

Bullying, Depression, and Suicidal Behaviors in Adolescents:
Secondary Analysis of Youth Risk Behavior Survey Data

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Abstract

PING GUO: Bullying, Depression, and Suicidal Behaviors in Adolescents: Secondary Analysis of Youth Risk Behavior Survey Data
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This study aims to examine the association between bullying and suicidal behaviors in adolescents in the United States, using the *2009 National Youth Risk Behavior Survey (YRBS)*. The national *YRBS*, conducted by Centers for Disease Control (CDC), provides data representative of public and private school students from 9th to 12th grade. In this study, 16,410 usable questionnaires from *2009 National YRBS* were analyzed. Logistic regression analyses were conducted to detect the association between being bullied and depression and suicidal behaviors, including suicidal ideation and suicide attempts. Also, logistic regression models were used to examine any gender effects involved in the association between being bullied and suicidal behaviors. This study found that there were association between bullying and depression and suicidal behaviors, and no significant gender differences were found in the association.

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Introduction

Bullying, sometimes referred to as peer victimization, is a prevalent problem in U.S. schools (Brunstein Klomek, Marrocco, Kleinman, Schonfeld, & Gould, 2007). It is estimated that 5-12% of students experience bullying at least once per week (Kaltiala-Heino, Rimpela, Rantanen, & Rimpela, 2000; Woods & Wolke, 2004; Young & Seals, 2003), and around 22% of students are bullied during a particular school year (O'Moore & Minton, 2005). Bullying is so common that many students view it as a normal activity. For example, 64% of students in a survey thought that school bullying was a normal part of school life (Rocke Henderson, Hymel, Bonano, & Davidson, 2002). Researchers even suggest that people need to understand "how teasing and bullying behavior are a part of normal childhood and adolescent development" (Roberts & Morotti, 2000, p. 148).

Bullying is common in school, and it has been recognized as an important issue affecting children's mental health (Nansel et al., 2001). Victims of bullying may experience various internalizing problems, including anxiety, insecurity, depression, low self-esteem, and suicidal ideation (Ivarsson, Broberg, Arvidsson, & Gillberg, 2005; Marsh, Parada, Craven, & Finger, 2004; Swearer, Song, Cary, Eagle, & Mickelson, 2001). Beale (2001) has identified six kinds of problems that victims of bullying may face: (a) chronic absenteeism; (b) reduced academic performance; (c) increased apprehension; (d) loneliness; (e) alienation from peers; and (f) suicidal behaviors. The problems may be more significant when victims are bullied more often and/or for a long time. Slee (1995) suggested that the anxiety levels of victims were correlated with the frequency of being bullied. Victims bullied at least once per

week experienced more anxiety than those bullied less frequently. Moreover, the levels are correlated with the duration of being bullied as well (Goldbaum, Craig, Pepler, & Connolly, 2003), and victims bullied for over three years experienced higher levels of anxiety than those bullied for a shorter time.

Not only victims of bullying but also bullies and witnesses report internalizing problems (Juvonen, Graham, & Schuster, 2003). Previous studies suggest that bullies are at risk for internalizing problems, including loneliness (Juvonen, Nishina, & Graham, 2000), depression (van der Wal, de Wit, & Hirasing, 2003), and anxiety (Craig, 1998). Moreover, witnesses of bullying behavior may have internalizing problems as well (Nishina & Juvonen, 2005). Rivers, Poteat, Noret, and Ashurst (2009) explored the association between bullying and the mental health of witnesses. There were total 2,002 students aged 12 to 16 years in the U.K. attending their study, and the results revealed that observing bullying was also found to be a risk predictor for mental health problems, including interpersonal sensitivity, depression, anxiety, and hostility.

In addition, longitudinal studies suggest that there can be long-term effects with which victims of bullying have to face (Olweus, 1993), and severe mental and behavior problems are often accompanied with bullying and victimization (Sourander, Helstelä, Helenius, & Piha, 2000). In an eight-year longitudinal study by Sourander et al. (2000), participants' depression status was evaluated by their parents and teacher at age 8 and by themselves at 16. The results showed that many victims of bullying had experienced a lot of problems at age 16 in externalizing and internalizing behavior domains and in social competence.

The problems associated with bullying vary with individuals' ages and the stage of development (Sawyer, Bradshaw, & O'Brennan, 2008). Compared with bullying among young kids, bullying among adolescents tends to be a more stable pattern and lasts for a longer duration (Eslea & Rees, 2001). Moreover, the pathway from adolescents to adults involves many transitions in various domains of life, and the diversity of individuals' lives is greatly increased (Sherrod, Haggerty, & Featherman, 1993); thus adolescents are more vulnerable to their environment and risk factors, including bullying behavior. Hence, to facilitate a smooth transition from childhood to adult life, it is critical to understand the problem of bullying in adolescence.

Research indicates that bullying is a potential risk for youth suicide (Kim & Leventhal, 2008). Suicide is a kind of self-destructive behavior, which has negative effects on people, their environment, and the society. For example, people who survive from attempted suicide may have serious injuries such as brain damage or organ failure. Relatives and friends of children with suicidal behaviors may feel shock, depression, anger, or guilt because of the suicidal behavior. Also, suicidal behavior causes enormous economic losses. It was estimated that the costs, including the expense of medication, hospitalization, and more general social costs for each suicide attempt and completed suicide, are approximately \$33,000 and \$400,000, respectively, in U.S. (Lester, 1995). Palmer, Revicki, Halpern, and Hatziandreu (1995) also estimated that the direct and indirect costs, including costs related to physicians, hospitals, autopsies, and investigation, for each completed suicide were over \$397,000 in 1994. As a result, the study of the risk factors for suicide, such as bullying, is especially important for suicide prevention intervention.

Brunstein Klomek, Sourander, and Gould (2010) reviewed relevant publications addressing the association of suicide and bullying in both cross-sectional and longitudinal studies. According to those cross-sectional studies in the review paper, the increased risk (i.e., odds ratio) of suicidal behavior associated with bullying ranged from 1.4 to 10.0. The studies also suggest that when controlling other risk factors, including depression, sex, socioeconomic status, and family structure, bullying is still a significant risk factor for suicidal behavior. Moreover, although there are only a few longitudinal studies available, most of them agree that bullying and peer victimization may lead to suicidality (Brunstein Klomek et al., 2010).

To date, only a few studies have been conducted to examine the association between victims of bullying and suicidal behavior using national data in the United States. Kaminski and Fang (2009) used the *2005 National YRBS* data set to investigate the association between victimization by peers and suicidal behaviors. The state of victimization was represented by the number of times threatened or injured on school property in the past 12 months (0 vs. 1 or more times). However, being bullied occurs only when a student is victimized repeatedly (Olweus, 1991). Victimization by peers in the study by Kaminski and Fang (2009) should not be considered bullying, and the number of students being bullied would be exaggerated if victimization was simply viewed as bullying. Following the definition of bullying, this study tried to investigate the association between bullying and suicidal behaviors and evaluate the association more accurately.

Research Questions

The purpose of this research was to explore the association between bullying in school and suicidal behaviors in high school students in United States using the *2009 National YRBS* data. The specific research questions studied were:

1. Is there any association between bullying and suicidal behaviors, e.g., suicidal ideation and suicide attempts, in adolescents in the United States?
2. Is there any interaction between gender and being bullied in the risk of suicidal behaviors?

Literature Review

In order to understand more fully the relationship between being bullied and suicidal behaviors, it is important to review the current literature in these two areas. In this section, I summarize some previous studies focusing on the definition of bullying, the association between bullying and internalizing problems, the development of suicidal behavior theory, the categories of suicidal behaviors, the association between bullying and suicidal behaviors, and gender differences involved in the association.

Bullying Behavior

Bullying is defined as an aggressive behavior, and individuals who are in a dominant position intend to cause mental and/or physical pain to others (Olweus, 1991). Generally, bullying behavior falls into one of four categories: direct-physical bullying (e.g., hitting, pushing, and kicking), direct-verbal bullying (e.g., name-calling and teasing in a hurtful way), indirect-relational bullying (e.g., social exclusion and spreading malicious rumors), and cyber bullying (Hinduja & Patchin, 2009). Wang, Iannotti, and Nansel (2009) examined the school bullying behavior among U.S. adolescents based on a national survey; the results showed that the prevalence rates of bullying were 20.8% for physical bullying and 53.6% for verbal bullying. Gender differences were also found in the study. Girls tended to be more involved in relational bullying, and boys tended to bully others or be bullied in direct physical or verbal forms.

Being bullied occurs when a student is “exposed, repeatedly and overtime, to negative actions on the part of one or more other students” (Olweus, 1991, p. 9). Oliver, Hoover, and

Hazler (1992) further specified that bullying includes intentionally negative or aggressive actions toward a peer of less power. Thus, three main components are occurred during bullying: power imbalance, intentionality, and repetition (Camodeca & Goossens, 2005; Griffin & Gross, 2004; Kokkinos & Panayiotou, 2004; Olweus, 1993).

Power imbalance. The imbalance of power is the fundamental component of bullying because it distinguishes bullying from other violent or aggressive behaviors (Aalsma & Brown, 2008). For example, an aggressive behavior may not be viewed as bullying when a six-grade student is kicked by a second-grade student repeatedly because there is no imbalance of power involved. Except for size, strength, and age differences between victims and bullies, power can also be expressed in other ways, such as appearance (Swearer & Cary, 2003), sexual orientation (Rivers, 2001), social status (Vaillancourt, Hymel, & McDougall, 2003) and disability status (Saylor & Leach, 2009).

Intentionality. Aggression theories have identified two subsets of aggression: reactive aggression and proactive regression (Dodge, 1991). According to Dodge (1991), reactive aggression is a defensive response to a foreseen threat, while proactive aggression is unprovoked behavior intended to harm or dominate others for external rewards, such as power, gaining property, or affiliation. Thus, the majority of bullying has been looked as proactive aggression, as bullies intend to harm victims with little provocation from victims (Espelage & Swearer, 2003).

Repetition. Repetition is another key point in the definition of bullying. It separates bullying from single acts of aggression between peers. The more frequently an individual is bullied during a given period, the more internalizing problems he/she tends to have (Goldbaum et al., 2003; Solberg & Olweus, 2003). Also, individuals' mental problems are

affected by the frequency and the duration of bullying behavior. For example, Craig, Pepler, and Blais (2007) suggested that individuals who are frequently (weekly) bullied or bullied over an extended duration (years) are at the highest risk for problems associated bullying. However, no universal standard for measuring repetition is available in literature. For example, Scheithauer, Hayer, Petermann, and Jugert (2006) used at least “once per week” to define bullying, while Baldry and Farrington (2004) used “at least sometimes” in the previous three months as their standard.

The risk factors for bullying can be grouped into five categories: (a) biological factors; (b) psychological factors; (c) cognitive risk factors; (d) environment factors; and (e) social factors (Moore, 2002). Each category contributes to bullying behavior from different perspectives. For example, environment risk factors include factors such as families, classrooms, and peer relationships. According to Vervoort, Scholte, and Overbeek, (2010), classroom effects contribute around 10% of the variance in school bullying. Also, classrooms are different from each other in the levels of bullying (Salmivalli, 2010). As a result, Doll, Song, Champion, and Jones (2010) suggested creating classroom contexts that discourage aggression to reduce bullying behavior. Not only positive classroom circumstances, but also positive peer relationships can help prevent bullying. Based on a study which involved around 300 elementary school students, Song (2006) concluded that promoting positive peer relations is an important method for bullying prevention.

Bullying and Internalizing Problems

Previous studies have found that internalizing problems, which refer to anxiety, depression, or problems internal to children’s emotional experience (Oram, Rutemiller, & Cornell, 1995), are associated with bullying. Hawker & Boulton (2000) conducted a meta-

analysis review of the cross-sectional studies, published from 1978 to 1997, on the association between bullying and internalizing problems. The results revealed that compared to non-victims, victims of bullying reported more negative emotion and thoughts on themselves. Additionally, among all the internalizing problems, children being bullied tend to be more depressed and less anxiety.

Reijntjes, Kamphuis, Prinzie, and Telch (2010) completed another meta-analysis review of the longitudinal studies examining the correlation between bullying and internalizing problems. After reviewing the 19 longitudinal studies, the authors concluded that internalizing problems can be looked as both consequence and antecedents of bullying. In other words, internalization problems are not only caused by bullying, but also a risk factor contributing to bullying.

Furthermore, a study by Nansel et al. (2004) showed that bullying is also a critical issue for youth health states across countries. The study involved 113,200 adolescents in 25 countries. The results revealed that victims of bullying tend to report greater health problems and poorer emotional and social adjustment than non-victims, and the association between bullying and poorer psychological adjustment is similar across countries.

The Development of Suicidal Behavior Theory

The term “suicide” was devised by Sir Tomas Browne in his writing, *Religio Medici*, in 1643 (Barraclough & Sheperd, 1994). It originated from the Latin words “SUI” (self) and “CIDE” (murder) (De Leo, Burgis, Bertolote, Kerkhof, & Bille-Brahe, 2006), which refers to self-murder. From then on, the word “suicide” has attracted continuous attention and been investigated in multiple fields.

Historically, there is no widely accepted theoretical view on suicide. One of the earliest influential theorists on suicidal behavior is the French sociologist Emile Durkheim (Miller, 2011). Durkheim emphasized that social forces are critical to suicidal behavior, but overlooked the influence of individual factors, such as genetics and psychiatric disorders (Joiner, 2005). For example, Durkheim categorized types of suicide, and individuals who commit egoistic suicide, one type of suicide, have a feeling of apathy, meaninglessness, and depression because they do not belong to a community. Therefore, egoistic suicide results from the weakening of the bonds which connect people and their communities (Breault & Barkey, 1982). Durkheim's theory is the first testable theory on suicide, and it remains influential because there has been empirical evidence that supports it (Joiner, 2005).

Psychodynamic perspective on suicidal behavior expands Durkheim's view through addressing the effects of affective and cognitive components of individuals. After reviewing literature on psychodynamics of suicide, Hendin (1991) found that rage, hopelessness, despair, and guilt are important affective states in which youth commit suicide. Moreover, the emotions may turn inward, and suicide occurs because of the inner conflicts, as people want to die as rebirth, as revenge, or as self-punishment (Hendin, 1991). However, psychodynamic theories of suicide have been abandoned by many researchers because of lack of empirical evidence (Joiner, 2005). As a result, the influence of the psychodynamic perspective on suicidal behavior has significantly declined in recent years (Miller, 2011).

Cognitive-behavioral theories, aiming to build cognitive models of individuals' thinking patterns and cognition which may contribute to suicidal behavior, are another popular perspective used to explain suicide (Miller, 2011). Based on cognitive-behavioral theories, cognitive errors and distorted thinking play an important role in the development of

suicidal behavior (Beck, 1996). According to Beck (1996), cognitive errors are produced when individuals' construction of their experiences is distorted due to external events or internal stimuli. Consequently, individuals tend to bias information processing and produce disordered cognitive content. The theory can be used to explain the symptoms of depression. Individuals' significant failure or a sequence of failures may invoke their negative representation of the self, the personal world, and the future, thus they tend to be depressed under the biased interpretation of events (Scher, Ingram, & Segal, 2005).

The interpersonal-psychological theory of suicidal behavior by Joiner has received great attention in recent years (Miller, 2011). Joiner (2009) believed that people commit suicide "because they can and because they want to" (p. 244). In other words, people who commit suicide are capable of suicide, and they also have the desire to commit suicide. People who have experienced enough past pain and provocation, especially involving intentional self-injury, may be capable of suicide. Their past pain enables them be habituated to the pain and fear of self-injury associated with suicide. A self-preservation instinct thus is overwhelmed in the process (Joiner, 2009). Joiner (2009) also mentioned that any experience producing extensive pain and/or fear, such as injury, accident, and violence, may develop the habituation.

According to interpersonal-psychological theory, people who have the desire to commit suicide must experience two related status of mind: perceived burdensomeness and failed belongingness. Perceived burdensomeness is the belief that one's presence is burdensome to his/her family, friends, and/or society. Failed belongingness is the view that one does not belong to his/her family, friends, or other valued groups (Joiner et al., 2009).

When individuals experience these two feelings at the same time, they may have the desire to suicide because there is nothing left to live for (Joiner, 2009).

Generally, all theories and perspectives of suicide agree that being bullied may contribute to the development of suicidal behavior. For example, bullying may alienate victims from peers and weaken the bonds connecting victims and their communities, such as classes and schools. Hence, according to Durkheim's theory, it may lead to egoistic suicide. Also, it may tempt failed belongingness of victims to their communities, according to Joiner's interpersonal-psychological theory. Additionally, based on cognitive-behavioral theories, depression, one of the main factors contribute to suicide, may occur when bullying trigger victims' negative evaluation of the self, the personal world, and the future. Furthermore, according to interpersonal-psychological theory, victims have experienced enough past pain, and the pain enables them to be habituated to the fear and pain associated with suicide.

Suicidal Behavior among Youth

Suicide among youth has emerged as a significant global issue (Bridge, Goldstein, & Brent, 2006). According to the World Health organization, suicide has increased over 60% worldwide from 1950 to 2000, and youth suicide has been the second leading cause of death in many countries (Miller 2011). In the U.S., the youth suicide rate increased more than 200% from 1950's to the late 1970's, and it is the third leading cause of death among young (age 15-24). It is estimated that five children and adolescents, on average, die by suicide every day in the U.S. (Wagner, 2009). From late 1970's to the mid 1990's, the rate remained stable and has slightly decreased (American Association of Suicidology, 2006). However, although the death rate of youth due to suicide has decreased as a result of medical advances in recent

decades, the youth suicide rate is still consistently high (King & Apter, 2003). According to Miller and Eckert (2009), for every young person who dies by suicide, it is estimated that at least 100 to 200 young people attempt to suicide, and thousands more have serious thoughts about suicide.

Suicidal behavior is a series of behaviors more than suicide alone, and it can be divided into four separate but frequently overlapping conditions based on severity levels: suicidal ideation, suicide-related communications, suicide attempts, and suicide (Miller, 2011). The more severity the condition of one's suicidal behavior, the greater the probability that one tends to die by suicide. Hence, although the frequency of a behavior declines as suicidal youth move forward into a more severe behavior, the probability of death increases as the severity level of suicidal behavior increases (Mazza & Reynolds, 2008). Moreover, the four behaviors are not mutually exclusive, and not all youth with suicidality experience them in sequence (Mazza, 2006).

Suicidal ideation. Suicidal ideation is defined as cognition or thoughts of suicide (Lewinsohn, Rohde, & Seeley, 1996). It is more common than other suicidal behaviors, especially during adolescence (Rueter, Holm, McGeorge, & Conger, 2008). It is reported that 63% of participants had some level of suicidal ideation in a study involved high school students (Smith & Crawford, 1986), but youth do not always move on to planning or attempting suicide even they have serious thoughts about suicide (Lewinsohn, Rohde, Seeley, & Baldwin, 2001). However, researchers on suicidal behavior agree that increasing suicidal ideation is a risk factor for attempting and completing suicide in the future (Lewinsohn et al., 1996; Nock & Banaji, 2007). Greening et al. (2007) found that suicidal ideation had a significant direct effect on suicide attempts, and a study by Rueter et al. (2008) also

suggested that many youth who die by suicide had considered, planned, and attempted it before.

Suicide-related communications. Suicide-related communications refer to verbal and nonverbal interpersonal behaviors that may convey suicidal intent, but without injurious outcomes for individuals (Silverman, Berman, Sanddal, O'Carroll, & Joiner, 2007). There are two subsets under this category: suicide threat and suicide plan. An example of the suicide threat is a student telling others he wants to kill himself, and an example of the suicide plan is a student designing a plan for suicide. Silverman et al. (2007) suggested that suicide-related communications can be looked as a halfway point between suicidal ideation and suicidal actions. Generally, signs for suicide are shown before people attempt suicide. It was estimated that 80% of adolescents who attempt suicide or die by suicide had made suicide plans or warnings (Silverman et al., 2007). However, suicide-related communications are not necessarily followed by suicidal actions, and it was estimated that the majority of individuals making suicidal-related communications will not take suicidal actions (Berman, Jobes, & Silverman, 2006).

Suicide attempt. A suicide attempt is “a self-inflicted, potentially injurious behavior with nonfatal outcome for which there is evidence (either explicit or implicit) of intent to die” (Silverman et al., 2007, p.273). It is much more common than completed suicides. As estimated by Miller and Eckert (2009), there are approximately 100-200 attempts per every completed suicide by youth. Moreover, the number of suicide attempts has been underestimated greatly because the majority of youth suicide attempts have not been documented if no medical treatments are required (Berman et al., 2006).

Repeated suicide attempters are individuals who attempt to commit suicide more than one time (Berman et al., 2006). Youth who make a suicide attempt tend to repeat their suicide attempts and increase the risk for later death (Groholt & Ekeberg, 2009). The study by Groholt and Ekeberg (2009) involved a group of adolescents who had made their suicide attempts eight to ten years ago, and the results showed that 44% of the participants in the study made additional suicide attempts after the first attempt. Also, compared to individuals who suicide only once, repeated suicide attempters tend to show more chronic symptoms associated with suicide, and the experience of prior suicide attempts is an important risk factors for death by suicide (Berman et al., 2006).

Bullying and Suicidal Behaviors

Some main risk factors for suicide among youth have been identified in the literature. After reviewing the related literature on youth suicide in the past 10 years, Gould, Greenberg, Velting, and Shaffer (2003) identified four domains of the main risk factors of youth suicide: personal characteristics, family characteristics, socio-environmental and contextual factors, and adverse life circumstances. Factors such as psychopathology, history of suicide attempts, cognitive factors, and biological factors are categorized as the domain of personal characteristics. The domain of family characteristics includes factors as history of suicidal behavior of family members, psychopathology of parents, the relationship of parents, and parent-child relationships. Socio-environment and contextual factors are factors such as socioeconomic status and school and work problems. Stressful life events, physical abuse, bullying, and sexual abuse are included in the domain of adverse life circumstances.

Studies have been conducted to address the association between being bullied and suicidal behavior (Kaltiala-Heino, Rimpela, Marttunen, Rimpela, & Rantanen, 1999; Kim,

Koh, & Leventhal, 2005, Roland, 2002). Previous literature has shown that being bullied is significantly correlated with suicidal ideation and suicide attempts. For example, the study by Kaltiala-Heino et al. (1999) examined the correlation between being bullied and suicidal ideation through a survey involving 16,410 Finnish adolescents from age 14 to 16. The results showed that among the boy victims, 4% of them reported severe suicidal ideation. However, only 1% of non-victim boys had severe suicidal ideation. The numbers of suicidal ideation for girls bullied and not bullied were 8% and 1% of the sample respectively. After adjusting for age and sex, being bullied increased the risk for severe suicidal ideation among Finnish adolescents (OR: 5.7). A study by Roland (2002) confirmed the conclusion by Kaltiala-Heino et al. (1999). There were 1,838 Norwegian students in 8th grade participating in the study, and the results showed that the victim boys were 2.5 times more likely to experience suicidal ideation than non-victim boys, and the girl victims were 4.2 times more likely to report suicidal ideation than non-victim girls.

Researchers have found evidence of a significant correlation between being bullied and suicide attempts as well. Kim et al. (2005) conducted a study aiming to examine the relation between school bullying and suicidal behaviors in Korea. The study involved 1,718 7th- and 8th-grade students in two Korean middle schools. The results showed that the female victims of bullying reported suicidal attempts / self-injurious behavior more than the participants who were not involved in bullying significantly. Similarly, Brunstein Klomek et al. (2007) tried to assess the association between bullying and suicidal behaviors among adolescents. There were 2,342 students in six New York State high schools participating in their study. Two kinds of victimization were investigated in the study, including victims in school and victims away from school. Students were asked whether they had been bullied

frequently, less than weekly, or never been bullied. The results showed that the students who were bullied frequently in school were 3.4 times more likely to report having attempted suicide than those who had never been bullied, and 1.5 times more than those who were bullied sometimes. For victimization out of school, students who were bullied frequently were 1.6 times more likely to report suicide attempts than non-bullies. However, there were no significant differences of suicidal attempts between the student who had been bullied frequently and less frequently.

Gender Differences in the Association between Victims and Suicidal Behavior

Significant interactions between gender and being bullied in the risk of suicidal behavior have been reported in previous literature, but the results have not been consistent. In most previous research, a strong association between being bullied and suicidal behavior among female students has been identified. For example, van der Wal et al. (2003) conducted a study involving 4,811 students in 7th- and 8th-grade in the Netherlands to examine the correlation between bullying and psychosocial problems, including depression, suicidal ideation and delinquent behaviors, for males and females separately, based on self-reported data. The results showed that direct bullying had a significant effect on depression and suicidal ideation only on girl victims. Park, Schepp, Jang, and Koo (2006) conducted a study aiming to investigate whether there were gender differences in suicidal ideation in Korean high school students; 1,312 students were enrolled in the study. Multiple behavior variables were used as predictor variables, such as smoking, drinking, drugs, victims of bullying, sexual orientation, and sexual behaviors. The results showed that all behaviors were predictor variables of suicidal ideation for boys, but only bullying and sexual orientation were predictive for girls. Similar results were found in Roland's study (2002)

which involved 2,088 Norwegian high school students. The results revealed that both boy and girl victims had significantly higher mean scores than non-bullied students on suicidal ideation, and mean scores for suicidal ideation of girl victims were significantly higher than those of boy victims.

However, some researchers also reported that there are no overall gender differences in the correlation between victims and suicidal behavior. For example, a study by Rigby and Slee (1999) investigated the relationship among suicidal ideation and bullying in secondary school in South Australia. There were 1,948 adolescents involved in the study. The results suggested that, after controlling the degree of perceived social support, the association between bullying and suicidal ideation were significant for both boy and girl victims, and no gender differences were found in the study. Brunstein Klomek et al. (2007) reported similar results in their study, and significant interactions between victims and gender with regard to suicidal ideation were not found.

To date, not many studies examining the interactions between gender and bullying about suicidal behaviors were conducted using national data collected in the United States. However, the problem is critical in practice, as it may help schools and communities design and execute separate and applicable interventions for boys and girls. Hence, one of the goals of this study is to investigate whether any gender differences exist regarding to the association between being bullied and suicidal behavior.

Method

This study used the quantitative data collected in the *2009 National YRBS* to address the research questions. In this section, a general description of the *Youth Risk Behavior Surveillance System (YRBSS)*, target population and sampling method, data collecting procedures, instrumentation, and national response rate will be discussed first. Then, validity and reliability issues will follow. Last, the description of the statistical analyses is presented.

The 2009 National YRBS

General description. The *Youth Risk Behavior Survey (YRBS)* is a component of the *YRBSS*, which was developed in 1990, aiming to monitor priority health-risk behaviors among youth and young adults in the United States (CDC, 2004). The *YRBSS* includes a national school-based survey and state, tribal, and local surveys. The national *YRBS* provides data representative of public and private school students from 9th to 12th grade. The data set used in the current study is the national *YRBS* conducted by the Centers for Disease Control (CDC) in 2009 (CDC, 2010).

The *YRBSS* was designed to measure the prevalence of health risk behaviors and access the change of health risk behaviors over time (CDC, 2010). In the late 1980s, only several health-risk school-based surveys existed (e.g., Monitoring the Future ongoing survey, National Adolescent Student Health one-time survey, and multiple smaller school-based categorical surveys focusing on nutrition, tobacco uses, and exercise). Moreover, those surveys did not meet the needs of state and local education agencies who wanted a survey including HIV prevention and school-coordinated health problems (CDC, 2004). As a result,

the CDC developed the *YRBSS* to monitor priority health-risk behaviors (CDC, 2004). The risk behaviors measured in the *YRBS* fall into six categories: 1, tobacco use; 2, dietary behaviors; 3, physical activity; 4, alcohol and other drug use; 5, sexual behaviors contributing to pregnancy and sexually transmitted diseases, including HIV; and 6, behaviors contributing to the unintentional injuries and violence (CDC, 2010).

Sampling method. *YRBS* employs a three-stage cluster sample design to collect data representative of target population (CDC, 2010); the target population that the *2009 National YRBS* tried to measure is all regular public and private schools with students from 9th to 12th grade in the 50 states and the District of Columbia (CDC, 2010). The first stage involved 1,276 primary sampling units (PSUs) decided by on the size of counties (CDC, 2010), and PSUs were stratified into 16 strata based on the metropolitan statistical area status (MSAs) and the percentages of black and Hispanic students (CDC, 2010). Of the 1,276 PSUs, 57 demonstrating probability proportional to overall school enrollment size were chosen (CDC, 2010).

At the second stage of selection, 196 schools were chosen with probability proportional to school enrollment size (CDC, 2010). In the third stage, one or two classrooms from 9th to 12th grade were randomly chosen from the schools selected in the second stage. All students in the sampled class were eligible to complete the self-administered questionnaire. Schools, classes, and students could refuse to participate without replacement (CDC, 2010).

Data collection and response rate. The *2009 National YRBS* questionnaire was approved by the CDC's Institutional Review Board, and parental permission was obtained before administrating the survey. *YRBS* procedures were designed to protect participants'

anonymity, and students can choose not to participate. Participating students were required to complete a self-administrated questionnaire during one class period and record their responses on a computer-scannable booklet or an answer sheet (CDC, 2010).

Although the *2009 National YRBS* was designed to be representative of students from 9th to 12th grade nationally, not all students from every state were included in the survey, as some states elected not to participate, or response rates in a state was less than 60% to receive weighted results (CDC, 2004). The 2009 *YRBS* participation map – high school is located in Appendix A. For the *2009 National YRBS*, 16,460 questionnaires were finished in 158 schools, and missing data were not statistically imputed. Among the 16,460 completed questionnaires, 50 were deleted from the analysis because there were less than 20 valid responses or the same answer to 15 or more items in a row (CDC, 2010) in them. The response rates were 81% for schools and 88% for students; the overall response rate was 71% (CDC, 2010).

The *2009 national YRBS* data set was corrected and edited for inconsistencies. If responses from a particular student for two questions conflict logically, both responses were coded as missing values (CDC, 2010). For example, if students responded “never attempt suicide” in item 26 and responded “have attempted suicide and been treated by a doctor or nurse” in item 27, the two responses were coded as blank.

Survey results were weighted to derive unbiased estimates. To accommodate the influence of non-response and over-sampling of black and Hispanic students, a weighting factor based on sex, race/ethnicity, and grade was applied for the *2009 National YRBS*. The overall weights were scaled, thus the weighted count of students was the same with the sample size, and the weighted proportions of students in each grade were equivalent the

national population proportions (CDC, 2010). As a result, weighted estimates are representative of the target population of the *2009 National YRBS* (CDC, 2010).

Instrumentation. The health risk behaviors measured in *YRBSS* were determined through reviewing the leading health risk behavior among youth and adults in 1988, and six categories were suggested to use in the *YRBSS*. In 1989, a panel consisting of experts from multiple fields, (e.g., CDC, federal agencies, academic institutions, state/local education agencies, state health departments, and survey research specialists) was established for each risk behavior category. Each panel was required to define priority behaviors and design questions to measure the behaviors for different category. The first version of the *YRBS* questionnaire was finished in 1988 and reviewed by representatives in the education agencies across the nation; the second version was used as laboratory and field testing with high school students. The core questionnaire was completed in October 1990 and reflected suggestions from the aforementioned national review. The *YRBS* was first conducted nationally in 1991, and it has been conducted every two years at the national, state and local level. The *YRBS* questionnaire will be revised before each biennial survey by the CDC and sites to meet the changing needs, and some items in the questionnaire may be deleted or revised during the process (CDC, 2004). For example, 16 new items were added in the *YRBS* questionnaire, and 11 questions were deleted from it after the review of the 1999 version of the questionnaire.

There are 98 questions in the *2009 National YRBS* (CDC, 2010), and all questions were measured as nominal or ordinal variables. Five questions were used in this study to answer the two research questions. Two of them measured bullying behavior, including bullying in general and severe physical bullying, one measured participants'

hopelessness/depression states, and the other two measured suicidal behaviors, including suicidal ideation and suicide attempts.

Validity and Reliability of the National YRBS

The CDC conducted a literature review of the empirical evidence to assess whether cognitive and situational factors affected the validity of adolescent self-reporting of behaviors measured in the *YRBS* questionnaire. According to the review (Brener, Billy, & Grady, 2003), self-reports of the six categories of behaviors were affected by cognitive and situational factors. For the items analyzed in this study, self-reports may be affected by recall error because students were required to recall previous situations. Also, the items measuring violence and suicidal behaviors may be sensitive for students to answer. For example, Klimes-Dougan (1998) found the reported suicidal ideation was lower when participants reported it in a paper-and-pencil survey. However, Brener et al. (2003) concluded that, although self-reports of the health-risk behaviors, measured in *YRBS*, were influenced by both cognitive and situational factors, the influential factors did not threaten the validity of *YRBS*.

Also, two test-retest reliability studies of the national *YRBS* questionnaire have been conducted, one in 1992 and the other in 2000. In the first study, the 1991 *YRBS* questionnaire was administered to 1,679 students from 7th to 12th grade on two occasions 14 days apart (Brener, Collins, Kann, Warren, and Williams, 1995). Around three fourths of the 54 self-reporting items were rated as substantially reliable ($\kappa = 61-100\%$), and no statistically significant differences were found between the prevalence estimates at the first and the second time (Brener et al., 1995). The 1999 *YRBS* questionnaire was administered in the second study which involved 4,619 high school students on two occasions, approximately

2 weeks apart (Brener et al., 2003). In general, students tended to report reliably over time, however ten items were suggested to be examined further because they had kappas less than 61% and significant differences for different prevalence estimates (Brener et al., 2003). As a result, the certain questionable items were revised for or deleted from the later questionnaires (CDC, 2004).

May and Klonsky (2011) conducted a study to evaluate the validity of the suicidality items in the 2007 version of the *YRBS* questionnaire. The study involved 386 high-school students in Long Island (Queens), New York; and the students completed a series of questionnaires assessing suicidality and related psychological constructs, including the Patient Health Questionnaire for Adolescents, the Mclean Screening Instrument for Borderline Personality Disorder, the UCLA Loneliness Scale, and the *YRBS* suicide questions. In general, the convergent and discriminant validity of the items was supported based on the statistical analyses conducted. The *YRBS* suicide items were highly correlated with each other and the related psychological constructs significantly, including depression and anxiety. Moreover, in terms of discriminant validity, the suicidality items in *YRBS* were more strongly correlated with items measuring similar behaviors than items measuring similar construct were. For example, *YRBS* items for suicidal ideation tended to be more strongly correlated with ideation items in other measures than *YRBS* items for suicide attempt did.

Analyses

This study aimed to examine the association between being bullied and suicidal behaviors among adolescents in the United States using data obtained from the 2009 *National YRBS*. Also, the study tried to investigate whether any interaction exists between

gender and the slope between bullying and suicidal behaviors. Variables and scales of measurement used in the study are presented in Table 1.

Table 1

Corresponding Questions from the 2009 National YRBS

Construct		2009 National YRBS Questionnaire Number and Question	Scale of Measurement
Being Bullied	Severe Physical Bullying	17. During the past 12 months, how many times has someone threatened or injured you with a weapon such as a gun, knife, or club on school property?	Ordinal
	Bullying in General	23. During the past 12 months, have you ever been bullied on school property?	Nominal
Hopelessness / Depression		24. During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?	Nominal
Suicidal Behaviors	Suicidal Ideation	25. During the past 12 months, did you ever seriously consider attempting suicide?	Nominal
	Suicide Attempts	27. During the past 12 months, how many times did you actually attempt suicide?	Ordinal

Due to the complex sampling design of *YRBS*, statistical analyses were conducted using weighted data suggested by the CDC. A weight based on gender, race/ethnicity, and grade was applied to each record to adjust for nonresponse and oversampling of black and Hispanic students (Eaton et al., 2008). After applying the weights, the count of students

equaled the sample size, and the proportions of students in each grade were the same with national population proportions (CDC, 2010).

The *2009 National YRBS* employed a three-stage cluster sampling design, and random samples within the same cluster may be more similar than those in a simple random sampling design. Compared to a simple random sampling design, the *YRBS* cluster sampling design adds less new information. The sample selected in *YRBS* was not as varied as it should be in a random sample, the variance may be biased, and the effective sample size was reduced. To obtain valid standard errors, confidence intervals, and tests of hypothesis, adjusted statistical analysis were conducted based on the cluster sampling design in the *YRBS* to correct for design effects.

All analyses were conducted using SAS 9.2 for Windows XP. SAS includes procedures that are appropriate for the analysis of data from complex sample surveys like data from the *YRBS*. SAS (version 9.2 and higher) can generate descriptive statistics (means, ratios, totals, and proportions with standard errors and confidence intervals), and conduct generalized linear regression and logistic regression for data from complex sample survey. Design effects can also be calculated for the proportion estimates and the regression coefficient estimates (CDC, 2012).

Each variable was examined separately, and weighted frequencies and percentages for each variable are reported. Although bullying is defined as repeated actions (Olweus, 1993), there is no agreement in the literature regarding to the criterion for the frequency of aggressive behaviors identified as bullying behavior (Swearer, Siebecker, Johnsen-Frerichs, & Wang, 2010) and scholars have used different cut points in previous literature to classify students as victims. For example, Unnever (2005) used two or three times per month as the

cut point in his study, while Baldry and Farrington (2004) identified students victimized at least sometime in the last three months as victims. In the current analysis, although it is arbitrary, I used being threatened or injured by a weapon six times during the last 12 months as the cut point to separate bullying behavior and other aggression behavior. Based on the definition, students would be considered victims only if they had been bullied at least once in two months, on average. Compared to other cut points, my cut point, at least once in two months, might imply less frequent victimization behaviors. However, although being threatened or injured by a weapon occurs much less frequently in school than other bullying behavior (i.e., teasing, hitting, pushing, and kicking), it should be looked as severe peer victimization, as it has detrimental effects on children's emotional and social development (Batsche & Knoff, 1994) and causes more physical and psychological harm to victims. Hence, being threatened or injured by a weapon at least one time per two months was considered as severe physical bullying in the analyses. When the responses of the times of being victimized are more than five times, they will be coded as severe physical bullying; otherwise, they will be coded as other aggressive behaviors. Also, to be consistent with the responses to Question 23 and avoid logical conflicts, only students who also responded "Yes" to Question 23 will be looked upon as victims of severe physical bullying. In addition, to examine how the cut point affected the results of my study, four and eight times were used as the alternative cut points to compare the results from the three cut points in the statistical analyses.

To answer the first research question, logistic regression analyses were completed. The status of being bullied, including physical bullying and bullying in general, were used as the independent variables (IVs) in the analyses. Dependent variables (DVs) include

hopelessness/depression, suicidal ideation, and suicide attempts. The categories “no depression”, “no suicidal ideation”, and “no suicide attempts” were referred as the reference groups in the logistic regression analyses.

According to Pedhazur (1997), logistic regression is suitable for predicting the outcome of binary dependent variables based on either categorical and/or continuous independent variables. As two of the three DVs, hopelessness/depression and suicidal ideation, are binary, logistic regression was used to examine the association between being bullied and these two dependent variables. Odds ratios (ORs) and confidence intervals (CIs) are reported to describe the strength of the associations assessed. Level of significance will be set a priori at $\alpha = .05$, and if the 95% confidence intervals do not include “1”, the corresponding odds ratios will be considered significant. An ordinal logistic regression model was used to assess the association between being bullied and the ordinal DV in the study, suicide attempts. ORs and CIs of each predictor are reported in tables, and level of significance was set a priori at $\alpha = .05$. Statistic methods are listed in Table 2 and 3, with the variables involved and their scale of measurement in the analyses.

Table 2

Research Questions and Correspondent Independent Variables

Research Question		Independent Variable	
		Variable	Scale of Measurement
RQ 1		Bullying in General	Binary
		Severe Physical Bullying	Binary
RQ 2	Step 1	Bullying in General Severe Physical Bullying Gender	Binary Binary Binary
	Step 2	Bullying in General Severe Physical Bullying Gender Gender* Severe Physical Bullying Gender*Bullying in General	Binary Binary Binary

Table 3

Dependent Variables and Correspondent Statistic Methods

Dependent Variable			Statistical Methods
Variable	Scale of Measurement	Reference Group	
Hopelessness / Depression	Binary	No depression	Binary Logistic Regression
Suicidal Ideation	Binary	No suicidal ideation	Binary Logistic Regression
Suicide Attempts	Ordinal	Never attempt suicide	Ordinal Logistic Regression

To answer the second research question, logistic regression analyses were completed in two steps. First, gender was added as a new IV to detect any gender effects involved in youth suicide. In this model, I was assuming that there is no interaction between gender and being bullied. Coefficients and *p*-values of the three variables were reported.

In the next model, the cross-product terms between gender and two IVs (i.e., gender*bullying in general, and gender*severe physical bullying) were included in logistic regression models incrementally. In this model, I tested whether the variables of gender and being bullied interact, and there was an interaction between gender and being bullied in the risk of suicidal behaviors, so the interaction terms between bullying and gender, the two cross-product terms, were included in the second model. Coefficients for each variable, including gender, bullying, and the interaction between being bullied and gender, were reported, and a comparison of the coefficients of the two models was presented to understand the contribution to the DVs from the interaction between being bullied and gender. Level of significance was set a priori at $\alpha = .05$, and if any *p*-values for cross-product terms (gender*bullying in general and gender*physical bullying) was less than .05, the interaction between gender and being bullied was looked as statistically significant. In other words, there were gender differences involved in the association between victims and suicidal behaviors.

Results

The study was designed to investigate the association between bullying and depression and suicidal behaviors. Results are presented in several sections. The first section presents descriptive findings, and the second section presents logistic regression findings.

Descriptive Findings

Personal factors of survey participants. Following the guideline from the CDC, to adjust for non-response and over-sampling of black and Hispanic students, a weighting factor based on sex, race/ethnicity, and grade was applied in all analyses. In this study, 16,410 usable questionnaires completed by the participants in grade 9-12 from the *2009 National YRBS* were analyzed. Table 4 lists weighted estimates and weighted percentages of personal factors reported by the participants. The mean age of the participants was 16.14, and the number of girls and boys were approximately evenly distributed in the sample. In terms of race or ethnicity, most participants were white (58.7%), followed by black or African American (14.4%), Hispanic or Latino (11.0%), Asian (3.4%), Native Hawaiian or other Pacific Islander (0.8%), and American Indian-Alaska Native (0.6%). About 7.6% of the survey population were students who selected “yes” for Hispanic/Latino and at least one response to the other race/ethnicity options, including American Indian or Alaska Native, Asian, Black or African, Native Hawaiian or other pacific Islander, and White. About 3.6% of the population were those selecting “no” for Hispanic/Latino and more than one response to the other race/ethnicity options.

Table 4

Personal Factors of 2009 National YRBS Participants (n=16410)

Personal Factors	<i>n</i>	%
Age		
≤ 12 years old	19	0.11
13 years old	17	0.10
14 years old	1851	11.33
15 years old	4045	24.75
16 years old	4234	25.90
17 years old	3963	24.25
≥ 18 years old	2215	13.55
Gender		
Female	7816	47.80
Male	8537	52.20
Grade		
9 th grade	4570	27.98
10 th grade	4273	26.15
11 th grade	3843	23.53
12 th grade	3628	22.21
Ungraded or other grade	19	0.12
Race-Ethnicity		
American Indian-Alaska Native	101	0.63
Asian	546	3.39
Black or African American	2320	14.40
Native Hawaiian-Other Pacific Islander	130	0.81
White	9452	58.67
Hispanic/Latino	1766	10.96
Multiple-Hispanic/Latino*	1223	7.59
Multiple-None-Hispanic/Latino**	572	3.55

Weighted sample sizes.

*Student selected “yes” for Hispanic/Latino and no less than one response to the other race/ethnicity options listed.

** Student selected “no” for Hispanic/Latino and more than one response to the other race/ethnicity options listed.

Prevalence of bullying behavior. A total of 20% of students reported being bullied on school property during the past 12 months. Of the female students, 21.2% had experienced bullying, and 18.7% of the male students identified themselves as victims.

Significantly more female than male students had experienced school bullying (Table 5, $F(1, 41) = 10.56, p < .01$).

Table 5

Prevalence of Being Bullied

Being Bullied	Male % (<i>n</i>)	Female % (<i>n</i>)	Total % (<i>n</i>)	Wald χ^2 <i>P</i>
During the past 12 months, have you ever been bullied on school property?				
Yes	18.73 (1535)	21.21 (1576)	19.91 (3110)	$F(1, 41) = 10.56$ $p < .01$
No	81.27 (6659)	78.79 (5852)	80.09 (12512)	
During the past 12 months, how many times has someone threatened or injured you with a weapon such as a gun, knife, or club on school property?				
0~3	98.31 (8373)	99.21 (7743)	98.74 (16117)	$F(1, 42) = 12.05$ $p < .01$
≥4	1.69 (144)	0.79 (62)	1.26 (206)	
0~5	98.74 (8414)	99.39 (7757)	99.05 (16167)	$F(1, 42) = 9.00$ $p < .01$
≥6	1.26 (108)	0.61 (48)	0.95 (156)	
0~7	98.97 (8429)	99.54 (7769)	99.24 (16198)	$F(1, 42) = 10.02$ $p < .01$
≥8	1.03 (88)	0.46 (36)	0.76 (124)	

Weighted sample sizes.

In terms of severe physical bullying, approximately 1.26% of adolescents reported being bullied and being threatened or injured with a weapon at least four times during the

past 12 months, 0.95% reported being bullied and threatened or injured at least six times, and 0.76% reported being bullied and being threatened or injured at least eight times. Around 1.7% of male students reported being physically bullied severely when bullying is defined as victims being threatened or injured at least four times, and around 0.8% of female students reported the same problem. Approximately 1.3% of male students and 0.6% of female students reported physically bullied when the cut point was set at six. When the cut point was changed to eight, around 1% of male students and 0.5% of female students reported being bullied. Significant gender differences were all found in the three cut points, and males reported being involved in severe physical bullying more than females ($F(1, 42) = 12.05, 9.00, 10.02$ when cut points=4, 6, 8, respectively, $p < .01$).

Prevalence of depression and suicidal behaviors. Approximately 26.1% of students reporting feeling so sad or hopeless almost every day for two weeks or more in a row that they stopped doing some usual activities. Significantly more female (33.9%) than male (19.1%) students reported depression or hopelessness (Table 6, $F(1, 42) = 108.35, p < .0001$). Around 13.8% of students seriously considered attempting suicide, and significant gender differences were also found in adolescents' suicidal ideation. Approximately 17.4% of females seriously considered attempting suicide during the last 12 months, and approximately 10.5% of males thought similarly.

Around 6.3% of students attempted suicide at least once during the last 12 months. Approximately 8.1% of female students and 4.6% of the male students attempted suicide at least once. Significant gender differences were found in the suicide attempts, and more female students tend to attempt suicide than do male students. However, slightly more male students (0.9%) than female students (0.6%) reported attempting suicide at least six times.

Table 6

Prevalence of Depression and Suicidal Behaviors

Depression and Suicidal Behaviors	Male % (<i>n</i>)	Female % (<i>n</i>)	Total % (<i>n</i>)	Wald χ^2 <i>p</i>
Sad / Hopelessness: during the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?				
Yes	19.06 (1605)	33.86 (2610)	26.13 (4215)	$F(1, 42) = 108.35$ $p < .0001$
No	80.94 (6817)	66.14 (5098)	73.87 (11915)	
Suicidal Ideation: during the past 12 months, did you ever seriously consider attempting suicide?				
Yes	10.47 (882)	17.40 (1340)	13.78 (2222)	$F(1, 42) = 58.34$ $p < .0001$
No	89.53 (7540)	82.60 (6359)	86.22 (13899)	
Suicide Attempts: during the past 12 months, how many times did you actually attempt suicide?				
0 times	95.41 (7316)	91.94 (6585)	93.73 (13900)	$F(4, 39) = 15.20$ $p < .0001$
1 time	2.07 (159)	4.55 (326)	3.27 (485)	
2-3 times	1.30 (100)	2.46 (176)	1.86 (176)	
4-5 times	0.34 (26)	0.45 (32)	0.39 (58)	
6 or more times	0.89 (68)	0.60 (43)	0.75 (111)	

Weighted sample sizes.

Logistic Regression Findings

Association between being bullied and depression. Logistic regression analysis was used to examine the association between being bullied and depression, and findings are listed in Table 7 and 8. Of all students who were not bullied, 21.8% reported feeling depressed or hopeless, while 43.5% of the victims of bullying reported experiencing the same problem. Compared with the students who were not bullied, being a victim of bullying significantly increased the likelihood of depression during the last 12 months (OR: 2.59). In terms of severe physical bullying, when the cut point was set at six, 73.6% of victims reported depression and hopelessness, while 25.7% of non-victims reported the same problem. Being a victim of severe physical bullying also led to increased risks for depression (OR: 3.87).

Table 7

Association between Being bullied in General and Risk of Depression

	Having been bullied in general before	
	No	Yes
Students in the category	12410	3073
Students reported depression or hopelessness in the category (%)	2705 (21.80%)	1336 (43.48%)
Odds ratio in regression		2.59*
95% CI		2.31-2.89†
R^2 (adjusted R^2)		.039 (.057)

Weighted sample sizes.

Reference group: students who did not report depression or hopelessness.

* $p < .0001$.

† Being threatened or injured at least 6 times. CI=confidence interval

Table 8

Association between Being Physically Bullied Severely and Risk of Depression

	Having been physically bullied severely before (times being threatened or injured) three different splitting settings			
	0~3	≥4	0~5	≥6
Students in the category	15949	202	15998	153
Students reported depression or hopelessness in the category (%)	4087 (25.62%)	134 (66.37%)	4108 (25.68%)	112 (73.59%)
Odds ratio in regression		2.74*		3.87*
95% CI		2.03-3.69		2.49-6.00
R^2 (adjusted R^2)		.038 (.056)		.039 (.057)

Weighted sample sizes.

Reference group: students who did not report depression or hopelessness.

* $p < .0001$. CI=confidence interval

Three logistic regression models were used to detect any differences in the association between severe physical bullying and depression separately, analyzing the data for each of the three cut points for defining severe physical bullying. No significant differences were found among the increased risks (OR: 2.74, 3.87, and 3.73 for being threatened or injured by a weapon at least 4, 6, and 8 times, respectively). Also, no significant differences were found in the increased risks of bullying in general when the definition of being physically bullied was changed (OR: 2.58, 2.59, and 2.62, respectively).

The R^2 implemented in SAS is based on the likelihood statistics for logistic regression model (Menard, 2000). However, the value of R^2 in SAS logistic regression cannot reach 1, even when a full model fits the data perfectly and has a likelihood of 1 (Menard, 2000). In 1991, Nagelkerke proposed an adjustment, which is also implemented in SAS and labeled as “Max-rescaled RSquare”, and the range of possible value of R^2 extends to 1 (Shtatland, Moore, & Barton, 2000). As a result, in the output of logistic regression models in SAS, the adjusted R^2 is always greater than R^2 .

Association between being bullied and suicidal behaviors. Multiple regression models were employed to detect the association between being bullied and suicidal behavior. The results of the association between being bullied and suicidal ideation are listed in Table 9 and 10. Around 10.7% of non-victims of bullying seriously considered attempting suicide in the past 12 months, while 26.0% of victims reported suicidal ideation. Being a victim of bullying increased the risk for suicidal ideation (OR: 2.66). In terms of severe physical bullying, when the cut point for severe physical bullying was set at six, approximately 61.4% of the victims reported suicidal ideation, while 13.3% of the non-victims reported the same

problem. Being a victim of severe physical bullying was more likely to result in suicide ideation than a non-victim (OR: 5.01).

Table 9

Association between Being Bullied in General and Risk of Suicidal Ideation

	Having been bullied in general before	
	No	Yes
Students in the category	12405	3063
Students reported suicidal ideation in the category (%)	1322 (10.66%)	795 (25.96%)
Odds Ratio in regression		2.66*†
95% CI		2.32-3.04†
R^2 (adjusted R^2)		.032 (.059)

Weighted sample sizes.

Reference group: students who did not report suicidal ideation.

* $p < .0001$.

† Being threatened or injured at least 6 times. CI=confidence interval

Table 10

Association between Being Physically Bullied Severely and Risk of Suicidal Ideation

Having been physically bullied severely before (times being threatened or injured)						
three different splitting settings						
	0~3	≥4	0~5	≥6	0~7	≥8
Students in the category	15943	199	15992	150	16021	121
Students reported suicidal ideation in the category (%)	2118 (13.28%)	113 (56.53%)	2138 (13.37%)	92 (61.36%)	2157 (13.47%)	73 (60.08%)
Odds Ratio in regression		4.17*		5.01*		4.64*
95% CI		2.91-5.97		3.37-7.44		2.90-7.43
R ² (adjusted R ²)		.033 (.059)		.032 (.059)		.031 (.057)

Weighted sample sizes.

Reference group: students who did not report suicidal ideation.

* p<.0001. CI=confidence interval

The results of the association between being bullied and suicide attempts are listed in Table 11, 12 and 13. Around 14.4% of the students who reported being bullied in general attempted suicide at least once in the past 12 months, while 4.6% of the non-victims reported the same issue. Of the victims, around 6.5% reported suicide attempt once, 4.5% reported 2-3 times, 0.9% reported 4-5 times, and 2.2% reported at least 6 times, while around 2.4% of non-victims reported once, 1.2% reported 2-3 times, 0.3% reported 4-5 times, and 0.4% reported at least 6 times. Compared to non-victims, being a victim of bullying significantly increased the likelihood of suicide attempts in the previous 12 months for attempting suicide 1 time, 2-3 times, 4-5 times, and more than 6 times (OR: 2.81, 3.55, 2.17, and 2.75, respectively). However, no differences were found in the likelihood increased by bullying between repeated suicide attempters and the adolescents who attempted suicide only once.

Of the victims of severe physical bullying, around 60% reported attempting suicide at least once, while only 5.8% of non-victims reported the same problems. Approximately 10% of students who were physically bullied severely attempted suicide once in the past 12 months, 15.1% attempted 2-3 times, 9.0% attempted 4-5 times, and 26.3% attempted at least 6 times. Meanwhile, around 2.4% of non-victims attempted suicide once, 1.2% attempted 2-3 times, 0.3% attempted 4-5 times, and 0.4% attempted at least 6 times. Students who were involved in severe physical bullying had significantly higher risks for suicide attempts (OR: 3.50, 8.38, 37.18, and 56.91 for attempting suicide 1 time, 2-3 times, 4-5 times, and more than 6 times, respectively), especially in repeated suicide attempters. Victims of severe physical bullying are 57 times more likely to attempt suicide at least 6 times than non-victims.

Table 11

Association between Being Bullied in General and Risk of Suicidal Attempts

		Having been bullied in general before		Odds ratio (95% CI)
		No <i>n</i> = 11369	Yes <i>n</i> = 2875	
Suicide attempts	1 time	278 (2.45%)	187 (6.49%)	2.81*† (2.15-3.67†)
	2-3 times	139 (1.22%)	130 (4.52%)	3.55*† (2.58-4.89†)
	4-5 times	31 (0.27%)	27 (0.94%)	2.17***† (1.12-4.24†)
	≥6 times	46 (0.41%)	63 (2.22%)	2.75***† (1.57-4.84†)
	Total	494 (4.35%)	407 (14.46%)	
<i>R</i> ² (adjusted <i>R</i> ²)			.039 (.085)	

Weighted sample sizes.

Reference group: students who did not report suicide attempts.

* *p* < .0001. ** *p* < .001. *** *p* < .05.

† Being threatened or injured at least 6 times. CI = Confidence Interval

Logistic regression models were also used to detect any differences, if the cut point for severe physical bullying changed, in the association between severe physical bullying and suicidal behaviors. The results show that when severe physical bullying is identified as being threatened or injured at least 4, 6, or 8 times during the last 12 months, no significant differences were detected in the association between severe physical bullying and suicidal behaviors, as well as in the association between bullying in general and suicidal behaviors.

Table 12

Numbers and Percentages of Students Reported Suicide Attempts by Being Physically Bullied Severely

Having been physically bullied severely before (times being threatened or injured)							
three different splitting settings							
		0~3 n = 14667	≥4 n = 181	0~5 n = 14713	≥6 n = 135	0~7 n = 14740	≥8 n = 108
Suicide attempts	1 time	472 (3.22%)	17 (9.27%)	476 (3.23%)	13 (9.97%)	481 (3.26%)	8 (7.71%)
	2-3 times	252 (1.72%)	26 (14.22%)	258 (1.75%)	20 (15.07%)	269 (1.82%)	10 (8.90%)
	4-5 times	42 (0.29%)	16 (8.80%)	46 (0.31%)	12 (9.02%)	47 (0.32%)	11 (10.38%)
	≥6 times	73 (0.50%)	39 (21.28%)	77 (0.52%)	35 (26.26%)	78 (0.53%)	34 (31.44%)
	Total	839 (5.72%)	98 (54.14%)	857 (5.82%)	81 (60.00%)	875 (5.94%)	63 (58.33%)

Table 13

Odds Ratio (95% Confidence Interval) of the Association between bullying and Risk of Suicide Attempts

Having been physically bullied severely before (times being threatened or injured) three different splitting settings			
	≥4	≥6	≥8
1 time	2.80*** (1.36-5.76)	3.50** (1.74-7.06)	2.52**** (1.16-5.44)
2-3 times	7.03* (3.74-13.19)	8.38* (3.78-18.59)	4.32**** (1.53-12.18)
4-5 times	41.29* (15.63-109.07)	37.18* (15.03-91.96)	38.41* (14.32-103.00)
≥6 times	42.97* (22.93-80.51)	56.91* (30.35-102.99)	60.71* (31.51-116.97)
R ² (adjusted R ²)	.041 (.087)	.039 (.085)	.037 (.080)

Weighted sample sizes.

Reference group: students who did not report suicide attempts.

* $p < .0001$. ** $p < .001$. *** $p < .01$. **** $p < .05$.

Interaction of gender and being bullied in the risk of suicidal behavior. Logistic regression was conducted in two steps to detect the interaction of gender and being bullied in the risk of suicidal behavior. In the first step, a logistic regression model was built with bullying, severe physical bullying, and sex as the independent variables. In the second step, two cross-product terms (sex*bullying, sex*physical bullying) were added as additional IVs into the regression model to detect any interaction between sex and bullying in the risk of depression and suicidal behaviors. Coefficients are presented through Table 14 to Table 17.

The results showed that gender, bullying in general, and severe physical bullying significantly contributed to the explanation of depression and suicidal behaviors in adolescents in the first model. However, after the two cross-product terms were added to the second model, the association between gender and suicidal ideation became smaller and non-significant. In other words, after controlling the effects of bullying and interaction terms, no statistically significant association was found between gender and suicidal ideation.

As the interaction terms were highly correlated with gender and being bullied, and they took some weight from the two IVs, thus the variance of DVs could be partly explained by them. However, although the contribution by gender and being bullied changed a bit after the interaction terms were added in analyses, and the two terms made some contribution to the explanation of depression and suicidal behaviors, no significant association was found in the interaction between gender and being bullied ($p > .05$). Hence, based on the data from the *2009 National YRBS*, there was no significant interaction between gender and being bullied in the risk of depression, suicidal ideation, and suicide attempts.

Addition of the two interaction terms did not change the significance of the association between being bullied and depression and suicidal behaviors. Compared to the

slopes of the two bullying variables in the first model, those in the second model did not change much. In the other words, the contribution by bullying to depression and suicidal behaviors did not vary by gender. Moreover, among all the contribution by the IVs, severe physical bullying contributes the most to depression and suicidal behaviors in both models.

Table 14

Slopes without Cross-product Terms based on Three Different Splitting Settings

Dependent Variable	Independent Variable (times being threatened injured ≥ 4)			Independent Variable (times being threatened injured ≥ 6)			Independent Variable (times being threatened injured ≥ 8)		
	Sex (Female)	Bullying in General	Severe Physical Bullying	Sex (Female)	Bullying in General	Severe Physical Bullying	Sex (Female)	Bullying in General	Severe Physical Bullying
Depression / Hopelessness	0.4036*	0.4685*	0.6164*	0.4033*	0.4707*	0.7883*	0.4012*	0.4783*	0.7731*
Suicidal Ideation	0.3180*	0.4700*	0.7999*	0.3152*	0.4787*	0.8991*	0.3109*	0.4912*	0.8568*
Suicidal Attempts	0.3492*	0.5111*	1.3583*	0.3402*	0.5301*	1.5147*	0.3385*	0.5576*	1.5279*

* $p < .0001$.

Table 15

Slopes with Cross-product Terms when Cutting Point is 4

Dependent Variable	Independent Variable (times being threatened injured ≥ 4)				
	Sex (Female)	Bullying in General	Severe Physical Bullying	Sex * Bullying in General	Sex * Severe Physical Bullying
Depression / Hopelessness	0.4108**	0.4628*	0.6302*	0.0435	-0.0145
Suicidal Ideation	0.2838****	0.4596*	0.7987*	0.0485	-0.0549
Suicidal Attempts	0.2336****	0.4923*	1.3368*	0.0585	-0.1452

* $p < .0001$. ** $p < .001$. *** $p < .01$. **** $p < .05$.

Table 16

Slopes with Cross-product Terms when Cutting Point is 6

Dependent Variable	Independent Variable (times being threatened injured ≥ 6)				
	Sex (Female)	Bullying in General	Severe Physical Bullying	Sex * Bullying in General	Sex * Severe Physical Bullying
Depression / Hopelessness	0.5793**	0.4659*	0.9120*	0.0385*	0.1591*
Suicidal Ideation	0.2521	0.4697*	0.8825*	0.0441	-0.0822
Suicidal Attempts	0.2469****	0.5189*	1.4938*	0.0377	-0.1111

* $p < .0001$. ** $p < .001$. *** $p < .01$. **** $p < .05$.

Table 17

Slopes with Cross-product Terms when Cutting Point is 8

Dependent Variable	Independent Variable (times being threatened injured ≥ 8)				
	Sex (Female)	Bullying in General	Severe Physical Bullying	Sex * Bullying in General	Sex * Severe Physical Bullying
Depression / Hopelessness	0.6555**	0.4743*	0.9546*	0.0336	0.2401
Suicidal Ideation	0.3073	0.4847*	0.8647*	0.0332	-0.0161
Suicidal Attempts	0.3416****	0.5551*	1.5342*	0.0093	0.0120

* $p < .0001$. ** $p < .001$. *** $p < .01$. **** $p < .05$.

Discussion

The primary purpose of this study was to examine whether any association between bullying and depression and suicidal behaviors in adolescents. This study also sought to investigate whether any interaction between gender and being bullied in the risk of depression and suicidal behaviors. The findings indicated that being a victim of school bullying, especially a victim of severe physical bullying, had significantly higher risks for depression, suicide ideation, and suicidal attempts, as compared with non-victims. However, no gender differences were found in the association between bullying and depression and suicidal behaviors. The key findings are discussed below. Each key finding is discussed in the context of the previous literature and regarding specific limitation.

Methodology Advantages

This study is another example of investigating cross sectional association between bullying and depression and suicidal behaviors. The sample size is large, and the sample is representative of adolescents in the U.S. All participants were attending 9th-12th grade, and the participation rate for the survey was high. Although Kaminski and Fang (2009) used data representative of U.S. adolescents to investigate the association between victimization and suicide, they identified victims as students being threatened or injured more than once, which was not consistent with the definition of bullying. As a result, the number of victims was exaggerated, and their results may be inappropriate. Following the definition of bullying, my study provides a more accurate estimation for the association between bullying and suicidal behaviors. However, the problem of being bullied with respect to depression, suicidal

ideation, and suicide attempts may be more severe among those students who were absent and did not participate in this survey. Hence, the prevalence of bullying, depression, and suicidal behaviors reported in the study may be underestimated.

For the first time, this study assessed the association between severe physical bullying and depression and suicidal behaviors. Although compared with other bullying forms (e.g., kicking, pushing, and teasing), severe physical bullying is relatively rare in school, the victims of severe physical bullying suffered negative developmental outcomes more than other victims. The topic has previously been studied combining with other bullying forms, and to my knowledge, no studies have examined the association between severe physical bullying and depression and suicidal behaviors. The effects of severe physical bullying have not been studied fully, and researchers are urged to pay more attention to this topic.

Association between Bullying and Depression and Suicidal Behaviors

Approximately 20% of students reported being bullied, and the rate is similar to previous studies (O'Moore & Minton, 2005). Among all the victims, approximately 5% experienced severe physical bullying and reported being threatened or injured by a weapon at least 6 times in the past 12 months. In other words, around 1% of adolescents were physically bullied severely in school, and the result is similar to that from 2009 Monitoring the Future (MTF) project. In 2009 MTF, around 0.6% of students reported being injured with a weapon more than 4 times, and 1.4% reported being threatened with a weapon more than 4 times at school during the past 12 months (Fu, Land, & Lamb, 2012).

Consistent with the findings of previous studies (Baldry & Winkel, 2003; Cleary, 2000; Eisenberg, Neumark-Sztainer & Story, 2003), this study found an association between bullying and depression, suicidal ideation, and suicide attempts in adolescents in data

representative of U.S. adolescents. In accounting for the observed association, possible explanation should be considered. A victim's construction of his or her experiences is distorted due to bullying. Bullying may trigger victims' negative evaluation on the self, the personal world, and the future, and thus depression, one of the main factors contribute to suicide, may occur. Bullying in school may isolate victims from peers and weaken the bonds between victims and classes and schools, which may lead to egoistic suicide, as victims feel they do not belonging to the communities. Moreover, the failed belongingness of victims to their communities tempted by bullying, accompanied with the enough past pain, which enables them to be habituated to the fear and pain associated with suicide, may drive victims of school bullying to commit suicide. However, the study is a cross-sectional design, and no causal relation can be inferred from this study, longitudinal studies are necessary to study causality between being bullied and suicidality.

In this study, the value of R^2 is always quite small. The result implies that the variability of suicidality of youth is also due to other factors not included in the models. Suicidality of youth is a complex issue, and it is believed to involve numerous risk factors. A review by Gould, Greenberg, Velting, and Shaffer (2003) has identified four domains of the main risk factors of youth suicide, including personal characteristics, family characteristics, socio-environmental and contextual factors, and adverse life circumstances, and each domain includes many factors. In my study, only bullying in general and severe physical bullying was included in the models, and the bullying factor can only explain a small part of the variability of suicidal behaviors. Hence, for a better understanding of suicidal behaviors in youth, a more complex model, which involved more risk factors, is suggested.

Previous studies have found that bullying was reported as more prevalent in boys than girls and occurred more frequently in middle school-aged students than high school-aged students (Nansel et al., 2001). The present results seem to contradict previous studies, which showed that more girls reported being bullied. However, previous studies have also found that boys are more likely to be involved in physical or verbal bullying, while girls are more likely to be involved in relational bullying (Wang, Iannotti, Nansel, 2009). Also, physical bullying has been found to decline with age, but relational bullying does not (Crick, Grotpeter, & Bigbee, 2002). Moreover, relational bullying tends to increase in school when physical bullying decreases (Woods & Wolke, 2003). As the *National YRBS* was designed to measure risk behaviors among high school-aged youth, and relational bullying increases while physical bullying decreases in high school-aged youth, it is reasonable that more girls reported being bullied, but more boys reported being physically bullied in the current study.

Consistent with previous studies (Rich, Kirkpatrick-Smith, Bonner, & Jans, 1992; Lewinsohn et al., 2001), my study found that more girls tend to be depressed and reported suicidal ideation and suicide attempts than boys, but more boys than girls tend to attempt suicide at least six times. Previous studies have proposed some reasons for the gender differences in suicidal behaviors among adolescents. For example, the fear of cowardice is a possible explanation for higher rates of completed suicide among young males. Even feeling depressed, males may not want to admit to suicidal thoughts because they may perceive their suicidal ideation as a sign of weakness and an inadequacy in handling one's affairs (Rosenthal, 1981).

Gender Differences in the Association

Another primary purpose of this study was to detect any interaction between gender and being bullied in the risk of depression and suicidal behaviors. The results of investigating the interaction are not consistent in previous studies. In current study, no significant gender differences were found, which contradict previous reports that victim girls are at higher risk for depression and suicidal ideation (Kim et al., 2005). However, Kim et al.'s study only examined the interaction in the previous two weeks, and the plausible explanation may be that girls respond to bullying with a more acute onset of suicidal ideation than boys do. In addition, they suggested that if bullying occurs over a long period of time, suicidal ideation becomes equally common in girls and boys, thus making the gender differences disappear (Kim et al., 2005). My study examined the interaction in the previous 12 months, and it is reasonable that gender differences disappear due to the long term effect. The topic of the interaction between gender and being bullied in the risk of depression and suicide will benefit from further exploration comparing short-term and long-terms effects of being bullied.

Severe Physical Bullying and Suicide Attempts

Consistent with previous studies that found that students who report experiencing multiple forms of victimization are found to be more likely to be male (Furlong & Chung, 1995), significant gender differences were found in severe physical bullying in this study, and more male students than female students reported being bullied and also threatened or injured by a weapon multiple times. High levels of exposure to violence and victimization have been always linked to a number of mental health and behavior problems, such as increased levels of depression, stress, anxiety, low self-esteem, self-destructive and

aggressive behavior, and impaired social skills (Borowsky, Ireland, & Resnick, 2001; Else, Goebert, Bell, Carlton, & Fukuda, 2009; Fitzpatrick & Boldizar, 1993; Flannery, Singer, & Wester, 2003; Lorion & Saltzman, 1993). Moreover, multi-victims of school violence and bullying tend to perceive school as unsafe places, have poor social support networks with teachers and peers, do not trust interpersonal relationships, and care school violence (Furlong & Chung, 1995).

In this study, depression, suicidal ideation, and suicide attempts are strongly linked to being physically bullied severely. Most victims of severe physical bullying reported depression, suicidal ideation, and attempting suicide at least once (74%, 61%, and 60%, respectively). Victims had significantly higher risks, especially for repeated suicide attempts, and they were around 57 times more likely to report attempting suicide more than 6 times than non-victims. As repeated suicide attempts represent a more suicidal problem and increase the risk of completed suicide (Brezo et al., 2008), special attention is suggested to be given to victims of severe physical bullying. Moreover, in terms of the contribution to depression and suicidal behaviors, severe physical bullying contributed the most among all the IVs involved, even after the interaction between gender and being bullied was included in the analyses. The topic is critical for suicide prevention intervention in adolescents. However, although it is important to address the problem of severe physical bullying, victims of it have been a group not fully studied, and more attention should be given to them.

Limitation and Future Perspective

Despite contributing to the existing knowledge on the association of bullying and suicidal behavior in adolescents, some limitations of this study call for further investigation. First, the validity of this study may be lessened due to weaknesses of the self-reported survey design. As mentioned previously, recall error may bias the response of self-reported surveys. For example, students may not be able to recall the number of times in which they are victimized in the previous 12 months because 12 months is quite long. Moreover, students may feel uncomfortable answering some sensitive questions, such as suicidal attempts and related treatment. Hence, simultaneously analyzing data from students, peers, and teachers would certainly provide a more accurate estimation of the association between bullying and suicidal behavior.

Second, my study suffers from a cross-sectional study design. Because cross-sectional studies only involve observation at one specific point, they are unable to assert causal relationships between independent and dependent variables. As a result, even if significant results were found in this study, I can only infer that bullying and suicidal behavior are correlated with each other. Longitudinal studies aiming to establish causality between the two variables would be another topic to be explored in future research.

Third, my study does not control the effects of race in the statistic analyses. Although race is not the included in my study, it is an important indicator for bullying among adolescents. Minorities are more likely to live in high-crime areas, and the exposure to violence may increase their aggressiveness in school (Faris, 2007). Ogbu (1991) argued that

minority groups may discard academic values and attitudes as “White” and behave badly in school. Also, race has been correlated with suicidal behaviors in previous studies. Hispanic adolescents have had the highest suicide attempt rate, followed by Blacks, and Whites have had the lowest rate (Wagner, 2009). However, race is a categorical variable, which includes eight groups in my dataset. As categorical values have no inherent order, to control the effects of race, many variables would have to be included in the regression models, such as the eight race groups, the cross-products between the eight groups and other independent variables, including gender and two bullying variables. As a result, the results would be extremely complex and difficult to interpret. Hence, to simplify the models in my study, race is not included in the analyses.

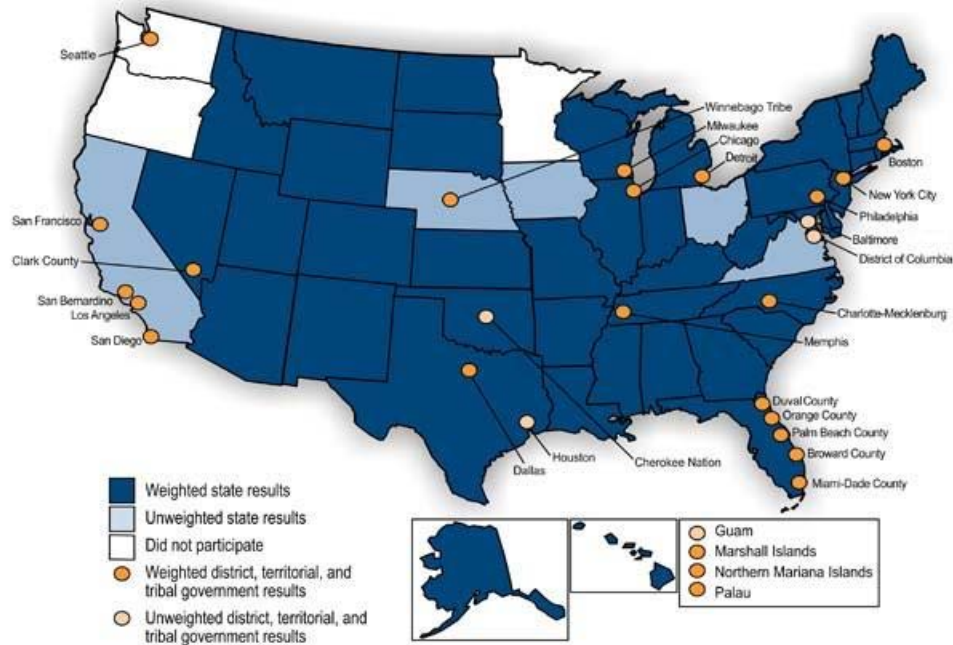
Finally, although the study mentions that victims’ depression, alienation, and negative representation of the self and their surroundings caused by bullying may account for individuals’ suicidal behavior, no conclusion about the connection between bullying and the suicide intention can be made without enough evidence. Future studies are suggested to explore the association between bullying and the intention of suicide, and qualitative studies to investigate the intention of which victims of bullying commit suicide are suggested.

Summary

In conclusion, using a representative sample of adolescents in grades 9-12 in the United States, the investigator examined the association between being bullied and depression, suicidal ideation, and suicide attempts in adolescents in U.S. The findings suggest that the victims of bullying, especially those of severe physical bullying, are more likely to experience depression, report suicidal ideation, and attempt suicide than non-victims. However, no significant interaction between gender and being bullied in the risk of depression and suicidal behaviors was found in the study. More studies are suggested for the causality between bullying and suicidal behaviors. Also, future research should be conducted examining severe physical bullying and gender differences in the association between bullying and suicidal behaviors.

Appendix A

Participation Map — High School YRBS, 2009



This map illustrates state, territory, tribal government, and district participation in the 2009 Youth Risk Behavior Survey. Weighted¹ and unweighted² state, territory, tribal government, and district surveys are shown.

Weighted State Surveys

Alabama	Illinois	Montana	Rhode Island
Alaska	Indiana	Nevada	South Carolina
Arizona	Kansas	New Hampshire	South Dakota
Arkansas	Kentucky	New Jersey	Tennessee
Colorado	Louisiana	New Mexico	Texas
Connecticut	Maine	New York	Utah
Delaware	Maryland	North Carolina	Vermont
Florida	Massachusetts	North Dakota	West Virginia
Georgia	Michigan	Oklahoma	Wisconsin
Hawaii	Mississippi	Pennsylvania	Wyoming
Idaho	Missouri		

Weighted Territories

Marshall Islands
Northern Mariana Islands
Palau

Appendix A (continued)

Weighted Tribal Governments

Winnebago Tribe

Weighted Districts

Boston, MA	Duval County, FL	Palm Beach County, FL
Broward County, FL	Los Angeles, CA	Philadelphia, PA
Charlotte-Mecklenburg, NC	Memphis, TN	San Bernardino, CA
Chicago, IL	Miami-Dade County, FL	San Diego, CA
Clark County, NV	Milwaukee, WI	San Francisco, CA
Dallas, TX	New York City, NY	Seattle, WA
Detroit, MI	Orange County, FL	

1. Weighted results means that the survey got an overall response rate of at least 60%. Weighted results are representative of all students in grades 9–12 attending public schools in each jurisdiction. With weighted data, it is possible to say, for example, "X% of students in state Y never or rarely wore a seat belt when riding in a car driven by someone else."

2. Unweighted data represent only the students who completed the survey. The following states, territories, tribal governments, and districts participated in the YRBS in 2009 and did not obtain weighted data: California, District of Columbia, Iowa, Nebraska, Ohio, Virginia, Guam, Cherokee Nation, Baltimore, and Houston.

Appendix B: SAS Code

```
libname data 'C:\Documents and Settings\gp\My Documents\Google
Drive\thesis\data file';

data yrbs2009;
    set data.yrbs2009;
    retain bully bully4 bully8 new2;
    if 1=<q16<=4 then bully=0;
    else if (q16>4 & q22=1) then bully=1;
    else if q16>4 then bully=0;
    else bully=.;
    if 1=<q16<=3 then bully4=0;
    else if (q16>3 & q22=1) then bully4=1;
    else if q16>3 then bully4=0;
    else bully4=.;
    if 1=<q16<=5 then bully8=0;
    else if (q16>5 & q22=1) then bully8=1;
    else if q16>5 then bully8=0;
    else bully8=.;
run;

****Variables:
q1: How old are you?
q2: What is your sex?
q3: In what grade are you?
raceeth: What is your race?
q16: During the past 12 months, how many times has someone threatened or
injured you with a weapon such as a gun, knife, or club on school property?
q22: During the past 12 months, have you ever been bullied on school
property?
q23: During the past 12 months, did you ever feel so sad or hopeless
almost every day for two weeks or more in a row that you stopped doing
some usual activities?
q24: During the past 12 months, did you ever seriously consider attempting
suicide?
q26: During the past 12 months, how many times did you actually attempt
suicide?
*****;

%macro descrp (var=);
    proc surveyfreq data=yrbs2009;
        tables &var /row wchisq;
        strata stratum ;
        cluster psu ;
        weight weight ;
    run;
%mend;

%macro logistic (vars);
    %let var1=%scan (&vars, 1);
    %let var2=%scan (&vars, 2);
    proc surveylogistic data=yrbs2009;
        strata stratum;
        cluster psu ;
        weight weight;
```

```

        class q22(ref='No') &var2(ref='0');
        model &var1(ref='No')= q22 &var2 /rsquare;
    run;
%mend;

%macro logistic_q26 (var=);
    proc surveylogistic data=yrbs2009;
        strata stratum;
        cluster psu ;
        weight weight;
        class q22(ref='No') &var(ref='0');
        model q26(ref='0 times')= q22 &var/rsquare link=glogit;
    run;
%mend;

%macro logistic_without (vars=);
    %let var1=%scan (&vars, 1);
    %let var2=%scan (&vars, 2);
    proc surveylogistic data=yrbs2009;
        strata stratum;
        cluster psu ;
        weight weight;
        class q2 (ref='Male') q22(ref='No') &var2(ref='0') ;
        model &var1(ref='No')=q2 q22 &var2;
    run;
%mend;

%macro logistic_without_q26 (var=);
    proc surveylogistic data=yrbs2009;
        strata stratum;
        cluster psu ;
        weight weight;
        class q2 (ref='Male') q22(ref='No') &var(ref='0') ;
        model q26(descending)=q2 q22 &var;
    run;
%mend;

%macro logistic_with (vars=);
    %let var1=%scan (&vars, 1);
    %let var2=%scan (&vars, 2);
    proc surveylogistic data=yrbs2009;
        strata stratum;
        cluster psu ;
        weight weight;
        class q2 (ref='Male') q22(ref='No') &var2(ref='0') ;
        model &var1(ref='No')=q2 q22 &var2 q2*q22 q2*&var2;
    run;
%mend;

%macro logistic_with_q26 (var=);
    proc surveylogistic data=yrbs2009;
        strata stratum;
        cluster psu ;
        weight weight;
        class q2 (ref='Male') q22(ref='No') &var(ref='0') ;
        model q26(descending)=q2 q22 &var q2*q22 q2*&var;
    run;

```

```

%mend;

****Table 4 Personal Factors of 2009 National YRBS Participants;
****age;
%descrip (var=q1)
****gender;
%descrip (var=q2)
****grade;
%descrip (var=q3)
****race;
%descrip (var=raceeth)

****Table 5 Prevalence of Being Bullied;
%descrip (var=q2*q22)
%descrip (var=q2*bully4)
%descrip (var=q2*bully)
%descrip (var=q2*bully8)

****Table 6 Prevalence of Depression and Suicidal Behaviors;
%descrip (var=q2*q23)
%descrip (var=q2*q24)
%descrip (var=q2*q26)

****Table 7 Association between Being Bullied in General and Risk of
Depression;
%descrip (var=q22*q23)
%logistic (vars=q23 bully)

****Table 8 Association between Being Physically Bullied Severely and
Risk of Depression;
%descrip (var=bully4*q23)
%descrip (var=bully*q23)
%descrip (var=bully8*q23)
%logistic (vars=q23 bully4)
%logistic (vars=q23 bully)
%logistic (vars=q23 bully8)

****Table 9 Association between Being Bullied in General and Suicidal
Ideation;
%descrip (var=q22*q24)
%logistic (vars=q24 bully)

****Table 10 Association between Being Physically Bullied Severely and
Suicidal Ideation;
%descrip (var=bully4*q24)
%descrip (var=bully*q24)
%descrip (var=bully8*q24)
%logistic (vars=q24 bully4)
%logistic (vars=q24 bully)
%logistic (vars=q24 bully8)

****Table 11 Association between Being Bullied in General and Suicide
Attempts;
%descrip (var=q22*q26)
%logistic_q26 (var=bully)

```

```

***Table 12 Numbers and Percentages of Students Reported Suicide Attempts
by Being Physically Bullied;
%descrip (var=bully4*q26)
%descrip (var=bully*q26)
%descrip (var=bully8*q26)

***Table 13 OR of the Association between bullying and Risk of Suicide
Attempts;
%logistic_q26 (var=bully4)
%logistic_q26 (var=bully)
%logistic_q26 (var=bully8)

***Table 14: Coefficients without Cross-product Terms based on Three
Different Splitting Settings;
%logistic_without (vars=q23 bully4)
%logistic_without (vars=q23 bully)
%logistic_without (vars=q23 bully8)
%logistic_without (vars=q24 bully4)
%logistic_without (vars=q24 bully)
%logistic_without (vars=q24 bully8)
%logistic_without_q26 (var=bully4)
%logistic_without_q26 (var=bully)
%logistic_without_q26 (var=bully8)

***Table 15: Coefficients with Cross-product Terms when Cutting Point is 4;
%logistic_with (vars=q23 bully4)
%logistic_with (vars=q24 bully4)
%logistic_with_q26 (var=bully4)

***Table 16: Coefficients with Cross-product Terms when Cutting Point is 6;
%logistic_with (vars=q23 bully)
%logistic_with (vars=q24 bully)
%logistic_with_q26 (var=bully)

***Table 17: Coefficients with Cross-product Terms when Cutting Point is 8;
%logistic_with (vars=q23 bully8)
%logistic_with (vars=q24 bully8)
%logistic_with_q26 (var=bully8)

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