.03	-.12**	-0.07	0.02	-0.12**	-0.16*	.11**	.33**	.88**	.43**
M3	.15**	.16**	.00	-.16**	-0.04	0.00	-0.16**	-0.19**	.14**	.34**	.88**	.39**
M4	.11**	.15**	-.01	-.14**	-0.07	-0.01	-0.17**	-0.13*	.08**	.28**	.84**	.33**
C1	.05	.29**	-.00	-.29**	-0.02	-0.03	-0.24**	-0.25**	.13**	.27**	.43**	.89**
C2	.06	.32**	-.03	-.30**	-0.04	-0.02	-0.20**	-0.26**	.17**	.27**	.44**	.92**
C3	.06	.31**	-.01	-.31**	-0.09	-0.08	-0.21**	-0.28**	.14**	.30**	.39**	.91**
C4	.03	.28**	-.01	-.28**	-0.07	-0.05	-0.17**	-0.23**	.14**	.28**	.35**	.88**

S = Suicidal Ideation, D = Depression, H = Heavy Drinking, M = Marijuana Use, C = Cigarette Smoking, 1 = Time 1, 2 = Time 2, 3 = Time 3, 4 = Time 4
^ only those in "2-year college' or "4-year college' groups included, those in 'no college' group not included
**p < .01, *p < .05

Table 5
Pearson Correlations Among Level 1 Variables

	S1	S2	S3	S4	D1	D2	D3	D4	H1	H2	H3	H4	M1	M2	M3	M4	C1	C2	C3	C4
S1	1																			
S2	.50**	1																		
S3	.35**	.42**	1																	
S4	.34**	.26**	.37**	1																
D1	.53**	.41**	.33**	.29**	1															
D2	.38**	.48**	.34**	.29**	.62**	1														
D3	.26**	.27**	.46**	.31**	.47**	.55**	1													
D4	.24**	.24**	.33**	.54**	.41**	.49**	.57**	1												
H1	.01	.04	-.05	.00	.06	.04	-.01	.01	1											
H2	-.01	.03	-.02	.01	.04	.07*	.00	.03	.50**	1										
H3	.02	.00	.00	-.01	.01	.03	.05	.03	.41**	.50**	1									
H4	.00	-.01	-.05	.00	-.01	.01	.00	.07*	.38**	.47**	.52**	1								
M1	.03	.11**	.04	.02	.14**	.14**	.08*	.04	.36**	.32**	.22**	.24**	1							
M2	.09**	.16**	.11*	.06	.12**	.11**	.08*	.04	.26**	.35**	.22**	.21**	.66**	1						
M3	.04	.08*	.10*	.07	.11**	.09*	.13**	.12**	.21**	.32**	.31**	.22**	.58**	.69**	1					
M4	.01	.05	.01	.01	.07*	.04	.03	.08	.19**	.26**	.18**	.24**	.51**	.62**	.72**	1				
C1	.04	.06	.05	.06	.15**	.09*	.09*	.10*	.25**	.26**	.19**	.14**	.39**	.41**	.36**	.30**	1			
C2	.09*	.11**	.10*	.05	.16**	.15**	.13**	.11*	.19**	.28**	.22**	.14**	.36**	.45**	.38**	.30**	.80**	1		
C3	.02	.04	.07*	.03	.12**	.09*	.12**	.11**	.19**	.26**	.28**	.18**	.34**	.37**	.36**	.27**	.74**	.78**	1	
C4	.02	.02	.04	.03	.10*	.10*	.14**	.11**	.18**	.20**	.25**	.21**	.29**	.31**	.31**	.31**	.67**	.73**	.77**	1

S = Suicidal Ideation, D = Depression, H = Heavy Drinking, M = Marijuana Use, C = Cigarette Smoking, 1 = Time 1, 2 = Time 2, 3 = Time 3, 4 = Time 4
**p < .01, *p < .05

Table 6
Poisson Model of Suicidal Ideation Examining Gender, Substance Use, and Depression

	Unconditional Model	**Gender**	**Substance Use**	**Substance Use & Depression**
FIXED EFFECTS	***Coefficient (SE)***	***Coefficient (SE)***	***Coefficient (SE)***	***Coefficient (SE)***
Initial Suicidal Ideation				
Intercept	.51 (.06)*	.60 (09)**	.61 (.09)**	.42 (.08)**
Gender (male)	---	-.18 (.12)	-.21 (.13)	.18 (.11)
Average Heavy Drinking	---	---	-.07 (.07)	-.06 (.06)
Average Marijuana Use	---	---	.12 (.05)*	.06 (.04)
Average Cigarette Smoking	---	---	-.01 (.06)	-.08 (.05)
Average Depression	---	---	--	.25 (.02)**
Yearly Growth Rate Suicidal Ideation				
Intercept	-.11 (.02)**	-.11 (.03)**	-.11 (.03)**	-.12 (.03)**
Gender (male)	---	.00 (.05)	.00 (.05)	.01 (.05)
Average Heavy Drinking	---	---	.02 (.03)	.02 (.03)
Average Marijuana Use	---	---	.01 (.02)	-.00 (.02)
Average Cigarette Smoking	---	---	.00 (.02)	-.01 (.02)
Average Depression	---	---	---	.01 (.01)*
Time varying covariates				
Heavy Drinking	---	---	.07 (.03)*	.07 (.03)*
Marijuana Use	---	---	.09 (.03)*	.04 (.03)
Cigarette Smoking	---	---	.06 (.05)	.01 (.04)
Depression	---	---	---	.09 (.01)**
RANDOM EFFECTS	*Variance*	*Variance*	*Variance*	*Variance*
Initial Suicidal Ideation	2.96**	2.96**	2.90**	2.10**
Yearly Growth Rate	.32**	.32**	.32**	.29**

** $p < 0.01$, * $p < 0.05$

Table 7
Poisson Model of Suicidal Ideation Examining Education Status

FIXED EFFECTS	***Coefficient (SE)***
Initial Suicidal Ideation	
Intercept	.40 (.14)**
Gender (male)	-.17 (.13)
2-Year vs. No College	.33 (.17)
4-Year vs. No College	.31 (.15)*
Yearly Growth Rate Suicidal Ideation	
Intercept	-.15 (.05)**
Gender (male)	.01 (.05)
2-Year vs. No College	-.00 (07)
4-Year vs. No College	.10 (.06)
RANDOM EFFECTS	*Variance*
Initial Suicidal Ideation	2.95**
Yearly Growth Rate	.32**

** $p < 0.01$, * $p < 0.05$

Table 8
Poisson Model of Suicidal Ideation Examining Substance Use and Depression by Education Group

	No College	**2-Year College**	**4-Year College**
FIXED EFFECTS	***Coefficient (SE)***	***Coefficient (SE)***	***Coefficient (SE)***
Initial Suicidal Ideation			
Intercept	.13 (.16)	.41 (.16)*	.70 (.10)**
Gender (male)	.15 (.21)	.41 (.23)	.01 (.15)
Ave. Heavy Drinking	-.01 (.10)	-.43 (.14)**	.12 (.10)
Ave. Marijuana Use	.10 (.06)	.03 (.09)	-.03 (.08)
Ave. Cigarette	-.09 (.08)	.17 (.10)	-.02 (.11)
Ave. Depression	.28 (.03)**	.20 (.03)**	.25 (.03)**
Yearly Growth Rate Suicidal Ideation			
Intercept	-.14 (.06)	-.14 (.07)	-.09 (.04)*
Gender (male)	.01 (.09)	-.10 (.11)	.08 (.24)
Ave. Heavy Drinking	-.01 (.01)	.07 (.07)	-.06 (.04)
Ave. Marijuana Use	.03 (.04)	.03 (.04)	.02 (.04)
Ave. Cigarette	.02 (.03)	-.10 (.05)	.02 (.04)
Ave. Depression	.02 (.03)	-10 (.05)	.01 (.01)
Time Varying Covariates			
Heavy Drinking	.04 (.04)	.18 (.09)*	.05 (.04)
Marijuana Use	.10 (.04)**	-.00 (07)	-.03 (.03)
Cigarette Smoking	-.01 (.04)	-.01 (.11)	.08 (.09)
Depression	.10 (.01)**	.10 (.03)**	.08 (.01)**
RANDOM EFFECTS	*Variance*	*Variance*	*Variance*
Initial Suicidal Ideation	2.48**	2.23**	1.51**
Yearly Growth Rate	.31**	.41**	.20**

** $p < 0.01$, * $p < 0.05$

Table 9
Poisson Model of Suicidal Ideation in College Subsample Examining Educational Factors, Substance Use, and Depression

	Unconditional	**All Education Variables**	**Education Variables, Substances, & Depression**
FIXED EFFECTS	***Coefficient (SE)***	***Coefficient (SE)***	***Coefficient (SE)***
Initial Suicidal Ideation			
Intercept	.66 (.08)**	.74 (.19)**	.61 (.17)**
Gender (male)	---	.01 (.16)	.20 (.15)
2-Year vs. 4-Year	---	-.14 (.22)	-.07(.20)
Grades	---	.37 (.13)**	.27 (.13)*
Educational Bonding	---	-.73 (.20)**	-.34 (.20)
Educational Aspiration	---	-.01 (.10)	.01 (.09)
Months in School	---	.00 (.01)	.00 (.01)
Average Depression	---	---	.21 (.03)**
Yearly Growth Rate Suicidal Ideation			
Intercept	-.08 (.03)**	-.17 (.07)*	-.18 (.08)*
Gender (male)	---	.06 (.06)	.04 (.06)
2-Year vs. 4-Year	---	-.04 (.08)	.11 (.09)
Grades	---	.10 (.05)	.08 (.05)
Educational Bonding	---	-.04 (.08)	-.03 (.08)
Educational Aspiration	---	.03 (.03)	.03 (.04)
Months in School	---	-.00 (.00)	.02 (.03)
Average Depression	---	---	.02 (.01)*
Time Varying Covariates			
Depression	---	---	.09 (.02)**
RANDOM EFFECTS	*Variance*	*Variance*	*Variance*
Initial Suicidal Ideation	2.36**	2.30**	1.87**
Yearly Growth Rate	.28**	.29**	.28**

** $p < 0.01$, * $p < .05$