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Abstract

Suicidal Behavior among U.S. High School Students and Associated Risk Factors, Individual Survey Years: 2013, 2015 and Trend Analysis from 1991 to 2015

By

Maithili Sridhar Bhat

January 5, 2017

Abstract:

INTRODUCTION: Suicidal behavior is a serious public health problem among adolescents in the United States (U.S). It is a complex phenomenon and process that may originate with suicidal thoughts and evolve over time into plans or attempts, or can more rarely be an impulsive act. A suicidal attempt may result in injury, disability or death. As adolescents are in a transitional period between childhood and adulthood, they are more vulnerable to adverse effects from health behaviors that put them at higher risk for suicidal behavior. The goal of this research was to examine high-risk health behaviors and assess their associations with suicidal risk.

METHODS: This research analyzed data from the Youth Risk Behavioral Surveillance System study data (YRBSS) from 2013 and 2015, to examine and quantify associations between health behaviors and suicide risk. Time trends were analyzed for changing relationships between health behaviors and suicide risk. They were examined with YRBSS data collected from 1991 to 2015. Suicide risk was defined as a categorical 3-level outcome. Statistical models were used to estimate associations with health behaviors and suicide risk. Analyses were stratified by sex. Odds ratios and 95% confidence intervals were reported.

RESULTS: Results of 2013 and 2015-year data showed that students who identified as feeling hopeless or sad, involved in abusing drugs such as cocaine or methamphetamine, involved in weight controlling behaviors such as vomiting or using laxatives, and/or involved in fights resulting in injury, were at increased risk for suicidal behavior. After controlling for race/ethnicity, age, and grade level, time trends from 1991 to 2015 showed students who identified as feeling hopeless or sad were at increased risk for suicidal behavior.

DISCUSSION: Adolescents were at higher risk for suicidal behavior when exposed to or involved in violence or other high-risk health behaviors. Teens exposed to or involved in violence at school or in their community should be screened to assess risk for suicidal behavior. Other factors to indicate potential for suicidal behavior include mental health issues, engaging in weight control measures, substance abuse, high-risk sexual behavior, or exhibiting aggressive or impulsive behavior. Additionally, screening may include flagging adolescents diagnosed with hopelessness or sadness. Interventions that may be effective with reducing the risk of suicidal behavior include pharmacotherapy, cognitive behavior therapy and social support. This research contributes to an improved understanding of health risk behaviors associated with suicidal behavior. This has implications for the development of preventive measures, including the design and testing of educational and public health interventions for promoting understanding of suicidal risk in adolescents.

Suicidal Behavior among U.S. High School Students and Associated Risk Factors, Individual Survey Years: 2013, 2015 and Trend Analysis from 1991 to 2015

by

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Author's Statement Page

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Maithili S. Bhat
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Introduction

Suicide in the United States (U.S.) is the 10th leading cause of death (Suicide: Facts at a Glance, n.d.); is the second leading cause of death among adolescents aged 10-14 years and among young adults aged 15-24 years (National Suicide Statistics, 2016). The number of deaths due to suicide was substantially higher among males aged 15-19 years in comparison to females. In 2014, there were 425 victims of suicide among adolescents aged 10-14 years and 5,079 victims of suicide among young adults aged 15-24 years (National Suicide Statistics, 2016). The "Healthy People 2020" initiative by the Office of Disease Prevention and Health Promotion (ODPHDP) in the U.S., aims for a reduction of suicide attempts among adolescents at 10% by year 2020 (Healthy People, 2020, n.d.). Adolescents are a subset of the population that are at a higher risk for suicidal behavior.

Suicidal behavior among adolescents is a serious public health problem in the U.S. This behavior often begins with thoughts about killing oneself. It can evolve into making a plan, which may eventually lead to a suicide attempt. Attempts result in harm ranging from disability, injury or death (Nock et al., 2008). Suicide completion may be conceptualized as an action taken by an individual when unable to cope with a crisis situation (Sveticic & De Leo, 2012). Although this offers a partial understanding, suicidal behavior is a complex phenomenon. It is a process that develops over time across various environmental, social and individual risk factors (Mościcki, 2001). This work examines associations between high risk health behaviors and suicide risk.

Suicidal thoughts can onset in adolescents as early as 12 years of age (Kessler, Borges, & Walters, 1999). A study by Adrian et al., (2016) found, suicidal thoughts peaked around 12 years for boys and 14 years for girls (Adrian, Miller, McCauley, & Vander Stoep, 2016). Although early adolescence is a high-risk time for onset of suicidal behavior, it peaks around 16 and can remain high into the early 20s (Kessler et al., 1999). Thus, for the current research, high school students age 14 to 18 is the population of interest.

Adolescence is a transitional period from childhood to adulthood and a period of rapid physical growth and sexual development (Adolescent Development, n.d.). During this vulnerable period, any exposure to or involvement in violence at school or community, or engaging in certain health behaviors puts adolescents at a higher risk for suicidal behavior. Negative experiences or adverse life events can trigger suicidal thoughts (Arie, Haruvi-Catalan, & Apter, 2005). Suicidal thoughts may also occur when stress, immaturity and lack of emotional support combine to overwhelm a teen's ability to cope and think logically (Portes, Sandhu, & Longwell-Grice, 2002). Teens with persistent suicidal thoughts are at increased risk of making suicidal plans (Mościcki, 2001). Adolescents experiencing suicidal thoughts and plans are at higher risk for a first suicidal attempt within the first year of onset. For teens who plan to commit suicide, the risk remains high till early 20s (Kessler et al., 1999). Nearly one-third of teens with suicidal thoughts developed plans of which, about 60% went on to attempt suicide. This transition from suicidal thoughts to plans and to attempts happened within one year of onset of suicidal thoughts (Nock et al., 2013). The risk of first suicide attempt is high only in the first year, and abates soon after, for teens experiencing suicidal thoughts without a plan (Kessler et al., 1999).

Although females are reported to have higher frequency of non-fatal suicidal attempts males are reported to have more frequent suicide completions. This gender paradox is well defined and described in the health literature (McLoughlin, Gould, & Malone, 2015). The ratio of suicide completion for males to females has been estimated to be in the range of 3:1 to 7.5:1 (Nock et al., 2008). This gender paradox

may be explained by males using more lethal methods for suicide completion (particularly firearms), consuming more alcohol, displaying greater aggressive and impulsive behavior, and externalizing violent behaviors (McLoughlin et al., 2015). Therefore, this study analyzes YRBSS data by sex.

The Diagnostic and Statistical Manual of Mental Disorder (DSM-5) is the primary tool used by healthcare providers to diagnose Suicidal Behavior Disorder. It describes five criteria for Suicidal Behavior Disorder. Suicidal attempt is a sequence of behaviors that is started by an individual, with steps taken towards the intention of killing oneself. The criteria include: 1) a suicide attempt in the last 24 months; 2) an action that fails to meet the criterion for non-suicidal self-injury; 3) a diagnosis not applicable to suicidal ideation or plans; 4) action not taken while delirious or confused; and, 5) action not taken only for political or religious reasons (American Psychiatric Association, 2013). Suicidal Behavior Disorder is formally diagnosed only if all the named criteria in DSM-5 are met. Suicidal behavior has multiple stages from suicidal ideation to plans and attempts. However, DSM-5 criteria exclude both suicidal ideation and plans and considers only suicidal attempts to have occurred in past 24 months as a criterion. This reveals opportunities to identify suicidal behavior early. Therefore, it is the primary motivation in this research, to elaborate on risk factors.

Identifying specific risk factors that make teens more vulnerable to suicidal behavior will be valuable in screening and providing appropriate and timely interventions (Shain, 2007). Knowledge of related risk factors can be beneficial in explaining and predicting suicidal behavior (Miller & Eckert, 2009). This research seeks to enable a better understanding of suicidal risk factors in adolescents. It focuses on quantifying associations between suicidal behavior and risk factors among adolescents in the YRBSS data. This knowledge can contribute to reducing the overall morbidity associated with adolescent suicidal behavior.

The following research questions are addressed:

- What are the high-risk health behaviors associated with suicidal thoughts and attempts in 2013 and 2015?
- What are the time trends in high-risk health behaviors associated with suicidal thoughts and attempts in the years 1991 to 2015?

Associations between high-risk health behaviors and suicidal thoughts and attempts are examined for a national probability sample of adolescents. Lowry et al (2014) provided a framework for categorization of risk factors to be studied for associations with increased risk for suicidal thoughts and attempts. The YRBSS data provided an opportunity to examine relationships for a representative sample of adolescents. The aims of this research are to: (a) investigate associations between high risk health behaviors and suicidal thoughts and attempts among adolescents; (b) assess which high risk health behaviors affect suicide risk over time. Understanding of associations may help clinicians and healthcare workers involved in working with adolescents at risk, as well as those designing educational and public health prevention programs intended to promote greater understanding of suicidal phenomenon.

The risk of advancement of suicidal thoughts to plans and then to attempts may be reduced through appropriate intervention and treatment (Arie et al., 2005). Suicides are preventable (Bailey et al., 2011) (Mościcki, 2001). Intervention begins with recognizing high-risk groups for suicidal behavior, increasing public awareness though health campaigns, and educating school personnel, health care and mental

health providers about suicidal behavior (Bailey et al., 2011). The American Academy of Child and Adolescent Psychiatry (AACAP) recommends preventative actions, including implementing crisis hotlines for individuals experiencing suicidal behavior, as well as restricting means of suicidal attempt such as firearms or over the counter drugs. Gatekeeper training can be provided to those in close contact with adolescents (teachers, counselors, students, parents and clergy), so that gatekeepers can identify youth experiencing suicidal behavior and provide appropriate referrals. Further, screening adolescents in ages 15-19, who are engaged in substance abuse, and those experiencing mental health disorders for suicidal behavior are helpful (Shaffer & Pfeffer, 2001).

A framework was constructed in this research for considering health behaviors based on work by Lowry et al (2014). Grouping risk factors by domains and assessing them against suicidal behavior helps determine precise associations among them. Health behaviors are categorized into seven domains including exposure to violence in the community, exposure to violence at school, substance abuse, high risk sexual behaviors, weight controlling behaviors, physical/sedentary activities, and personal characteristics. This lays the groundwork for the YRBSS data analysis of such high-risk behaviors. This literature review explores risk factors cited in the health literature associated with suicidal behavior to support this research.

Literature Review

Overview

Suicidal behavior is defined in different ways in health literature. For example, in one study, suicidal behavior is defined as any action by an individual to hurt oneself (aggression towards self), regardless of the level of intended harm (Botega, Barros, Oliveira, Dalgalarrondo, & Marín-León, 2005). Another study categorized non-fatal suicidal behavior into three groups: suicidal ideation involving thoughts about how to end one's life; suicidal plan pertaining to usage of a specific method to attain death; and suicide attempt engaging in self-injurious behavior with intention of dying (Nock et al., 2008). The Centers for Disease Control and Prevention (CDC) categorized suicidal behavior into two groups: suicidal ideation and suicidal attempts. Suicidal ideations were defined as thoughts and plans about death. Suicide attempts were defined as non-fatal, self-directed, injurious behavior with motivation to die that might not result in injury (CDC-Definitions: Self-directed Violence, n.d.).

There are various risk factors that increase the risk for suicidal behavior. For example, previous research has shown major risk factors for suicidal behavior include mental health issues such as depression; Attention Deficit Hyperactivity Disorder ; Post Traumatic Stress Disorder; history of suicide attempt; family history of suicide; disruptive behavior disorder; drug or alcohol dependence or misuse; anxiety disorders; loss of a family member; access to lethal weapons; social isolation; hopelessness; experiencing stigma against mental illness; and experiencing physical illness (Bailey et al., 2011). Multiple risk factors may also be involved, leading to suicidal behavior (Mościcki, 2001). Untreated mental health issues are major risk factors for suicidal behavior. Individuals with two or more risk factors are at a higher risk for suicidal behavior (Bailey et al., 2011). Reducing risk factors helps in reduction for risk of suicidal behavior. Risk factors considered in this work are those individuals who were unable to focus at school, those who felt hopeless or sad, and those who abused alcohol or drugs.

Risk factors can be organized as proximal and distal and they influence suicidal behavior at different levels (Mościcki, 2001). Proximal risk factors are adverse events found to have occurred prior to a

suicidal attempt such as a crisis in an individual's life. Distal risk factors are not specific to suicidal behavior; however, they function as risk thresholds beyond which the individual susceptibility increases for proximal risk factors. Either proximal or distal risk factors, by themselves are insufficient for attempted or completed suicide. The synergistic activities between proximal and distal risk factors, along with individual and environmental factors create an agreeable condition for complex suicidal behavior. While considering proximal and distal risk factors for this research, two proximal risk factors and a single distal risk factor were found in YRBSS data. Sense of hopelessness or sadness and dependency or addiction to alcohol were identified as the proximal risk factors. Substance abuse was identified as the distal risk factor. However, this research organizes risk factors in terms of seven different domains and not in terms of proximal and distal risk factors.

Protective factors may provide safeguards against developing suicidal thoughts and attempts among teens. For example, protective factors such as social support, religious support (Nock et al., 2008), being in good physical, mental health (Sveticic & De Leo, 2012), having higher academic achievement at school (Borowsky, Ireland, & Resnick, 2001), having positive attitude, developing coping skills and problem-solving skills can help reduce the risk for suicidal behavior (Lubell & Vetter, 2006). A protective factor considered in this research was, if higher academic performance of adolescents at school made them more or less prone to suicidal thoughts and attempts.

Most studies pertaining to suicidal behavior, consider risk factors in general. However, one study by Lowry et al., (2014) organized risk factors among of six domains. The current research expands on the Lowry et al., (2014) study, by adding a seventh domain, for personal characteristics, and analyzed YRBSS data for recent years. Also, there are few studies analyzing suicidal behavior trends over time utilizing YRBSS data in the U.S. One study that analyzed data from 1991 to 2001, reported an increase in risk for suicide attempt for male black students (Joe & Marcus, 2003). A more recent analysis looking at 1991 to 2011 found a decrease in suicidal behavior for male students (Lowry, Crosby, Brener, & Kann, 2014). This research differentiates from such studies by analyzing time trends in associations between suicidal behaviors and risk factors across the seven domains for 1991 to 2015. Review of the seven domains of risk factors considered for this research follow.

Community related Violence

Adolescents can be exposed to violence in their community, in various forms for example, usage of weapons such as guns; cyber bullying; physical violence at home or streets; and violence from an intimate partner. Such exposure to violence or involvement in violence leaves them at a higher risk for suicidal behavior. For example, a longitudinal study found some of the risk factors associated with suicide attempts among males included, being a victim of violent incidents, being a perpetrator of violence, or having been involved in past suicide attempts. Among females, those experiencing physical illness and exposure to suicide by a peer, were associated with an increase in risk for suicide attempts (Borowsky et al., 2001). A study among female Latino adolescents found, those involved in physical fights were at a higher risk for suicidal ideation and attempt (Eaton et al., 2011). Another study reported, teens experiencing direct violence were at a higher risk for suicidal behavior (Wolitzky-Taylor et al., 2009). A secondary analysis suggested, teens involved in carrying a weapon in the community or being involved in a physical fight were at increased risk for suicidal thoughts, plans, and attempts (Nickerson & Slater, 2009). Further, teen victims of cyberbullying were at an increased risk for suicidal thoughts and attempts as compared to non-victims (Hinduja & Patchin, 2010). Also, teens who were

victims of interpersonal violence by their intimate partner were at higher risk for suicidal thoughts and attempts in comparison to teens who were not victims. Victims of physical assault were at a higher risk for planning suicide. Females were more vulnerable for dating violence and this illustrates the gender paradox for suicidal behavior (Belshaw, Siddique, Tanner, & Osho, 2012). The suicide literature suggests a gender paradox; females report higher frequency of suicidal attempts, whereas males report more frequently committing suicides. The current research explores the associations between suicide risk and exposures to violence in communities such as carrying weapon, being involved in physical fights, being bullied electronically, being exposed to physical violence by an intimate partner and being forced to have sexual intercourse.

School Related Violence

Adolescents can be exposed to violence at school from a range of threats such as carrying guns or knives on school property, being bullied, being subject to intimidation or threats, or getting involved in physical fights. Such involvement or exposure to violence at school, makes adolescents more vulnerable to suicidal thoughts and attempts (Hinduja & Patchin, 2010). In addition, such unsafe school environments may discourage some adolescents from attending school. For example, a study showed, among teens who missed school because they felt unsafe and threatened at school were at a higher risk for suicidal ideation and attempts (Lowry et al., 2014). Another study found victims of school bullying were three times as likely to report suicidal ideation or attempts in comparison to non-victims (Sibold, Edwards, Murray-Close, & Hudziak, 2015). A meta-analysis examining the association between bullying and suicide found victims of bullying were at increased risk for suicidal thoughts and attempts. In addition, perpetrators of bullying were also at a higher risk for suicidal thoughts and attempts (Hinduja & Patchin, 2010) (Holt et al., 2015). A negative attitude towards school and lower grades was associated with increased risk for suicidal behavior (Lubell & Vetter, 2006). Finally, a study found among adolescents threatened or injured at school, those involved in physical fights and those injured in a physical fight at school were at a higher risk for suicidal thoughts, plans, and attempts (Nickerson & Slater, 2009). Therefore, the associations between risk for suicide risk and exposure to violence at school such as carrying weapon to school, being involved in physical fights in school, being bullied at school, missing school because of safety concerns, and being threatened at school were examined in this research.

Substance Abuse

Experimenting with different types of illicit drugs and alcohol are some of the risks that can onset during teen years. Curiosity in experiencing such substances can initiate abuse, and subsequently, owing to the addictive nature of such substances, it can result in recurring abuse by adolescents. Access to illicit substances in school or community and peer pressure can further increase risk for substance abuse. Clinical and community based studies show that teens involved in drug and alcohol abuse were at increased risk for suicidal behavior (Esposito-Smythers & Spirito, 2004). For example, among teens with substance abuse issues, the odds of suicidal attempt was three times higher than those who were not involved in substance abuse (Esposito-Smythers & Spirito, 2004). A secondary analysis reported, abusing alcohol or illicit drugs such as marijuana and cocaine were associated with an increased risk for suicidal thoughts and attempts (Gart & Kelly, 2015). Another secondary analysis with use of the YRBSS data found, teens engaged in abuse of substances such as alcohol, marijuana, methamphetamine, cocaine and injection drugs were at a higher risk for suicidal thoughts and attempts (Lowry et al., 2014). Further, a study reported, alcohol abuse was a proximal risk factor and substance abuse was a distal risk

factor for suicidal behavior (Esposito-Smythers & Spirito, 2004). Consumption of alcohol rendered teens more vulnerable to suicidal thoughts and attempts (Tomek et al., 2015). Another study indicated synergistic associations between substance abuse and suicidal behavior (Vijayakumar, Kumar, & Vijayakumar, 2011). In the current research, the associations between suicide risk and abuse of substances such as alcohol, marijuana, cocaine, methamphetamine, injection drug were investigated.

High Risk Sexual Behaviors

Adolescents undergo significant physical and sexual development during puberty and are more curious and conscious about sexuality. During this time, they may explore sexual relationships at an early age (13 or younger) or engage in unprotected sex or have sex with multiple partners resulting in increased risk for suicidal thoughts and attempts (Lowry et al., 2014). For example, a longitudinal study reported behaviors such as initiation of sexual intercourse at an early age or having multiple sexual partners were associated with increased risk for suicidal thoughts and attempts. In addition, those who used alcohol or drugs prior to a sexual intercourse were also at higher risk for suicidal thoughts and attempts (Hallfors et al., 2004). Another study reported incorrect or inconsistent usage of condoms was associated with increased risk for suicide attempts. Teens who had three or more sexual partners were at increased risk for suicide attempt (Houck et al., 2008). This research examined the associations between high risk sexual behavior such as engaging in sexual intercourse, initiation of sexual intercourse at 13 or younger, having multiple sexual partners, and refraining from condom use in the prior sexual intercourse and suicidal thoughts and attempts.

Weight Related Behaviors

Adolescence is a period of physical transformation, during which some teens engage in aggressive weight loss measures to gain social acceptance from their peers. Among them, some perceive themselves as overweight or obese while others are truly so. Their pursuit of any extreme weight loss measures such as prolonged fasting, using diet pills, vomiting or using laxatives have been identified as Unhealthy Weight Controlling Behaviors (UWCB) (Kim, Cho, Cho, & Lim, 2009). Such UWCBs in adolescents were associated with suicidal behavior. Teens who were obese were prone to suicidal behavior regardless of UWCB as well. For example, in a study by Kim et al., (2009), overweight teens were at a higher risk for suicidal thoughts than those in the normal weight range. Being overweight was also associated with increased risk for UWCB and suicidal thoughts. Another study found that teens with self-perception of being overweight were at a higher risk for suicidal thoughts regardless of their BMI. As teens grew older, the self-perception of being overweight was reduced for females, however, it was not for males (Lee & Seo, 2013). Further, teens with all three UWCBs (fasting, diet pills and vomiting/laxatives) were associated with increased risk for suicidal thoughts, plans and attempts (Johnson, Weiler, Barnett, & Pealer, 2016). The associations between adolescents who were obese, had self-perception of being overweight or experienced various UWCBs such as using diet pills, fasting, vomiting or using laxatives and suicide risk were explored in the current work.

Physical/Sedentary Activities

Physical activities benefit both physical and mental health by averting stress or anxiety, and improving overall energy levels. Many routinely engaged in sedentary activities such as watching television, playing video games or internet surfing can be associated with suicidal behavior. For example, a case control study reported, sedentary activity was associated with increased risk for suicidal thoughts. However,

teens engaged in team sports were resilient, felt socially connected and experienced a sense of belonging (Simon, Powell, & Swann, 2004). Another study reported, involvement with team sports had a protective effect against suicidal thoughts by enhancing endogenous endorphins, improved self-esteem, improved self-perception of body image, increased social support and altered substance abuse behavior (Babiss & Gangwisch, 2009). A secondary analysis reported, sedentary lifestyle such as spending four or more hours per day playing video games or internet surfing was associated with increased risk for suicidal thoughts and plans. Further, teens engaged in five or more hours of playing video games and internet surfing behaviors were also associated with an increased risk for suicidal thoughts, plans and attempts (Messias, Castro, Saini, Usman, & Peeples, 2011). Adolescence is a period of significant change in sleeping habits. A study reported, teens in the insomnia group were at a higher risk for suicidal thoughts and attempts compared to those in non-insomnia group (Bailly, Bailly-Lambin, Querleu, Beuscart, & Collinet, 2003). A prospective study on sleep related problems among adolescents aged 12-14 years predicted them to have suicidal thoughts and behaviors by the time they were 15-17, while controlling for depression (Wong, Brower, & Zucker, 2011). Another study reported that insomnia was a significant predictor for suicidal ideation among young people in aged 11-19 years (McGlinchey, Courtney-Seidler, German, & Miller, 2016). This research examined the associations between suicide risk and activities such as not being physically active, not participating in team sports, watching television or engaging in video games for more than 3 hours or sleeping for less than 8 hours per night.

Personal Characteristics

Adolescents with certain personal characteristics such as aggressive or impulsive behavior, experiencing feelings of hopelessness or sadness, or inability to concentrate leaves them at increased risk for suicidal behavior. For example, a study reported that characteristics such as aggression, anxiety, hopelessness, neuroticism, impulsivity, hostility, psychoticism and extroversion were closely associated with suicidal behavior (Brezo, Paris, & Turecki, 2006). Some of the major risk factors for suicidal behavior were untreated mental health problems such as depression or ADHD. Characteristics such as novelty seeking behavior, impulsiveness, and aggressiveness were associated with suicidal behavior (McGirr et al., 2008). Another study reported that presence of any psychiatric disorder was one of the major risk factors for suicidal thoughts and attempts (Nock et al., 2008). Teens diagnosed with major depression or major depression with dysthymic disorder were associated with increased risk for suicidal behavior (Shafii, Steltz-Lenarsky, Derrick, Beckner, & Whittinghill, 1988). Appropriate treatment for impulsivity in early years was crucial in managing and reducing risk for suicidal behavior (Vijayakumar et al., 2011). The current research investigated associations between being hopelessness and sadness, driving while intoxicated, involving in fights resulting in injury, driving without wearing seatbelts or abusing substances prior to sexual activity and suicide risk. Additionally, associations between academic performance at school, inability to focus and suicide risk were also explored.

Introduction Summary

Suicidal behavior among adolescents is a serious public health problem in the U.S. Public health organizations have set goals for reducing suicidal behavior among youth. Adolescents are a subset of the population that are at an increased risk for suicidal behavior. Teens who are involved with high risk health behaviors can begin to have suicidal thoughts and subsequently advance to suicidal planning and attempts, which may result injury, disability or death. Associations between suicidal behavior and risk factors elaborated in this research can help in early identification of adolescents at high risk for suicidal

behavior. Timely screening can result in referrals to appropriate services to reduce and prevent increased risk. This research analyzed over seven domains of risk factor associations with suicidal behavior among adolescents such as community related violence, school related violence, substance abuse, high risk sexual behaviors, weight controlling behaviors, physical/sedentary activities and personal characteristics. The results of this research might be used by those who work closely with adolescents such as school personnel, healthcare providers, and parents to raise overall awareness and empower them, with adequate knowledge in early identification and screening for suicidal behavior. Raising awareness and education at various levels of society, community, family and individual will further contribute to overall reduction of risk for suicidal behavior.

Methods

To better understand the factors that increased the risk for suicidal thoughts and attempts among adolescents, two sets of statistical analyses with the YRBSS data were conducted. The first was single year analysis for each of 2013 and 2015, examining risk factors associated with suicide risk. The second was a time trend analysis of risk factors associated with suicide risk for the years 1991 to 2015.

Study Design

The YRBSS study was developed and first implemented in 1991 and intended to monitor health risk behaviors that may lead to death, disability, and social problems among adolescents in the U.S. The YRBSS was a biannual cross-sectional survey conducted in odd years from 1991 to 2015 by the CDC. Independent sampling and operational procedures were used to collect data from national, state, territorial, tribal and large urban school districts. For the purpose of this research, the national YRBSS was used. The national YRBSS protocol has been approved by the Institutional Review Board at the CDC (Youth Risk Behavior Surveillance-United States, 2011, n.d.).

A probability sample was selected to obtain a nationally representative sample of student populations of those attending public and private high schools. Parental consent was obtained before administering the survey. The survey did not include name or any other personally identifiable information. The YRBSS was conducted from February to May of each survey year (Methodology of Youth Risk Behavior Surveillance System-2013, n.d.).

The target population for this survey was public and private school students in grades 9-12. The standard questionnaire consisted of 90-99 items. Each year, a small subset of 5 to 11 additional questions were added, while still limiting the total survey size to 99 questions. The survey was administered by experienced data collectors and excluded skip patterns, grid formats and fill-in-the blank formats (Methodology of Youth Risk Behavior Surveillance System-2013, n.d.). This approach ensured that each participant had the same amount of time to complete the questionnaire. Test-retest reliability for the questionnaire was first completed in 1992 and again in 2000. About two thirds of the questions indicated adequate reliability (Methodology of Youth Risk Behavior Surveillance System-2013, n.d.). Students answered questions in a paper booklet which was later scanned. The questionnaire included six categories of health-related behaviors:

(1) Unintentional injury and violence
(2) Tobacco use
(3) Alcohol and other drug use
(4) Sexual behaviors contributing to unintended pregnancy and sexually transmitted diseases

(5) Dietary behaviors
(6) Physical activity

YRBSS Methodology

The probability sampling technique was a three-stage cluster sample design. The target population included students from all public and private schools in the 50 states of the U.S. and the District of Columbia. The U.S. territories were not included in the sampling frame (Methodology of Youth Risk Behavior Surveillance System-2013, n.d.). In the first stage, the sampling frame contained primary sampling units (PSUs) that included large counties, sub-areas of large counties, or groups of small adjacent counties. The PSUs were organized into different strata based on Metropolitan Statistical Area and percentage of black and Hispanic students in the PSUs. At the second stage, schools were chosen within previously selected PSUs with probability proportional to school enrollment size. At the third stage, sampling was completed in each school, by randomly selecting 1-2 classes for required subjects (English or Social Studies) from grades 9 through 12. A weighting factor was applied to each participant to account for probability of selection at each sampling stage, nonresponse, and oversampling of black and Hispanic students.

Dependent Variable

The suicide risk dependent variable used in this research originally appeared in Lowry et al (2014) and was constructed as a 3-level categorical variable based on four suicide related questions from the YRBSS data. The three levels of suicide risk were defined as: low, moderate and high. The four suicide related questions included in the YRBSS survey were with respect to suicidal thoughts, plans, attempts and injurious attempts in the past 12 months (Table 1). Table 2 provides the description of number of students that belonged to low, moderate and high risk groups in years 2013 and 2015.

Table 1 displays the construction of the suicide risk outcome and categories. Low risk category was defined as those who said 'No' to suicidal thoughts, plans, attempts and injurious attempts. The moderate risk category was defined as those who said 'Yes' to either suicidal thoughts, plans or both and said 'No' to suicidal attempts and injurious attempts. High risk category was defined as those who answered 'Yes' to suicidal thoughts and plans as well as those who answered 'Yes' to either attempts or injurious attempts or both. Suicide risk had three possible values:

- **Low risk:** those who had no suicidal thoughts, plans, attempts and injurious attempts in past 12 months
- **Moderate risk**: those who had suicidal thoughts or plans ('Yes' to either question on suicidal ideation but 'No' to suicide attempts/injurious attempts in the last 12 months)
- **High risk:** those with suicidal thoughts, plans and at least one suicide attempt/injurious attempt or both in the past 12 months

Independent Variables

The YRBSS dataset for any given year has between 90 and 99 variables. Only categorical variables were considered in this work. Independent variables consisted of demographic characteristics and health behavior data. Demographics included sex, race/ethnicity, grade and age. There were a host of risk factors that indicated associations with suicidal ideation and attempts from the past literature review. A

framework was constructed in this research for considering health behaviors based on work by Lowry et al (2014). This include behaviors characterized into seven domains:

1. Community related violence
2. School related violence
3. Substance abuse
4. High risk sexual behavior
5. Weight related behavior
6. Physical/Sedentary activities
7. Personal characteristics

Table 4 displays details of survey questions for each domain and health behavior information collected for each. All of the health behavior variables within each domain were measured as dichotomous variable.

In the interest of being consistent with previous published studies of YRBSS data, the race/ethnicity variable was grouped into four categories: white, black, Hispanic and Other. Grade was categorized as 9^{th}, 10^{th}, 11^{th}, and 12^{th} grade students. Age was treated as a categorical variable, with age values of 14, 15, 16, 17 and 18 years or older. Table 5 for 2013 data and Table 9 for 2015 data displays the demographic characteristics of the participants. There were four high risk health behavior questions that were reverse coded. For these questions, participants that answered 'No' to the questions were considered.

Health behavior questions were not asked in all of the survey years between 1991 and 2015. Table 13 for females and Table 14 for males shows the survey years each question was asked, and the number of participants responding to each.

Data Analysis

The first analysis was to assess health behaviors associated with suicide risk for each of 2013 and 2015, and the second analysis was to assess time trends for the association with health behaviors and suicide risk from 1991 to 2015. For the single year analyses, there were 35 (2013) and 37 (2015) questions pertinent to high risk health behaviors that were considered as independent (predictor) variables for each survey year. There were 36 questions capturing health behaviors that were examined for an association with suicide risk for the combined data across years 1991 to 2015. Combined data was explored for linear trends. Line graphs were used to display associations between demographic characteristics and health behaviors significantly associated with suicide risk.

Missing data presented a challenge, as there was a considerable amount of missing responses for all study variables. The dependent variable was categorized for responses that were missing for suicide risk and responses that were not missing for suicide risk. Thus, an analysis was completed to compare participant characteristics for subjects with the observed risk outcome against those with missing risk outcome for 2013 and 2015 data. All study variables considered in this analysis were categorical. This resulted in a contingency table and a Pearson Chi-Square statistical test for comparing the distribution of missing and non-missing for each study variable. These results are displayed in Table 6 for 2013 data and Table 10 for 2015 data.

Statistical Analysis

The 3-level ordinal dependent variable was modeled with ordinal logistic regression. The study plan was to check the proportional odds assumption for this model. If the assumption was violated, the plan was to resort to the more general multinomial logistic regression model framework.

It was decided to structure this analysis in a format similar to a previous publication that examined the same outcome and also considered associations with risky health behaviors (Lowry et al, 2014). Lowry et al (2014) appeared in 2014 and analyzed YRBSS data collected up through 2011. This research includes original results for 2013 and 2015. In line with this previous published work, included here are bivariate statistical models with each health behavior as an independent variable also include race/ethnicity, age, and grade. Due to sex differences cited in Lowry et al (2014), all results are stratified by sex. Results of ordinal or multinomial logistic regression models were reported as odds ratios and 95% confidence intervals.

In analyzing time trends with data from 1991 to 2015, the focus was to examine how health behaviors changing over time affected suicide risk. Thus, a health behavior by time interaction term was included in each model. This allowed an approach for assessing which health behaviors contributed to changes in the suicide risk over the time period examined. This model also included race/ethnicity, age, and grade and all results are stratified by sex. Results of ordinal or multinomial logistic regression models were reported as odds ratios and 95% confidence intervals.

SAS version 9.4 (SAS Inc., Cary NC, 1989) was used for statistical analyses and Microsoft Excel was used for creating graphical displays. Due to the complex sampling methods used in YRBSS surveys, the SAS procedures PROC SURVEYFREQ and PROC SURVEYLOGISTIC were used. In order to avoid list wise deletion of the data and to improve variance estimates, NOMACR option was used for each model. This option treated the data with non-missing values as one domain and compared it with the domain that included both missing and non-missing values to improve the variance estimation in the model and obtain more accurate standard error estimates. The level of significance in this work was set at $\alpha = 0.05$.

Results

Results for 2013 Data Analysis

Table 2 displays the description of students at low, moderate and high risk for 2013 data. There were 9,327 students in low risk, 1381 students in moderate risk and 939 students in the high-risk group. The details of the sampling plan, sample size and response rate for 2013 is given in Table 3. A description of health behaviors is provided in Table 4. In 2013, 193 schools were selected in the probability sample and invited to participate. Out of these, 148 schools participated, resulting in a school response rate of 77%. There were 15,480 students enrolled in the 148 schools, of which 13,633 students participated. If a response to a question matched with any of the available responses, it was considered valid, if not it was categorized as missing. There were 13,583 valid responses, resulting in a student response rate of 88%. The CDC reports overall response rate as a multiplication of school response rate and student response rate. Thus, the overall response rate for the survey was 68%. In 2013, the sample size for YRBSS data was 13,583. In this analysis, there were 46 students who reported suicide attempts without an indication of a suicidal ideation/plan, and hence were categorized as missing.

Descriptive Statistics for 2013 Data Analysis

Summary statistics by each of the suicide risks for demographic characteristics including sex, race/ethnicity, grade and age are described in Table 5. There were more female students than male students associated with moderate risk group (59.6% vs. 40.4%) and high risk group for suicide (68.9% vs. 31.1%). There were more white students than black, Hispanic or those belonging to Other race/ethnicity that were associated with moderate risk group (59.8% vs. 10.1%, 19.2%, 11.0%) and high risk group (47.0% vs. 13.6%, 28.0%, 11.4%). Students in grades 9^{th} through 12^{th} were associated with similar moderate risk for suicide. Students in 9^{th} grade experienced higher risk for suicide (31.7%) than students in the 10^{th} (28.4%), 11^{th} (22.7%) and 12^{th} grade (17.3%). Those students aged 18 or older had lower association with moderate or high risk for suicide than to students who were younger.

Missing data were present for all study variables. Table 6 displays summary statistics and statistical tests for comparing subject characteristics across missing and non-missing responses. Teens with missing risk were more likely to be involved in physical fights at school than those with non-missing risk for suicide (χ^2 (1) = 15.09, p <.001. Students who carried weapon on school property were more prone to be in missing risk group than non-missing risk for suicide (χ^2 (1) = 5.11, p = 0.03). Adolescents with missing risk were more likely to use marijuana than those in non-missing group for suicide (χ^2 (1) = 12.87, p<.001). Teens who had four or more sexual partners were more prone to be in missing risk group than non-missing risk group for suicide (χ^2 (1) = 20.80, p<.001). Students who were obese were inclined to be in missing risk group than non-missing risk group (χ^2 (1) = 13.82, p< .001). Adolescents with missing risk were more likely to not play on a sports team than those with non-missing risk for suicide χ^2 (1) = 4 .42, (p=0.04). Teens who felt hopeless of sad were less prone to be in non-missing risk group than missing risk group for suicide (χ^2 (1) =0.0001, p = 0.99).

Due to the ordinal nature of the dependent variable, the analytic plan was to build an ordinal logistic regression model. Once fit, proportional odds assumption was tested, and the assumption did not hold (Chi Square value of 110.10, p <.001). Hence, instead of ordinal logistic regression model, multinomial logistic regression model was constructed to measure the association between suicidal behavior and each high-risk health behavior. This model was controlled for race/ethnicity, grade and age for female students (N = 6,621) as well as male students (N = 6,950). Results of the multinomial logistic regression models were reported in Table 7 for female and Table 8 for male students.

Results for Female Students for 2013 Analysis

All of the models fit for 2013 data controlled for race/ethnicity, age and grade. Female students who experienced community related violence and were forced to have sexual intercourse were more likely to be at moderate than low risk group for suicide (OR = 2.92, 95% CI: 2.01, 4.23). This risk was substantially higher, with females who were forced to have sexual intercourse at 7.74 (95% CI: 5.86, 10.22) times the odds of being in the high versus low risk group. Females students who were exposed to school related violence and carried a weapon on school property were more inclined to be in the moderate than low risk group (OR = 3.42, 95% CI: 2.10, 5.56). This risk was considerably higher, with females who carried a weapon on school property at 7.45 (95% CI: 4.72, 11.75) times the odds of being in high versus low risk group. Female students who experienced school related violence and were threatened at school were prone to be at moderate than low risk group (OR = 2.52, 95% CI: 1.57, 4.05). The risk was considerably higher, with female students who were threatened at school at 6.39 (95% CI: 4.91, 8.30) times the odds of being in high versus low risk group. Female students involved in substance abuse and used cocaine

were more likely to be at moderate than low risk group (OR = 1.88, 95% CI: 1.12, 3.16). This risk elevated substantially, with females who were cocaine users at 7.41 (05% CI: 4.86, 11.28) times the odds of being in high versus low risk group. Among female students who were substance abusers, and who used methamphetamine were more inclined to be at moderate than low risk group (OR = 3.26, 95% CI: 1.60, 6.64). This risk was considerably higher, with those who used methamphetamine at 7.26 (95% CI: 4.16, 12.67) times the odds of being in high than low risk group. Female students involved in weight controlling behavior and used vomiting or laxatives to control their weight were more likely to be at moderate than low risk group (OR = 2.49, 95% CI: 1.70, 3.64). This risk was considerably higher, with females who used vomiting or laxatives to control their weight at 7.25 (95% CI: 4.96, 10.58) times the odds of being in high than low risk group. Female students who felt hopeless or sad were more prone to be at moderate than low risk group (OR = 8.58, 95% CI: 7.11, 10.34). This risk heightened substantially, with females who felt hopeless or sad at 19.14 (95% CI: 14.13, 25.93) times the odds of being in high than low risk group for suicide.

Results for Male Students for 2013 Analysis

For 2013 data, male students who were exposed to community related violence and forced to have sexual intercourse were more inclined to be at moderate than low risk group for suicide (OR = 4.74, 95% CI: 2.62, 8.59). This risk expanded considerably for males who were forced to have sexual intercourse at 16.17 (95% CI: 11.14, 23.49) times the odds of being in high versus low risk group. For male students who were exposed to school related violence and threatened at school were more inclined to be at moderate than low risk group (OR = 1.86, 95% CI: 1.31, 2.64). This risk was substantially higher, with those who were threatened at school at 9.50 (95% CI: 6.51, 13.84) times the odds of being in the high than low risk group. Males involved in substance abuse and who used methamphetamine were more likely to be at moderate than low risk group (OR = 1.97, 95% CI: 1.16, 3.36). This risk expanded considerably, with males who used methamphetamine at 15.88 (95% CI: 10.25, 24.59) times the odds of being in high than low risk group for suicide. Male students involved in high risk sexual behavior and had sex before the age of 13 were more prone to be at moderate than low risk group (OR = 2.11, 95% CI: 1.46, 3.05). This risk expanded considerably for males who had sex before the age of 13 at 6.38 (95% CI: 3.94, 10.34) times the odds of being in high than low risk group. Male students involved in weight controlling behavior and who used vomiting or laxatives for controlling their weight were more inclined to be at moderate than low risk group (OR = 3.99, 95% CI: 2.21, 7.20). This risk was substantially higher with males who used vomiting or laxatives to control their weight at 12.02 (95% CI: 6.58, 21.98) times the odds of being in the high than low risk group. Male students who felt hopeless or sad were more prone to be at moderate than low risk group (OR = 12.42, 95% CI: 9.28, 16.61). This risk elevated substantially, with males who felt hopeless or sad at 19.30 (95% CI: 12.67, 29.42) times the odds of being in high than low risk group for suicide.

Results for 2015 Data Analysis

Table 2 displays the description of students at low, moderate and high risk for 2015 data. There were 9,346 students in low risk, 1541 students in moderate risk and 1063 students in the high-risk group. The details of the sampling plan, sample size and response rate for 2015 data is depicted in Table 3. In 2015, 180 schools were selected in the probability sample and invited to participate. Out of these, 125 schools participated, resulting in a school response rate of 69%. There were 18,165 students enrolled in 125 schools, of which 15,713 students participated. If a response to a question matched with any of the

available responses, it was considered valid, if not, it was categorized as missing. There were 15,624 valid responses resulting in a student response rate of 69%. The CDC reports the overall response rate as multiplication of school response rate and student response rate. Hence, the overall response rate was 60%. The sample size for 2015 data was 15,624In this analysis, there were 74 students who reported suicide attempts without an indication of a suicidal ideation/plan and hence were categorized as missing.

Descriptive Statistics for 2015 Analysis

Summary statistics by each level of suicide for demographic characteristics including sex, race/ethnicity, grade and age are described in Table 9. There were more female than male students that were associated with moderate risk group (58.8% vs. 41.2%) and high risk group for suicide (70% vs. 30%). There were more white students than black, Hispanic or those belonging to Other race/ethnicity that were associated with moderate risk group (57.8% vs. 11.8%, 20.0%, 10.4%) and high risk group (44.6% vs. 11.5%, 30.4%, 13.4%). Students in grades 9 through 12 were associated with similar moderate risk for suicide. Students in 9^{th} grade were more likely to be (32.6%) associated with an increase in risk for suicide than those in grades 10^{th} (29.1%), 11^{th} (21.6%) and 12^{th} (16.7%). Students aged 18 or older had lower association with moderate or high risk for suicide than those younger.

Missing data were present for all the study variables. Table 10 displays summary statistics and statistical tests for comparing subject characteristics across missing and non-missing responses. Students with missing risk were more likely to be victims of electronic bullying than those in non-missing risk group for suicide (χ^2 (1) = 5.96, p = 0.02). Teens involved in physical fights on school property were more prone to be in missing risk group than non-missing risk group for suicide (χ^2 (1) = 17.69, p<0.001). Participants who used cocaine were more inclined to be in missing risk group than non-missing risk group (χ^2 (1) =29.35, p<0.001). Those who had four or more sexual partners were more likely to be at missing risk group than non-missing risk group (χ^2 (1) = 31.29, p <0.001). Adolescents who achieved higher academic performance were more likely to be in missing risk group than non-missing risk group for suicide (χ^2 (1) = 16.14, p < .001).

The analysis plan was to use ordinal logistic regression models to account for the ordinal nature of the dependent variable. When proportional odds assumption was tested, the assumption did not hold (Chi-square value of 80.43, p = <.0001). Hence, instead of ordinal logistic regression model, multinomial logistic regression models were constructed to measure the associations between suicide risk and high risk health behaviors. The models were controlled for race/ethnicity, grade and age. The results are reported in Table 11 for females and Table 12 for males.

Results for Female Students for 2015 Analysis

The statistical models described below for the 2015 data controlled for race/ethnicity, age and grade. Female students who experienced community related violence and forced to have sexual intercourse were more likely to be at moderate than low risk group for suicide (OR = 3.25, 95% 2.49, 4.23). This risk expanded considerably, with females who were forced to have sexual intercourse at 7.10 (95% CI: 5.18, 9.74) times the odds of being in the high versus low risk group. Among female students who were exposed to school related violence, and carried a weapon on the school property were more likely to be at moderate than low risk group (OR = 3.30, 95% CI: 1.58, 6.89). This risk was substantially higher, with females who carried a weapon on school property at 7.93 (95% CI: 4.27, 14.71) times odds of being in

high versus low risk group. Among female students involved in substance abuse and used methamphetamine were more likely to be at moderate versus low risk group for suicide (OR = 3.21, 95% CI: 1.40, 7.37). This risk expanded considerably for those who used methamphetamine at 9.97 (95% CI: 4.94, 20.11) times the odds of being in the high versus low risk group. Female students involved in high risk sexual behavior, and had sexual intercourse before the age of 13 were more likely to be at moderate versus low risk group (OR = 3.24, 95% CI: 1.79, 5.85). This risk was substantially higher among those who had sex before the age of 13 at 5.74 (95% CI: 3.24, 10.17) times the odds of being in the high versus low risk group. Female students involved in weight controlling behavior and involved in weight loss efforts were prone to be at moderate versus low risk group (OR = 2.49, 95% CI: 1.70, 3.64). This risk expanded considerably for those involved in weight loss efforts at 7.25 (95% CI: 4.96, 10.58) times the odds of being in high versus low risk group. Female students who felt hopeless or sad were more inclined to be at moderate versus low risk group (OR = 8.17, 95% CI: 6.87, 9.71). This risk was considerably higher among those who felt hopeless or sad at 23.90 (95% CI: 15.35, 37.21) times the odds of being in high versus low risk group. Female students who were unable to concentrate were more prone to be at moderate versus low risk group (OR = 4.05, 95% CI: 3.22, 5.09). This risk was substantially higher, with females who were unable to concentrate at 8.97 (95% CI: 6.49, 12.39) times the odds of being in high versus low risk group for suicide.

Results for Male Students for 2015 Analysis

Male students who experienced community related violence and who were victims of electronic bullying were more inclined to be at moderate than low risk group for suicide (OR = 2.71, 95% CI: 1.66, 4.43). This risk expanded considerably, with males who were victims of electronic bullying at 8.21 (95% CI: 5.44, 12.41) times the odds of being in high versus low risk group. Male students who were exposed to school related violence and threatened at school were more prone to be at moderate versus high risk group (OR = 2.77, 95% CI: 1.80, 4.27). This risk was substantially higher for male students who were threatened at school at 7.66 (95% CI: 4.97, 11.81) times the odds of being in high versus low risk group. Male students involved with substance abuse and used cocaine were more likely to be at moderate versus low risk group (OR = 2.37, 95% CI: 1.47, 3.81). This risk escalated considerably for males who used cocaine at 6.53 (95% CI: 4.40, 9.70) times the odds of being in the high versus low risk group. Male students who felt hopeless or sad were more inclined to be at moderate than low risk group (OR = 9.88, 95% CI: 6.77, 14.42). This risk was considerably higher, among those who felt hopeless or sad at 17.98 (95% CI: 11.40, 28.34) times the odds of being in high versus low risk group. Male students who were unable to concentrate were more prone to be in moderate versus low risk for suicide (OR = 3.56, 95% CI: 2.43, 5.21). This risk expanded substantially, with male students who were unable to concentrate at 6.05 (95% CI: 4.15, 8.84) times the odds of being in high versus low risk group.

Results for Data Analysis from 1991 to 2015

Table 3 displays details of the sampling plan, sample sizes, and response rates, across all study years. For data from 1991 to 2015, the school response rate ranged from 69% to 81% and the student response rate ranged from 83% to 90%. Hence, the overall response rate ranged from 60% to 71%. For data from 1991 to 2015, the sample size was 188,898 (ranged from 10,904 in 1995 to 16,410 in 2009). In this analysis, there were 722 students who reported suicide attempt without an indication of a suicidal ideation/plan and hence they were categorized as missing.

A linear trend was observed based on suicide risk among males and females across the years (Figure 1). A similar linear trend was also observed among white, black, Hispanic and Other race/ethnicity based on suicide risk scale (Figure 2). The independent variable questions were not consistently asked across the survey years from 1991 to 2015. For each question that was asked, not all students provided a response. Hence, the number of questions included in each survey year and number of students that answered the high-risk health behavior questions were reported for females (Table 13) and males (Table 14) by corresponding survey year.

The analysis plan was to build ordinal logistic regression model to account for the ordinal nature of the dependent variable. The proportional odds assumption was tested and this did not hold (Chi-Square value of 1194.21, p-value<.0001). Hence, instead of ordinal logistic regression model, a multinomial logistic regression model was constructed.

In order to understand how health behaviors changed over time affected the suicide risk, an interaction term between each health behavior by time was included for each model. The results of the multinomial logistic regression models for each high-risk health behavior was reported for female (Table 15) and male students (Table 16). Significant patterns detected from using interaction terms between each high-risk health behavior by year, follow.

Results for Female Students from 1991 to 2015 Analysis

All the models fit for 1991 to 2015 data were controlled for race/ethnicity, age and grade. For female students, there were six high risk health behaviors that were significantly associated with moderate and high risk group in comparison to low risk group for suicide. Female students who experienced community related violence and carried a weapon in the community were more likely to be at moderate than low risk group (OR = 1.01, 95% CI: 1.00, 1.03). Female students who carried a weapon in the community were at 1.01 (95% CI: 1.00, 1.03) times the odds of being in high versus low risk group. Female students who experienced school related violence and missed school due to safety concerns were more prone to be at moderate than low risk group (OR = 1.02, 95% CI: 1.00, 1.04). Female students who missed school due to safety concerns were at 1.03 (95% CI: 1.01, 1.04) times the odds of being in high versus low risk group. Female students who were involved with high risk sexual behavior and refrained from condom use during the prior sexual intercourse were more inclined to be at moderate than low risk group (OR = 1.02, 95% CI: 1.00, 1.03). Female students who abstained from condom use during the last sexual intercourse were at 1.02 (95% CI: 1.00, 1.03) times the odds of being in high risk versus low risk group. Female students involved in weight controlling behavior and had a perception of being overweight were more likely to be at moderate than low risk group (OR = 1.00, 95% CI: 1.00, 1.01). Female students with self-perception of being overweight were at 1.02 (95% CI: 1.01, 1.02) times the odds of being in high versus low risk group. Female students who felt hopeless or sad were more prone to be at moderate than low risk group (OR = 1.04, 95% CI: 1.02, 1.05). Female students who felt hopeless or sad were at 1.05 (95% CI: 1.02, 1.07) times the odds of being in high versus low risk group. Female students involved in fights resulting in injury were more prone to be at moderate than low risk group (OR = 1.02, 95% CI: 1.00, 1.04). Female students involved in fights resulting in injury had 1.02 (95% CI: 1.00, 1.04) times the odds of being in high versus low risk group for suicide.

Line graphs were used to display association between the above six health behaviors significantly associated with suicide risk for data from 1991 to 2015 (Figure 3). A multivariable model was

constructed with six risk factors, and their corresponding interaction terms. The interaction terms between each risk factor and year was estimated and reported (Table 17 for females). Female students who felt hopeless or sad were at 1.03 (95% CI: 1.00, 1.06) times the odds of being in the high versus low risk group for suicide.

Results for Male Students from 1991 to 2015 Analysis

There were three high risk health behaviors that were significantly associated with both moderate and high risk than low risk for suicide among male students. Male students who experienced school related violence and were involved in a physical fight at school were more prone to be at moderate than low risk for suicide (1.01, 95% CI: 1.00, 1.03). Male students who were involved with physical fights at school were at 1.02 (95% CI: 1.00, 1.03) times the odds of being in high versus low risk group. Male students who were involved with high risk sexual behavior and had sex before the age of 13 or younger were more inclined to be at moderate than low risk group (OR = 1.02, 95% CI: 1.00, 1.03). Male students who had sex before the age of 13 or younger were at 1.00 (95% CI: 1.00, 1.03) times the odds of being in high versus low risk group. Male students who felt hopeless or sad were more likely to be at moderate than low risk group for suicide (OR = 1.02, 95% CI: 1.00, 1.04).

Line graphs were used to display the associations for the above three risk factors significantly associated with suicide risk (Figure 4). These three significant risk factors were entered into a multivariable model which included the risk factors and the interaction terms between the risk factor and year (time). The estimation of the interaction terms and a 95% confidence interval were reported (Table 18). Male students who felt hopeless or sad were more inclined to be at moderate than low risk for suicide (OR = 1.02, 95% CI: 1.00, 1.04). Male students who felt hopeless or sad were at 1.04 (95% CI: 1.00, 1.08) times the odds of being in high versus low risk group for suicide.

Discussion

Suicidal behavior is a major public health problem in the U.S., and an alarming number of adolescents are at a significant risk for engaging in suicidal behaviors. Public health organizations have set goals to reduce morbidity due to suicidal attempts by as much as 10% by the year 2020 (Healthy People, 2020). It is important to understand the associations between various risk factors and suicidal thoughts, attempts to enable timely detection and early intervention.

This research makes two key contributions to enable a better understanding of risk factors pertaining to suicidal thoughts and attempts. The first contribution is an analysis of health behaviors associated with suicide risk among adolescents in recent survey years (YRBSS, 2013 and 2015). The second contribution is an assessment of risk factors affecting suicide risk over time (YRBSS, 1991 to 2015). Knowledge of such associations between suicidal thoughts, attempts and various risk factors will help timely screening for suicidal behavior, and thus enable early treatment to reduce suicidal risk.

Results from surveys in 2013 and 2015 indicate a host of health behaviors were associated with moderate and high risk in comparison to low risk for suicide in adolescents. Seven domains related to health behaviors studied here included exposure to community related violence, exposure to school related violence, substance abuse, high risk sexual behavior, weight related issues, physical/sedentary activities and personal characteristics. Among these, physical/sedentary activities was the only risk domain that indicated weak associations with moderate and high-risk suicidal behavior. The rest

indicated strong associations with moderate and high risk suicidal behavior. The results here are aligned with results reported in previous years by Lowry et al., (2014). However, these results differ from the results observed in the studies by Simon et al., (2004), and Messias et al., (2011). Among female students, behaviors such as feelings of hopelessness or sadness, abuse of methamphetamine or cocaine and weight controlling methods such as vomiting or laxative usage, indicated a strong association with moderate or high risk than low risk for suicidal behavior. Among male students, behaviors such as feelings of hopelessness or sadness, involvement in fights resulting in injury and abuse of methamphetamine or cocaine indicate a strong association with moderate or high risk than low risk for suicidal behavior. These results were similar to those reported in Lowry et al., (2014) and Esposito-Smythers et al., (2004). Earning higher grades at school was found to be protective against suicidal behavior. This result is similar to the study results from Borowsky et al., (2001) and Lubell et al., (2006).

Results pertaining to survey years from 1991 to 2015 indicate linear associations between males and females and among white, black, Hispanic and Other race/ethnicity groups. A small set of risk factors indicate associations with suicidal behavior over the years. Among these, feelings of hopelessness or sadness is the only risk factor that emerges indicating an association with moderate or high risk than low risk for suicidal behavior. This is in line with results reported in studies by Baily et al., (2011), Brezo et al., (2008) and Eaton et al., (2011).

The YRBSS dataset is a national representative sample and the sampling frame consists of 50 states in U.S. and District of Columbia. Because this research is based on YRBSS data, one of its strengths is in the ability to generalize to students attending high schools in U.S. The YRBSS collects data on various high-risk health behaviors among adolescents in U.S. These facilities exploring multiple domains of risk factors associated with suicidal behavior. Unlike other studies that consider a single domain of risk factors, this study considers seven domains of risk factors to determine their associations with suicidal behavior. For example, associations between personal characteristics and suicidal risk were examined, but were not explored in the study by Lowry et al., (2014).

There are some study limitations to note. The YRBSS is a cross-sectional survey that collects data at a specific period and participants without any follow-up. Thus, causal inferences are not possible here. This work is limited to measurements at one point in time, does not provide information on potential progression of suicidal behavior. The participants' responses are self-reports which are subject to recall and response bias. The YRBSS survey does not include questions about parental socio economic status, education, or marital status. Nor, does it collect information on exposure to suicide in the family or community or protective factors for suicidal behavior. Some proximal risk factors such as personal crisis situations and means available for suicide attempts were also not collected.

Prevention strategies for suicidal behavior are implemented in schools, communities and health-care systems (Gould & Kramer, 2001). These strategies typically have two goals: identifying and providing appropriate referrals or treatments to individuals who experience suicidal behavior and reducing risk factors. At the school level, some strategies implemented are suicide awareness curricula, skills training, screening, and gatekeeper training. At the community level, having crisis centers or hotlines, restricting means for suicide attempts and careful media communication regarding suicide are some strategies implemented. At the healthcare system level, training primary care physician and pediatricians was found effective in identification and treatment (Gould & Kramer, 2001).

School based intervention programs were beneficial in reducing suicidal behavior among youth, given that adolescents spend a large portion of their time at school (Miller & Eckert, 2009). A longitudinal study by Zenere et al., (2009) implemented the 'Youth Suicide Prevention and Intervention Program' - a 3-tier program to reduce suicidal behavior between 1989 and 2006 among students in ages 5-19. It combined universal, selected and indicated strategies of suicidal intervention/prevention and was implemented for an entire school district. They reported a decrease in suicide rate from 5.5 per 100,000 to 1.4 per 100,000 during the study period. Suicide attempts also declined at the same time period (Zenere & Lazarus, 2009).

A systematic review by Katz et al (2014) found, certain school based prevention programs effective in reducing suicide attempts: Signs of Suicide (SOS), Good Behavior Game (GBG) and Sources of Strength (Katz et al., 2013). SOS is a suicide awareness curricula. The main goal of the SOS program was to make teens aware of signs of suicide, so they will be able to identify this behavior among their peers (Katz et al., 2013). A randomized controlled trial (RCT) for SOS suicide prevention program reported, the intervention group had lower rates of suicide attempts, greater knowledge and adaptive attitudes about depression and suicides in comparison to the control group (Aseltine Jr, 2003). However, the SOS program was not effective in reduction of suicidal thoughts.

GBG is a skills training program. GBG is the most recommend suicide prevention program in the U.S., as it indicated a significant reduction in suicidal thoughts and attempts among adolescents and it is backed by SAMHSA (Substance Abuse and Mental Health Services Administration) (Katz et al., 2013). GBG was found effective in an RCT that was implemented among children in elementary grades and participants were followed up to teen years. It reported a reduction in suicidal thoughts and advancement to attempts in the intervention group in comparison to the control group in teen years. The strategy used by GBG for reduction of onset of suicidal thoughts and attempts was by reducing aggressive and disruptive behaviors in classrooms (Wilcox et al., 2008).

Sources of Strength was a peer leadership program that trained students to be gatekeepers and reach out to their peers who were at risk for suicidal behavior (Katz et al., 2013). When this program was evaluated in an RCT, the trained students were more inclined to connect an adult with a suicidal friend, seek adult support and accept help from adults (Wyman et al., 2010).

Reduction in suicidal behavior can also be achieved by enhancing protective factors such as clinical management of impulsivity and hostility, improving interpersonal relationships with family and peers (Vijayakumar et al., 2011), and teaching successful problem solving and coping skills to persevere under stressful situations (Lubell & Vetter, 2006). Affiliation to a religious group and having positive attitude also had a protective effect against suicidal behavior (Bailey et al., 2011) (Nock et al., 2008). This research found, students who earned higher grades at school were less likely to be associated with suicide risk than students who earned lower grades.

It is important to note that suicidal behavior is formally diagnosed as Suicidal Behavior Disorder by DSM-5 which is the primary tool used by healthcare providers. One of the key criteria in DSM-5 is that a suicidal attempt was made within past 24 months. As suicidal behavior develops across various stages starting from suicidal thoughts on to plans, and attempts, this indicates adolescents who are in early stage of suicidal behavior (thoughts and plans) may benefit from early identification. This study includes risk-factor associations with suicidal thoughts and attempts, which can help with early screening and intervention.

Results here suggest adolescents diagnosed with mental health issues, substance abuse issues and weight controlling issues should be screened for suicidal behavior. Further, adolescents with exposure to violence in the community or school should also be screened for suicidal behavior. Associations were also found between feelings of hopelessness or sadness and suicidal behavior. Those diagnosed with hopelessness or sadness should be routinely screened for suicidal behavior. Screening for suicidal ideations should be conducted at an early adolescence stage (Adrian et al., 2016). Further clinical referrals for mental health services such as prescription for Selective Serotonin Reuptake Inhibitor (SSRI), cognitive behavior therapy (CBT) and social support should be provided to these adolescents to reduce suicidal behaviors (Pelkonen & Marttunen, 2003). Using SSRIs was effective in reduction of aggressive and impulsive behavior among adolescents which in turn resulted in reduction of suicidal behavior (Gould, Greenberg, Velting, & Shaffer, 2003).

In order to assess the progressive nature of suicidal behavior, a longitudinal study needs to be designed to segment the various stages of suicidal behavior such as onset of suicidal thoughts, plans and attempts over time. Such a study could identify a set of risk factors for each stage of suicidal behavior. Detailing combination of risk factors corresponding to each stage of suicidal behavior as well as catalyzing transition from one stage to the next would be invaluable. Strategies for averting progression across various suicidal stages can be developed with further understanding of this mechanism. More research to determine additional protective factors needs to be conducted to further the mission of overall reduction in suicidal behavior.

In summary, the research described here examined and found associations between some health risk behaviors and suicide ideation and attempts which indicate suicidal risk among adolescents. The primary contributions of this research are in enabling a better understanding of health risk behaviors associated with suicide risk in recent years. The secondary contribution includes assessment of health risk behaviors affecting suicide risk over time. Understanding such associations, are helpful in screening youth at risk for suicidal behavior and enabling appropriate referral services early, to reduce the risk of this behavior. This knowledge, can also be beneficial to those designing educational and public health prevention programs, intended to promote a greater understanding of suicidal risk in adolescents.

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Table 1. Construction of the Suicide Risk Dependent Variable with 4 Suicide Related Questions.

Suicidal Behavior	Response	Low-Risk	Moderate-Risk	High-Risk
Q1: During the past 12 months, did you ever seriously consider attempting suicide?	Yes		X	X
	No	X		
Q2: During the past 12 months, did you make a plan about how you would attempt suicide?	Yes		X	X
	No	X		
Q3: During the past 12 months, how many times did you attempt suicide?	1+			X
	None	X	X	
Q4: If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?	Yes			X
	No	X	X	

Table 2. Description of Suicide Risk Outcome with 4 Suicide Related Questions for 2013 YRBSS Data (N = 13,583)[a] and for 2015 YRBSS Data (N = 15,624)[b].

2013 Data						2015 Data			
Suicide Behavior Questions	Response	Risk			Total	Risk			
		Low	Moderate	High	Total	Low	Moderate	High	Total
Q1: During the past 12 months, did you ever seriously consider attempting suicide?	Yes	0	1050	895	1945	0	1165	1022	2187
	No	9327	331	44	9702	9346	376	41	9763
Q2: During the past 12 months, did you make a plan about how you would attempt suicide?	Yes	0	869	782	1651	0	994	896	1890
	No	9327	512	157	9996	9346	547	167	10060
Q3: During the past 12 months, how many times did you attempt suicide?	1+	0	0	939	939	0	0	1063	1063
	None	9327	1381	0	10708	9346	1541	0	10887
Q4: If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?	Yes	0	0	304	304	0	0	351	351
	No	9327	1381	635	11343	9346	1541	712	11599
Total		**9327**	**1381**	**939**		**9346**	**1541**	**1063**	

[a] Missing data for individual questions: Q1 92, Q2 98, Q3 1601, Q4 1833. Total missing overall suicide risk outcome variable: 1936.

[b] Missing data for Q1 190, Q2 483, Q3 3057, Q4 3293. Total missing overall suicide risk outcome variable: 3674.

Table 3. Details of Sampling Plan, Sample Sizes and Response Rates for YRBSS Data from 1991 to 2015 (N = 188,898).*

						Response Rate		
Year of Survey	Schools Sampled	Schools Participated	Total # of Questions Administered	Total # of Completed Questions	Sample Size	School (%)	Student (%)	Overall (%)
1991	-	137	-	12,272	12,272	75	90	68
1993	-	155	-	16,296	16,296	78	90	70
1995	-	110	-	10,904	10,904	70	86	60
1997	-	151	-	16,262	16,262	79	87	69
1999	-	144	-	15,394	15,349	77	86	66
2001	199	150	16,398	13,601	13,601	75	83	63
2003	195	158	15,240	15,214	15,214	81	83	67
2005	203	159	16,262	13,953	13,917	78	86	67
2007	195	157	16,662	14,103	14,041	81	84	68
2009	196	158	18,573	16,460	16,410	81	88	71
2011	194	158	17,672	15,503	15,425	81	87	71
2013	193	148	15,480	13,633	13,583	77	88	68
2015	180	125	18,165	15,624	15,624	69	86	60

*Hyphen indicated that the number of schools sampled and total number of questions administered were not available for those years.

Table 4. Description of Independent Variables.

High-Risk Health Behaviors	Questionnaire Item	Values
Community Related Violence		
Carried a weapon	During the past 30 days, on how many days did you carry a weapon such as a gun, knife, or club?	>=1 vs. 0 days
In a physical fight	During the past 12 months, how many times were you in a physical fight?	>=1 vs. 0 times
Bullied electronically	During the past 12 months, have you ever been electronically bullied? (Include being bullied through email, chat rooms, instant messaging, Web sites, or texting.)	Yes vs. No
Hit by boyfriend/girlfriend	During the past 12 months, how many times did someone you were dating or going out with physically hurt you on purpose? (Count such things as being hit, slammed into something, or injured with an object or weapon.)	Yes vs. No
Forced to have sex	Have you ever been physically forced to have sexual intercourse when you did not want to?	Yes vs. No
School Related Violence		
Carried a weapon on school property	During the past 30 days, on how many days did you carry a weapon such as a gun, knife, or club on school property?	>=1 vs. 0 days
In a physical fight on school property	During the past 12 months, how many times were you in a physical fight on school property?	>=1 vs. 0 times
Bullied at school	During the past 12 months, have you ever been bullied on school property?	Yes vs. No
Missed school because they felt unsafe	During the past 30 days, on how many days did you not go to school because you felt you would be unsafe at school or on your way to or from school?	>=1 vs. 0 days
Threatened at school	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?	>=1 vs. 0 times
Substance Use		
Current alcohol use	During the past 30 days, on how many days did you have at least one drink of alcohol?	>=1 vs. 0 days
Current marijuana use	During the past 30 days, how many times did you use marijuana?	>=1 vs. 0 times
Ever used cocaine	During your life, how many times have you used any form of cocaine, including powder, crack, or freebase?	>=1 vs. 0 times
Ever used methamphetamine	During your life, how many times have you used methamphetamines (also called speed, crystal, crank, or ice)?	>=1 vs. 0 times
Ever injected drugs	During your life, how many times have you used a needle to inject any illegal drug into your body?	>=1 vs. 0 times
Sexual Health		
Ever had sexual intercourse	Have you ever had sexual intercourse?	Yes vs. No
Had sex before the age of 13	How old were you when you had sexual intercourse for the first time?	<13 vs. >=13 years

Four or more sex partners	During your life, with how many people have you had sexual intercourse?	>=4 vs. <4 persons
Currently sexually active	During the past 3 months, with how many people did you have sexual intercourse?	>=1 vs. 0 persons
No condom use at last sex[a]	The last time you had sexual intercourse, did you or your partner use a condom?	No vs. Yes
Weight Related Issues		
Obese (BMI >=95th percentile)	Percentage of students who were obese (i.e., at or above the 95th percentile for body mass index, by age and sex)	BMI>= 95th percentile vs. <95th percentile
Self-perception of being overweight	How do you describe your weight?	Very or slightly overweight vs. all other options
Fasted >=24 hours for weight control	During the past 30 days, did you go without eating for 24 hours or more (also called fasting) to lose weight or to keep from gaining weight?	Yes vs. No
Took diet pills for weight control	During the past 30 days, did you take any diet pills, powders, or liquids without a doctor's advice to lose weight or to keep from gaining weight? (Do not include meal replacement products such as Slim Fast.)	Yes vs. No
Vomit/laxatives for weight control	During the past 30 days, did you vomit or take laxatives to lose weight or to keep from gaining weight?	Yes vs. No
Physical/Sedentary Activities		
Not physically active for more than 60 minutes daily[a]	Percentage of students who were physically active for a total of at least 60 minutes per day on all seven of the past seven days	<7 vs. 7 days
Did not play on a sports team[a]	During the past 12 months, on how many sports teams did you play? (Count any teams run by your school or community groups.)	0 vs. >=1 team
Watched TV for >= 3 hours a day	On an average school day, how many hours do you watch TV?	>=3 vs. <3 hours
Computer/video games for >=3 hours a day	On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Count time spent on things such as Xbox, PlayStation, an iPod, an iPad or other tablet, a smartphone, YouTube, Facebook or other social networking tools, and the Internet.)	>=3 vs. <3 hours
Slept<8 hours per night[a]	On an average school night, how many hours of sleep do you get?	<8 vs. >=8 hours
Personal Characteristics		
Feelings of sadness or hopelessness in past two weeks or more	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 vs. No
Driving while intoxicated	During the past 30 days, how many times did you drive a car or other vehicle when you had been drinking alcohol?	0 vs. >=1 times

Fights resulting in injury	During the past 12 months, how many times were you in a physical fight in which you were injured and had to be treated by a doctor or nurse?	0 vs. >=1 times
Lack of seatbelt use	How often do you wear a seat belt when riding in a car driven by someone else?	never/rarely vs. sometimes/always
Substance use before the last sexual activity	Did you drink alcohol or use drugs before you had sexual intercourse the last time?	Yes vs. No
Academic Performance in school[c]	During the past 12 months, how would you describe your grades in school?	Mostly As/Bs vs. lower grades
Difficulty in concentration[c]	Because of physical, mental or emotional problems, do you have serious difficulty concentrating, remembering, or making decisions?	Yes vs. No

[a] reverse coded.

[b] Question asked only in 2015 and 1991 to 2015 data.

[c] Question asked only in 2015 data.

Table 5. Demographic Characteristics by Suicide Risk Scale, 2013 (N = 13,583) [a].

Demographic Characteristics	Low Risk		Moderate Risk		High Risk	
	N	%	N	%	N	%
Sex						
Female	4277	47.3	810	59.6	647	68.9
Male	5045	52.7	571	40.4	292	31.1
Race/Ethnicity						
White	4069	59.8	628	59.8	326	47.0
Black	1876	12.5	198	10.1	185	13.6
Hispanic	2234	19.4	343	19.2	290	28.0
Other	962	8.3	178	11.0	114	11.4
Grade						
9^{th}	2393	27.3	324	23.7	306	31.7
10^{th}	2166	25.7	330	24.6	233	28.4
11^{th}	2201	23.5	348	27.6	199	22.7
12^{th}	2508	23.5	369	24.0	190	17.3
Age						
14 Years Old	943	10.6	122	7.2	122	12.5
15 Years Old	2142	24.4	316	23.5	226	23.3
16 Years Old	2172	25.0	340	25.6	261	31.2
17 years Old	2429	24.6	379	27.3	197	20.9
18 Years or Older	1577	15.4	212	15.5	120	12.1

[a] Un-weighted count and weighted percentage.

Table 6. Comparisons of Missing versus Non-Missing Suicide Risk Observations for All 2013 Study Variables (N = 13,583).

Variables	Levels of Variables	Count of Missing Values for Independent Variables	Missing Risk N (%)	Not Missing Risk N (%)	P-Value
Sex	Female	12	887 (46.8)	5734 (50.4)	0.0755
	Male		1042 (53.2)	5908 (49.6)	
Race	White	318	426 (32.9)	5023 (58.8)	<.0001
	Black		734 (28.6)	2259 (12.4)	
	Hispanic		528 (29.3)	2867 (20.0)	
	Other		174 (9.2)	1254 (8.9)	
Grade	9th	102	565 (28.4)	3023 (27.2)	0.8938
	10th		423 (25.3)	2729 (25.8)	
	11th		436 (23.4)	2748 (23.9)	
	12th		490 (22.9)	3067 (23.1)	
Age	14 Years old	121	181 (8.6)	1187 (10.3)	0.2912
	15 Years Old		414 (22.9)	2684 (24.3)	
	16 Years Old		430 (24.4)	2773 (25.5)	
	17 Years Old		468 (24.8)	3005 (24.7)	
	18 Years or Older		411 (19.3)	1909 (15.1)	
Violence (Community-Related)	Carried a weapon	331	336 (20.1)	1924 (17.6)	0.1172
	In a physical fight	251	631 (31.5)	2989 (23.7)	0.0004
	Bullied electronically	82	224 (13.1)	1654 (15.0)	0.0997
	Hit by boyfriend/girlfriend	3653	195 (12.9)	868 (9.8)	0.0106
	Forced to have sex	76	187 (10.2)	841 (6.9)	0.0025
Violence (School-Related)	Carried a weapon on school property	229	105 (7.3)	522 (5.0)	0.0292
	In a physical fight on school property	231	272 (13.9)	978 (7.4)	<.0001
	Bullied at school	68	286 (15.9)	2222 (20.2)	0.0004
	Missed school because unsafe	29	268 (13.8)	786 (6.1)	<.0001
	Threatened at school	28	216 (11.5)	782 (6.3)	0.0005
Substance Use	Current alcohol use	1295	566 (37.0)	3807 (34.7)	0.3295
	Current marijuana use	269	547 (29.0)	2820 (22.7)	0.0009

	Ever used cocaine	126	149 (9.2)	600 (5.0)	0.0009
	Ever used methamphetamine	226	84 (5.4)	331 (2.9)	0.0069
	Ever injected drugs	226	63 (3.4)	182 (1.5)	0.0044
Sexual Health	Ever had sexual intercourse	669	1023 (58.8)	5397 (45.2)	<.0001
	Had sex before age 13 years	686	192 (10.8)	692 (5.0)	<.0001
	Four or more sex partners	725	401 (22.7)	1758 (14.0)	<.0001
	Currently sexually active	707	777 (45.0)	3890 (32.6)	<.0001
	No condom use at last sex[a]	9018	280 (37.3)	1580 (41.5)	0.1485
Weight Related Issues	Obese (BMI>=95th percentile)	1004	287 (18.1)	1499 (13.1)	0.0006
	Perceive self to be overweight	242	503 (30.7)	3554 (31.2)	0.7702
	Fasted >=24 hours for weight control	226	299 (16.6)	1482 (12.6)	0.0111
	Took diet pills for weight control	247	116 (6.4)	569 (4.9)	0.0393
	Vomit/laxative for weight control	299	94 (5.0)	466 (4.3)	0.3986
Physical/Sedentary Activities	Not physically active >=60 minutes daily[a]	273	1356 (73.5)	8332 (72.8)	0.6509
	Did not play on a sports team[a]	388	862 (48.8)	5289 (45.6)	0.0417
	Watched TV>=3 hours/day	338	804 (40.7)	3978 (31.4)	<.0001
	Computer/video games>=3 hours/day	328	762 (40.8)	4907 (41.4)	0.6996
	Slept<8 hours/night[a]	1248	1111 (67.7)	7453 (68.4)	0.6479
Personal Characteristics	Feeling of hopelessness or sadness	88	532 (30.0)	3554 (29.9)	0.9927
	Driving while intoxicated	5725	135 (12.0)	626 (9.7)	0.2109
	Fights resulting in injury	201	126 (6.6)	342 (2.6)	0.0002

	Lack of seat belt use	24	241 (13.9)	811 (6.7)	<.0001
	Substance use before the last sexual activity	8948	180 (25.7)	860 (21.8)	0.1686

[a] Reverse coded.

Table 7. Multinomial Logistic Modeling Results for High Risk Health Behaviors among Female Students by Suicide Risk Scale, 2013 (N = 6,621).

High Risk Health Behaviors among Female Students	Suicide Risk Scale						
	Low Risk	Moderate Risk			High Risk		
	%	%	Odds Ratio[a]	95% CI	%	Odds Ratio[a]	95% CI
Violence (Community-Related)							
Carried a weapon	5.2	10.1	2.10	(1.30, 3.39)	23.3	5.50	(4.00, 7.56)
In a physical fight	13.3	25.2	2.32	(1.71, 3.16)	44.9	5.01	(3.75, 6.70)
Bullied electronically	15.9	31.4	2.48	(1.99, 3.08)	47.6	5.33	(4.24, 6.69)
Hit by boyfriend/girlfriend	8.6	19.4	2.53	(1.78, 3.61)	32.0	5.38	(3.95, 7.33)
Forced to have sex	5.9	16.0	2.92	(2.01, 4.23)	32.5	7.74	(5.86, 10.22)
Violence (School-Related)							
Carried a weapon on school property	1.6	5.0	3.42	(2.10, 5.56)	10.4	7.45	(4.72, 11.75)
In a physical fight on school property	3.1	8.1	3.04	(2.00, 4.62)	15.1	4.59	(3.10, 6.79)
Bullied at school	18.0	38.9	3.06	(2.49, 3.77)	50.6	4.92	(4.01, 6.04)
Missed school because unsafe	5.7	9.8	1.75	(1.13, 2.70)	22.5	4.36	(3.03, 6.28)
Threatened at school	3.3	7.8	2.52	(1.57, 4.05)	19.4	6.39	(4.91, 8.30)
Substance Use							
Current alcohol use	30.7	42.9	1.69	(1.33, 2.15)	56.3	3.31	(2.62, 4.17)
Current marijuana use	16.9	26.9	1.78	(1.40, 2.26)	42.2	3.62	(2.65, 4.94)
Ever used cocaine	2.5	4.8	1.88	(1.12, 3.16)	15.6	7.41	(4.86, 11.28)
Ever used methamphetamine	1.5	4.8	3.26	(1.60, 6.64)	9.6	7.26	(4.16, 12.67)
Ever injected drugs	0.4	0.7	1.75	(0.44, 6.98)	7.0	17.79	(6.53, 48.49)
Sexual Health							
Ever had sexual intercourse	41.2	49.9	1.46	(1.18, 1.79)	65.4	3.42	(2.64, 4.44)
Had sex before age 13 years	2.1	3.3	1.67	(0.98, 2.84)	8.1	3.58	(2.37, 5.40)

Four or more sex partners	10.0	18.8	2.15	(1.68, 2.76)	22.9	3.49	(2.66, 4.57)
Currently sexually active	31.9	36.8	1.25	(1.01, 1.54)	48.2	2.43	(1.90, 3.11)
No condom use at last sex[b]	44.3	55.5	1.56	(1.22, 1.99)	52.0	1.32	(1.00, 1.74)
Weight Related Issues							
Obese (BMI>=95th percentile)	9.5	11.4	1.24	(0.92, 1.67)	17.1	2.01	(1.54, 2.60)
Perceive self to be overweight	33.0	44.7	1.60	(1.31, 1.96)	47.6	1.88	(1.54, 2.31)
Fasted >=24 hours for weight control	12.0	31.4	3.43	(2.79, 4.23)	46.3	6.12	(4.50, 8.32)
Took diet pills for weight control	4.6	8.3	1.87	(1.36, 2.56)	18.5	4.90	(3.74, 6.43)
Vomit/laxative for weight control	4.0	9.4	2.49	(1.70, 3.64)	22.7	7.25	(4.96, 10.58)
Physical/Sedentary Activities							
Not physically active >=60 minutes daily[b]	81.8	84.4	1.22	(0.96, 1.55)	82.4	1.06	(0.80, 1.41)
Did not play on a sports team[b]	49.9	53.8	1.16	(0.99, 1.35)	54.4	1.23	(0.90, 1.67)
Watched TV>=3 hours/day	30.9	31.2	1.03	(0.83-1.29)	33.5	0.97	(0.78, 1.21)
Computer/video games>=3 hours/day	37.3	48.2	1.57	(1.23, 2.01)	51.9	1.68	(1.31, 2.14)
Slept<8 hours/night[b]	68.9	78.7	1.66	(1.21, 2.27)	79.9	1.98	(1.53, 2.57)
Personal Characteristics							
Feeling of hopelessness or sadness	25.1	73.9	8.58	(7.11, 10.34)	86.9	19.14	(14.13, 25.93)
Driving while intoxicated	5.9	11.1	1.97	(1.28, 3.02)	18.0	3.88	(2.2, 6.69)
Fights resulting in injury	1.0	3.8	3.9 1	(2.46, 6.22)	7.7	6.24	(3.65, 10.65)
Lack of seat belt use	4.8	5.9	1.20	(0.83, 1.74)	11.5	2.26	(1.53, 3.35)
Substance use before the last sexual activity	14.5	23.8	1.85	(1.11, 3.09)	35.8	3.35	(2.30, 4.89)

BMI = body mass index; CI = Confidence Interval.

[a] Models adjusted for age, race/ethnicity and grade.

[b] Reverse coded.

Table 8. Multinomial Logistic Modeling Results for High Risk Health Behaviors among Male Students by Suicide Risk Scale for YRBSS, 2013 (N = 6,950).

High Risk Health Behaviors among Male Students	Suicide Risk Scale						
	Low Risk	Moderate Risk			High Risk		
	%	%	Odds Ratio[a]	95% CI	%	Odds Ratio[a]	95% CI
Violence (Community-Related)							
Carried a weapon	25.1	37.4	1.76	(1.29, 2.41)	58.0	4.31	(2.97, 6.25)
In a physical fight	26.2	40.6	1.94	(1.58, 2.38)	63.1	4.85	(3.43, 6.85)
Bullied electronically	5.7	17.5	3.28	(2.59, 4.14)	34.0	8.40	(5.79, 12.17)
Hit by boyfriend/girlfriend	4.5	12.0	2.50	(1.68, 3.71)	25.9	7.16	(4.76, 10.77)
Forced to have sex	1.9	8.7	4.74	(2.62, 8.59)	24.8	16.17	(11.14, 23.49)
Violence (School- Related)							
Carried a weapon on school property	5.5	10.4	1.78	(1.21, 2.63)	28.6	7.33	(4.68, 11.50)
In a physical fight on school property	8.1	13.6	1.89	(1.41, 2.54)	31.6	5.42	(3.62, 8.13)
Bullied at school	12.2	34.9	3.92	(3.12, 4.91)	40.2	5.44	(4.02, 7.37)
Missed school because unsafe	3.1	5.2	1.59	(1.04, 2.44)	20.4	7.20	(4.04, 12.83)
Threatened at school	5.1	9.5	1.86	(1.31, 2.64)	34.0	9.50	(6.51, 13.84)
Substance Use							
Current alcohol use	31.6	44.8	1.61	(1.26, 2.04)	60.9	3.54	(2.44, 5.12)
Current marijuana use	21.4	34.5	1.86	(1.55, 2.23)	59.6	5.19	(3.65, 7.37)
Ever used cocaine	4.4	7.2	1.64	(1.10, 2.45)	30.2	9.30	(7.05, 12.3)
Ever used methamphetamine	1.9	3.6	1.97	(1.16, 3.36)	23.1	15.88	(10.25, 24.59)
Ever injected drugs	0.9	1.8	1.92	(0.85, 4.35)	19.9	28.33	(16.43, 48.85)
Sexual Health							
Ever had sexual intercourse	43.1	52.8	1.52	(1.13, 2.05)	76.4	4.45	(3.16, 6.25)
Had sex before age 13 years	5.8	9.6	2.11	(1.46, 3.05)	26.7	6.38	(3.94, 10.34)
Four or more sex partners	14.1	13.3	0.93	(0.71, 1.23)	46.1	5.42	(3.92, 7.50)
Currently sexually active	29.6	28.4	0.91	(0.70, 1.19)	60.6	3.69	(2.69, 5.08)
No condom use at last sex[b]	32.4	38.5	1.34	(0.95, 1.87)	53.5	2.45	(1.61, 3.71)
Weight Related Issues							
Obese (BMI>=95th percentile)	15.0	20.8	1.46	(1.13, 1.91)	17.9	1.25	(0.89, 1.75)
Perceive self to be overweight	24.7	35.1	1.64	(1.24, 2.15)	30.4	1.31	(0.90, 1.89)

Fasted >=24 hours for weight control	4.5	14.0	3.55	(2.53, 4.97)	31.7	9.18	(6.15, 13.72)
Took diet pills for weight control	2.3	5.2	2.39	(1.44, 3.97)	13.2	5.96	(3.66, 9.70)
Vomit/laxative for weight control	1.0	4.2	3.99	(2.21, 7.20)	14.0	12.02	(6.58, 21.98)
Physical/Sedentary Activities							
Not physically active >=60 minutes daily[b]	62.1	70.3	1.40	(1.10, 1.78)	69.3	1.47	(1.06, 2.04)
Did not play on a sports team[b]	38.4	51.6	1.70	(1.40, 2.08)	49.1	1.53	(1.14, 2.06)
Watched TV>=3 hours/day	30.3	35.3	1.27	(0.98, 1.64)	45.9	1.93	(1.41, 2.63)
Computer/video games>=3 hours/day	40.2	55.7	1.92	(1.43, 2.58)	54.7	1.76	(1.17, 2.67)
Slept<8 hours/night[b]	63.2	76.8	1.98	(1.31, 2.99)	78.0	2.11	(1.40, 3.17)
Personal Characteristics							
Feeling of hopelessness or sadness	13.0	64.7	12.42	(9.28, 16.61)	75.6	19.30	(12.67, 29.42)
Driving while intoxicated	10.6	10.8	0.99	(0.76, 1.29)	30.2	3.67	(2.32, 5.83)
Fights resulting in injury	2.2	3.0	1.18	(0.75, 1.87)	20.6	10.33	(6.81, 15.67)
Lack of seat belt use	7.3	7.1	1.03	(0.70, 1.52)	17.6	2.68	(1.80, 3.99)
Substance use before the last sexual activity	22.6	26.6	1.22	(0.84, 1.77)	45.9	3.01	(1.97, 4.60)

BMI = body mass index; CI = Confidence Interval.

[a] Models adjusted for age, race/ethnicity and grade.

[b] Reverse coded.

Table 9. Demographic Characteristics by Suicide Risk Scale for 2015, (N = 15,624) [a].

Demographic Characteristics	Low Risk		Moderate Risk		High Risk	
	N	%	N	%	N	%
Sex						
Female	4357	45.5	938	58.8	768	70
Male	4935	54.5	590	41.2	291	30
Race/Ethnicity						
White	4015	57.1	718	57.8	385	44.6
Black	983	12.4	133	11.8	113	11.5
Hispanic	3241	21.5	498	20	415	30.4
Other	932	9.0	165	10.4	128	13.4
Grade						
9^{th}	2331	27.2	380	25.2	322	32.6
10^{th}	2374	25.5	361	23.8	292	29.1
11^{th}	2324	23.8	401	25.8	256	21.6
12^{th}	2254	23.4	388	25.2	178	16.7
Age						
14 Years Old	856	10.0	152	9.8	126	11.3
15 Years Old	2325	26.7	340	23.1	294	31.8
16 Years Old	2391	24.5	398	25.7	285	25.2
17 years Old	2351	23.7	415	24.9	246	20.5
18 Years or Older	1378	15.1	226	16.5	103	11.3

[a] Un-weighted count and weighted percentage.

Table 10. Comparisons of Missing versus Non-Missing Suicide Risk Observations for All 2015 Study Variables (N = 15,624).

Variables	Levels of Variables	Missing Independent Variable N	Missing Risk N (%)	Not Missing Risk N (%)	P-Value
Sex	Female	118	1694 (46.0)	6063 (49.2)	0.1171
	Male		1933 (54.0)	5816 (50.8)	
Race/Ethnicity	White	358	1731 (45.3)	5118 (56.2)	0.0024
	Black		438 (20.5)	1229 (12.3)	
	Hispanic		967 (24.0)	4154 (22.0)	
	Other		404 (10.2)	1225 (9.6)	
Grade	9^{th}	152	970 (26.5)	3033 (27.4)	0.8879
	10^{th}		911 (26.4)	3027 (25.6)	
	11^{th}		949 (24.2)	2981 (23.9)	
	12^{th}		781 (22.9)	2820 (23.1)	
Age	14 Years old	126	550 (10.1)	1134 (10.1)	0.241
	15 Years Old		858 (24.0)	2959 (26.6)	
	16 Years Old		959 (27.4)	3074 (24.7)	
	17 Years Old		821 (24.3)	3012 (23.6)	
	18 Years or Older		424 (14.2)	1707 (15.0)	
Violence (Community-Related)	Carried a weapon	1201	725 (18.4)	1801 (15.8)	0.2681
	In a physical fight	2500	496 (26.0)	2385 (22.1)	0.0474
	Bullied electronically	159	511 (13.5)	1757 (15.9)	0.0191
	Hit by boyfriend/girlfriend	5133	263 (10.2)	805 (9.5)	0.533
	Forced to have sex	728	296 (9.0)	823 (6.3)	0.0066
Violence (School-Related)	Carried a weapon on school property	156	219 (5.6)	485 (3.8)	0.0249
	In a physical fight on school property	292	405 (11.9)	848 (7.1)	0.0001
	Bullied at school	176	678 (19.4)	2278 (20.3)	0.4167
	Missed school because unsafe	61	321 (10.0)	666 (4.8)	<.0001
	Threatened at school	631	301 (9.7)	649 (5.3)	0.0005
Substance Use	Current alcohol use	1510	1081 (33.7)	3578 (32.6)	0.5832
	Current marijuana use	374	773 (24.6)	2582 (21.1)	0.0379
	Ever used cocaine	192	320 (9.9)	597 (4.3)	<.0001

	Ever used methamphetamine	735	204 (7.1)	296 (2.3)	<.0001
	Ever injected drugs	838	151 (5.0)	134 (1.2)	<0001
Sexual Health	Ever had sexual intercourse	1636	1320 (46.4)	4638 (40.4)	0.0098
	Had sex before age 13 years	1692	198 (7.9)	454 (3.3)	0.0001
	Four or more sex partners	1714	404 (16.9)	1203 (10.6)	<.0001
	Currently sexually active	1714	967 (34.6)	3337 (29.4)	0.0081
	No condom use at last sex[a]	11428	422(46.9)	1439 (42.5)	0.0902
Weight Related Issues	Obese (BMI>=95th percentile)	1266	506 (15.8)	1665 (13.6)	0.0277
	Perceive self to be overweight	304	1017 (28.1)	3995 (32.2)	0.0099
	Weight loss	1780	983 (44.3)	5693 (45.8)	0.3335
Physical/Sedentary activities	Not physically active >=60 minutes daily[a]	379	2654(75.4)	8698 (72.5)	0.0723
	Did not play on a sports team[a]	2502	863 (42.8)	5240 (42.3)	0.811
	Watched TV>=3 hours/day	500	958 (28.8)	3062 (24.0)	0.008
	Computer/video games>=3 hours/day	446	1364 (40.0)	5165 (42.0)	0.2791
	Slept<8 hours/night[a]	1090	2336 (69.5)	8112 (73.3)	0.0412
Personal Characteristics	Feeling of hopelessness or sadness	169	991 (29.5)	3798 (29.9)	0.7879
	Driving while intoxicated	7192	236 (11.0)	518 (7.2)	0.0132
	Fights resulting in injury	2284	91 (5.0)	306 (2.6)	0.001
	Lack of seat belt use	1554	230 (11.2)	646 (5.3)	0.0001
	Substance use before the last sexual activity	11464	257 (26.7)	645 (19.6)	0.0067
	Academic Performance in School	855	2323 (63.8)	7998 (73.8)	0.0002
	Difficulty in concentration	4507	426 (31.2)	3081 (29.7)	0.5523

[a] Reverse coded.

Table 11. Multinomial Logistic Modeling Results for High Risk Health Behaviors among Female Students by Suicide Risk Scale for 2015 (N = 7,757).

Health Risk Behaviors among Female Students	Suicide Risk among Female Students						
	Low Risk	Moderate Risk			High Risk		
	%	%	Odds Ratio[a]	95% CI	%	Odds Ratio[a]	95% CI
Violence (Community-Related)							
Carried a weapon	4.9	9.7	2.16	(1.49, 3.13)	20.9	5.37	(3.80, 7.59)
In a physical fight	11.5	18.1	1.72	(1.28, 2.31)	43.9	5.82	(4.46, 7.59)
Bullied electronically	16.0	32.9	2.59	(2.05, 3.29)	48.6	5.30	(3.94, 7.12)
Hit by boyfriend/girlfriend	7.8	15.8	2.34	(1.65, 3.21)	30.4	5.52	(3.84, 7.94)
Forced to have sex	5.9	16.8	3.25	(2.49, 4.23)	30.0	7.10	(5.18, 9.74)
Violence (School- Related)							
Carried a weapon on school property	0.9	2.8	3.30	(1.58, 6.89)	7.2	7.93	(4.27, 14.71)
In a physical fight on school property	3.3	3.8	1.20	(0.81, 1.77)	12.8	3.74	(2.66, 5.28)
Bullied at school	17.9	39.8	3.06	(2.39, 3.94)	52.8	5.37	(4.17, 6.92)
Missed school because unsafe	2.8	9.6	3.71	(2.25, 6.12)	16.2	6.32	(4.29, 9.31)
Threatened at school	2.7	4.5	1.70	(0.87, 3.32)	14.6	5.42	(3.57, 8.24)
Substance Use							
Current alcohol use	28.0	42.1	1.93	(1.55, 2.41)	56.9	3.93	(3.00, 5.14)
Current marijuana use	15.7	22.2	1.57	(1.25, 1.96)	42.3	4.34	(3.45, 5.47)
Ever used cocaine	2.0	4.1	2.05	(1.21, 3.47)	10.8	5.83	(3.65, 9.31)
Ever used methamphetamine	0.8	2.6	3.21	(1.40, 7.37)	8.7	9.97	(4.94, 20.11)
Ever injected drugs	0.3	1.0	3.02	(0.79, 11.52)	3.9	11.20	(5.02, 24.97)
Sexual Health							
Ever had sexual intercourse	34.3	45.9	1.81	(1.49, 2.19)	62.4	4.42	(3.42, 5.71)
Had sex before age 13 years	1.2	3.4	3.24	(1.79, 5.85)	6.7	5.74	(3.24, 10.17)
Four or more sex partners	6.5	12.7	1.24	(0.91, 1.67)	16.6	2.76	(1.87, 4.08)
Currently sexually active	26.1	35.9	1.73	(1.37, 2.18)	46.8	3.27	(2.51, 4.25)
No condom use at last sex[b]	45.4	49.0	1.22	(0.82, 1.83)	50.1	1.36	(0.97, 1.93)
Weight Related Issues							
Obese (BMI>=95th percentile)	9.5	13.4	1.47	(1.06, 2.03)	13.5	1.45	(1.00, 2.09)

Perceive self to be overweight	35.9	46.0	1.53	(1.31, 1.79)	50.9	1.87	(1.52, 2.30)
Weight loss	58.4	67.6	2.49	(1.70, 3.64)	71.6	7.25	(4.96, 10.58)
Physical/Sedentary Activities							
Not physically active >=60 minutes daily[b]	81.2	83.0	1.21	(0.87, 1.45)	84.5	1.33	(1.02, 1.73)
Did not play on a sports team[b]	43.4	52.5	1.49	(1.21, 1.83)	58.6	1.90	(1.42, 2.55)
Watched TV>=3 hours/day	22.6	26.1	1.22	(0.95, 1.55)	27.9	1.31	(0.97, 1.75)
Computer/video games>=3 hours/day	39.7	52.3	1.68	(1.45, 1.95)	51.0	1.43	(1.19, 1.74)
Slept<8 hours/night[b]	74.3	82.2	1.62	(1.26, 2.08)	78.0	1.31	(1.02, 1.69)
Personal Characteristics							
Feeling of hopelessness or sadness	25.5	73.2	8.17	(6.87, 9.71)	88.5	23.90	(15.35, 37.21)
Driving while intoxicated	4.2	9.6	2.50	(1.56, 4.02)	9.5	2.29	(1.33, 3.94)
Fights resulting in injury	0.7	1.8	2.90	(1.61, 5.25)	7.8	11.50	(6.77, 19.52)
Lack of seat belt use	3.1	6.8	2.29	(1.62, 3.22)	11.6	3.71	(2.45, 5.61)
Substance use before the last sexual activity	12.7	15.8	1.37	(0.90, 2.09)	25.8	2.64	(1.77, 3.95)
Academic Performance in school	83.3	73.8	0.55	(0.45, 0.68)	57.9	0.29	(0.21, 0.39)
Difficulty in concentration	24.9	57.2	4.05	(3.22, 5.09)	75.7	8.97	(6.49, 12.39)

BMI = body mass index; CI = Confidence Interval.

[a] Models adjusted for age, race/ethnicity and grade.

[b] Reverse coded.

Table 12. Multinomial Logistic Modeling Results for High Risk Health Behaviors among Male Students by Suicide Risk Scale for 2015 (N = 7,749).

Health Risk Behaviors among Male Students	Suicide Risk among Male Students						
	Low Risk	Moderate Risk			High Risk		
	%	%	Odds Ratio[a]	95% CI	%	Odds Ratio[a]	95% CI
Violence (Community-Related)							
Carried a weapon	21.8	33.5	1.82	(1.36, 2.43)	43.1	2.90	(1.88, 4.47)
In a physical fight	25.5	34.6	1.67	(1.33, 2.09)	55.3	3.77	(2.79, 5.09)
Bullied electronically	7.4	17.0	2.71	(1.66, 4.43)	37.9	8.21	(5.44, 12.41)
Hit by boyfriend/girlfriend	4.7	11.8	2.37	(1.44, 3.91)	30.6	8.00	(4.71, 13.62)
Forced to have sex	1.6	5.2	3.10	(2.01, 4.78)	13.7	8.00	(4.90, 13.08)
Violence (School- Related)							
Carried a weapon on school property	4.2	10.8	2.80	(1.83, 4.28)	23.1	6.80	(3.72, 12.46)
In a physical fight on school property	8.2	13.4	1.91	(1.29, 2.84)	30.7	5.01	(3.47, 7.24)
Bullied at school	12.6	29.0	3.04	(2.32, 3.99)	42.1	5.54	(3.33, 9.22)
Missed school because unsafe	3.6	4.1	1.11	(0.58, 2.12)	15.9	4.37	(2.71, 7.05)
Threatened at school	4.4	11.2	2.77	(1.80, 4.27)	27.0	7.66	(4.97, 11.81)
Substance Use							
Current alcohol use	29.3	43.0	1.70	(1.34, 2.16)	62.0	4.14	(2.98, 5.75)
Current marijuana use	20.8	30.3	1.59	(1.24, 2.04)	40.1	2.49	(1.77, 3.51)
Ever used cocaine	3.8	9.5	2.37	(1.47, 3.81)	22.7	6.53	(4.40, 9.70)
Ever used methamphetamine	1.7	3.9	1.82	(1.11, 2.99)	16.5	9.81	(5.30, 18.15)
Ever injected drugs	0.6	2.5	2.95	(1.11, 7.85)	16.1	28.39	(14.47, 55.68)
Sexual Health							
Ever had sexual intercourse	39.3	51.9	1.51	(1.12, 2.03)	63.1	2.85	(1.91, 4.26)
Had sex before age 13 years	3.9	5.6	1.45	(0.93, 2.25)	13.7	3.38	(2.07, 5.53)
Four or more sex partners	11.7	15.1	1.24	(0.91, 1.67)	26.4	2.76	(1.87, 4.08)
Currently sexually active	27	36.5	1.44	(1.03, 2.01)	49.2	2.84	(1.94, 4.17)
No condom use at last sex[b]	35.3	45.6	1.38	(0.90, 2.13)	51.4	1.91	(1.11, 3.29)
Weight Related Issues							
Obese (BMI>=95th percentile)	16.1	17.0	1.07	(0.78, 1.48)	22.5	1.42	(0.95, 2.11)

Perceive self to be overweight	24.4	29.2	1.30	(1.02, 1.67)	33.7	1.51	(1.03, 2.21)
Weight loss	30	34.5	1.48	(1.27, 1.73)	37.1	1.81	(1.32, 2.50)
Physical/Sedentary Activities							
Not physically active >=60 minutes daily[b]	62	70.2	1.48	(1.10, 2.01)	74.3	1.75	(1.26, 2.43)
Did not play on a sports team[b]	36.1	51.4	1.92	(1.55, 2.37)	46.1	1.44	(1.02, 2.03)
Watched TV>=3 hours/day	24.6	22.4	0.92	(0.69, 1.23)	24.2	0.89	(0.62, 1.29)
Computer/video games>=3 hours/day	39.4	49.5	1.60	(1.28, 2.02)	51.5	1.58	(1.15, 2.16)
Slept<8 hours/night[b]	68.6	82.3	1.93	(1.44, 2.59)	82.9	2.29	(1.43, 3.67)
Personal Characteristics							
Feeling of hopelessness or sadness	12.7	58.5	9.88	(6.77, 14.42)	72.6	17.98	(11.40, 28.34)
Driving while intoxicated	7.8	12.7	1.44	(1.02, 2.02)	21.5	2.68	(1.47, 4.87)
Fights resulting in injury	2.4	5.0	2.07	(1.0, 4.37)	19.5	8.97	(4.84, 16.63)
Lack of seat belt use	5.1	7.7	1.57	(1.03, 2.39)	15.3	3.08	(2.03, 4.68)
Substance use before the last sexual activity	23.1	22.5	0.95	(0.61, 1.47)	30.1	1.35	(0.64, 2.85)
Academic Performance in school	70.6	61.2	0.63	(0.52, 0.75)	56.1	0.58	(0.39, 0.87)
Difficulty in concentration	19.4	46.0	3.56	(2.43, 5.21)	59.3	6.05	(4.15, 8.84)

BMI = body mass index; CI = Confidence Interval.

[a] Models adjusted for age, race/ethnicity and grade.

[b] Reverse coded.

Table 13. High Risk Health Questions Included in each Survey Year and the Number of Participants Who Endorsed the High-Risk Health Question in each Survey Year among Female High School Students: 1991 to 2015 (N = 95,129) *.

High-Risk Health Behavior	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013	2015	Total
Community Related Violence														
Carried a weapon	6186	8155	5424	8116	7752	6783	7276	7119	6886	8203	7589	6524	7203	93216
In a physical fight	6236	8107	5415	8130	7737	6874	7282	7107	6909	8183	7565	6532	6561	92638
Bullied electronically	-	-	-	-	-	-	-	-	-	-	6980	6591	7690	21261
Hit by boyfriend/girlfriend	-	-	-	-	-	-	-	-	-	-	-	4876	5299	10175
Forced to have sex	-	-	-	-	-	6599	7042	6751	6928	7926	7600	6582	7391	56819
School Related Violence														
Carried a weapon on school property		8178	5438	8129	7767	6907	7488	7146	6904	8239	7485	6541	7717	87939
In a physical fight on school property		8133	5447	8142	7758	6893	7299	7137	6926	8150	7602	6525	7637	87649
Bullied at school	-	-	-	-	-	-	-	-	-	7838	7348r	6597	7686	29469
Missed school because they felt unsafe	-	8229	5493	8186	7820	6943	7528	7185	6968	8268	7671	6611	7739	88641
Threatened at school	-	8228	5494	8190	7816	6946	7535	7189	6968	8264	7678	6608	7442	88358
Substance Use														
Current alcohol use	6023	7902	5236	7849	7552	6680	7096	6916	6425	7531	7032	6012	7069	89323
Current marijuana use	6268	8151	5424	8101	7730	6882	7391	7106	6886	8166	7534	6526	7619	93784
Ever used cocaine	6232	8180	5458	8128	7802	6917	7386	7153	6946	8214	7606	6586	7680	94288
Ever used methamphetamine	-	-	-	-	7811	6933	7517	7160	6954	8244	7483	6542	7402	66046
Ever injected drugs	-	-	5477	8164	7809	6928	7468	7160	6952	8157	6994	6544	7362	79015
Sexual Health														
Ever had sexual intercourse	6024	8119	5309	8028	7479	6706	6642	6458	6637	7693	7263	6394	7070	89822
Had sex before the age of 13	6017	8117	5307	8019	7461	6709	6645	6460	6628	7689	7261	6403	7040	89756
Four or more sex partners	6015	8102	5304	8009	7466	6604	6629	6439	6619	7672	7252	6383	7053	89547
Currently sexually active	6013	8113	5303	8018	7471	6609	6636	6448	6632	7680	7254	6394	7046	89617
No condom use at last sex	2304	3134	2272	3012	2755	2322	2549	2434	2529	2789	2532	2251	2086	32969

Weight Related Issues														
Obese (BMI >=95th percentile)	-	-	-	-	7556	6480	7026	6860	6623	7798	7164	6166	7145	62818
Self-perception of being overweight	6270	8217	5479	8167	7807	6890	7331	7133	6917	8153	7594	6514	7625	94097
Weight loss	6272	8221	5485	8164	7806	6911	7438	7131	6921	8174	7616	6498	6906	93543
Physical/Sedentary Activities														
Not physically active for more than 60 minutes daily	-	-	-	-	-	-	-	-	-	-	7559	6526	7598	21683
Did not play on a sports team	-	-	-	-	7794	6778	7174	6890	6779	7846	7499	6463	6549	63772
Watched TV for >= 3 hours a day	-	-	-	-	7761	6786	7311	7080	6971	8175	7559	6504	7535	65682
Computer/video games for >=3 hours a day	-	-	-	-	-	-	6496	6102	6965	8172	7550	6511	7561	49357
Slept<8 hours per night	-	-	-	-	-	-	-	-	6145	7430	6108	6052	7255	32990
Personal Characteristics														
Feelings of sadness or hopelessness in past two weeks or more	-	-	-	-	7815	6923	7403	7137	6940	8199	7640	6588	7688	66333
Driving while intoxicated												3610	3996	7606
Fights resulting in injury	6247	8189	5469	8174	7790	6859	7498	7130	6864	7938	7278	6528	6644	92608
Lack of seatbelt use	6278	8231	5496	8189	7812	6904	7486	7189	6964	8175	7458	6613	7028	93823
Substance use before the last sexual activity	2328	3165	2293	3047	2780	2356	2581	2462	2572	2829	2564	2275	2052	33304
Academic Performance in school	-	-	-	-	-	6879	7473	-	-	7601	-	-	7368	29321

*Hyphen indicates questions that were not asked in all those years.

Table 14. High Risk Health Questions Included in each Survey Year and the Number of Participants who Endorsed the High Risk Health Question in each Survey Year among Male High School Students: 1991 to 2015 (N = 93,138)*.

High-Risk Health Behavior	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013	2015	Total
Community Related Violence														
Carried a weapon	5813	7804	5202	7863	7245	6365	7216	6473	6716	7848	7392	6716	7127	89780
In a physical fight	5907	7762	5217	7917	7305	6457	7229	6546	6799	7890	7487	6790	6476	89852
Bullied electronically	-	-	-	-	-	-	-	-	-	-	6846	6899	7668	21413
Hit by boyfriend/girlfriend	-	-	-	-	-	-	-	-	-	-	-	5043	5126	10169
Forced to have sex	-	-	-	-	-	6310	7119	6246	6877	7748	7544	6914	7412	56170
School Related Violence														
Carried a weapon on school property	-	7896	5264	7953	7340	6494	7496	6561	6824	7958	7394	6801	7647	85628
In a physical fight on school property	-	7823	5260	7938	7331	6505	7330	6569	6813	7879	7523	6818	7589	85378
Bullied at school	-	-	-	-	-	-	-	-	-	7734	7290	6907	7655	29586
Missed school because they felt unsafe	-	8002	5346	8042	7437	6586	7579	6641	6914	8040	7597	6931	7719	86834
Threatened at school	-	8000	5347	8039	7430	6588	7582	6649	6913	8041	7612	6935	7451	86587
Substance Use														
Current alcohol use	5637	7518	5047	7567	7046	6139	6987	6269	6234	7283	6861	6266	6945	85799
Current marijuana use	5918	7844	5225	7899	7266	6436	7337	6483	6766	7883	7383	6777	7526	90743
Ever used cocaine	5887	7893	5250	7934	7370	6505	7366	6556	6834	7927	7478	6859	7640	91499
Ever used methamphetamine	-	-	-	-	7403	6544	7504	6581	6856	7982	7393	6803	7382	64448
Ever injected drugs	-	-	5308	8008	7401	6549	7472	6579	6877	7923	7013	6802	7320	77252
Sexual Health														
Ever had sexual intercourse	5598	7735	5071	7737	6922	6162	6529	5854	6458	7317	7032	6512	6840	85767
Had sex before the age of 13	5600	7725	5065	7719	6906	6163	6513	5844	6447	7303	7028	6487	6814	85614
Four or more sex partners	5591	7704	5057	7696	6894	6085	6503	5825	6431	7261	6984	6467	6780	85278
Currently sexually active	5589	7719	5058	7701	6890	6090	6506	5830	6433	7283	6993	6474	6788	85354

No condom use at last sex	2327	3205	2127	2958	2756	2228	2516	2182	2437	2640	2485	2310	2085	32256
Weight Related Issues														
Obese (BMI >=95th percentile)	-	-	-	-	7154	6159	7031	6358	6597	7598	7121	6414	7213	61645
Self-perception of being overweight	5956	7952	5316	7999	7377	6514	7348	6565	6864	7907	7490	6815	7589	91692
Weight loss	5962	7952	5319	7989	7377	6519	7447	6548	6857	7915	7511	6814	6838	91048
Physical/Sedentary Activities														
Not physically active for more than 60 minutes daily	-	-	-	-	-	-	-	-	-	-	7431	6773	7536	21740
Did not play on a sports team	-	-	-	-	7319	6385	7152	6262	6705	7657	7336	6721	6473	62010
Watched TV for >= 3 hours a day	-	-	-	-	7305	6417	7284	6515	6842	7887	7393	6731	7479	63853
Computer/video games for >=3 hours a day	-	-	-	-	-	-	6538	5579	6841	7888	7389	6734	7508	48477
Slept<8 hours per night	-	-	-	-	-	-	-	-	6003	7294	6042	6273	7176	32788
Personal Characteristics														
Feelings of sadness or hopelessness in past two weeks or more	-	-	-	-	7429	6572	7447	6588	6893	7969	7572	6896	7659	65025
Driving while intoxicated	-	-	-	-	-	-	-	-	-	-	-	4240	4385	8625
Fights resulting in injury	5930	7934	5306	8010	7385	6479	7505	6585	6809	7752	7238	6844	6601	90378
Lack of seatbelt use	5975	8012	5354	8047	7420	6554	7559	6648	6915	7984	7429	6935	6938	91770
Substance use before the last sexual activity	2366	3245	2166	3010	2803	2268	2587	2219	2468	2692	2528	2356	2085	32793
Academic Performance in school	-	-	-	-	-	6519	7519	-	-	7403	-	-	7296	28737

*Hyphen indicates questions that were not asked in all those years.

Table 15. Multinomial Logistic Modeling with Interaction of Covariate by Time Results Displayed for High-Risk Health Behavior among Female High School Students by Suicide Risk: 1991 to 2015 (N = 95,129). Significant results in bold.

Behavior by Time Interaction	Moderate Risk[a]		High Risk[a]	
	Odds Ratio[b]	95% CI	Odds Ratio[b]	95% CI
Community Related Violence				
Carried a weapon	**1.01**	**(1.00, 1.03)**	**1.01**	**(1.00, 1.03)**
In a physical fight	1.00	(0.99, 1.01)	1.02	(1.01, 1.03)
Bullied electronically	0.94	(0.87, 1.02)	1.03	(0.93, 1.14)
Hit by boyfriend/girlfriend	0.94	(0.74, 1.19)	1.00	(0.80, 1.26)
Forced to have sex	1.00	(0.98, 1.03)	1.01	(0.99, 1.03)
School Related Violence				
Carried a weapon on school property	1.01	(0.99, 1.04)	1.02	(1.00, 1.04)
In a physical fight on school property	1.01	(0.99, 1.02)	1.01	(0.99, 1.02)
Bullied at school	1.03	(0.98, 1.08)	1.06	(1.01, 1.12)
Missed school because they felt unsafe	**1.02**	**(1.00, 1.04)**	**1.03**	**(1.01, 1.04)**
Threatened at school	1.00	(0.97, 1.02)	1.01	(0.99, 1.03)
Substance Use				
Current alcohol use	0.99	(0.98, 1.00)	1.00	(0.99, 1.01)
Current marijuana use	1.00	(0.99, 1.01)	1.01	(1.00, 1.02)
Ever used cocaine	0.99	(0.97, 1.01)	0.99	(0.98, 1.01)
Ever used methamphetamine	1.01	(0.97, 1.05)	1.01	(0.98, 1.04)
Ever injected drugs	0.99	(0.93, 1.06)	0.99	(0.95, 1.04)
Sexual Health				
Ever had sexual intercourse	1.00	(0.99, 1.01)	1.00	(0.99, 1.01)
Had sex before the age of 13	1.01	(0.99, 1.03)	1.01	(0.99, 1.03)
Four or more sex partners	1.01	(1.00, 1.02)	1.00	(0.99, 1.01)
Currently sexually active	1.00	(0.99, 1.01)	1.00	(0.99, 1.01)
No condom use at last sex[c]	**1.02**	**(1.00, 1.03)**	**1.02**	**(1.00, 1.03)**
Weight Related Issues				
Obese (BMI >=95th percentile)	1.01	(0.99, 1.04)	0.99	(0.96, 1.02)
Self-perception of being overweight	**1.00**	**(1.00, 1.01)**	**1.02**	**(1.01, 1.02)**
Weight loss	1.00	(0.99, 1.00)	1.01	(1.00, 1.02)
Physical/Sedentary Activities				
Not physically active for more than 60 minutes daily[c]	0.98	(0.90, 1.08)	1.02	(0.93, 1.12)
Did not play on a sports team[c]	1.01	(0.99, 1.02)	1.02	(1.00, 1.04)
Watched TV for >= 3 hours a day	0.99	(0.97, 1.01)	1.01	(1.00, 1.03)

Computer/video games for >=3 hours a day	1.01	(0.99, 1.04)	1.01	(0.93, 1.00)
Slept<8 hours per night[c]	0.98	(0.95, 1.02)	0.96	(0.92, 1.00)
Personal Characteristics				
Feelings of sadness or hopelessness in past two weeks or more	**1.04**	**(1.02, 1.05)**	**1.05**	**(1.02, 1.07)**
Driving while intoxicated	1.20	(0.80, 1.50)	0.79	(0.54, 1.15)
Fights resulting in injury	**1.02**	**(1.00, 1.04)**	**1.02**	**(1.00, 1.04)**
Lack of seatbelt use	1.00	(0.99, 1.02)	1.02	(1.00, 1.03)
Substance use before the last sexual activity	1.01	(0.99, 1.03)	1.01	(0.99, 1.02)
Academic Performance in school	0.99	(0.97, 1.01)	0.96	(0.96, 1.01)

BMI = body mass index; CI = Confidence Interval

[a] Low Risk as reference category.

[b] Models adjusted for age, grade and race/ethnicity.

[c] Reverse coded.

Table 16. Multinomial Logistic Modeling with Interaction of Covariate by Time Results Displayed for High-Risk Health Behavior among Male High School Students by Suicide Risk: 1991 to 2015 (N = 93,138). Significant results in bold.

Behavior by Time Interaction	Moderate Risk[a]		High Risk[a]	
	Odds Ratio[b]	95% CI	Odds Ratio[b]	95% CI
Community Related Violence				
Carried a weapon	1.00	(0.98, 1.01)	0.99	(0.97, 1.00)
In a physical fight	1.01	(1.00, 1.02)	1.00	(0.98, 1.02)
Bullied electronically	0.99	(0.85, 1.15)	1.06	(0.95, 1.18)
Hit by boyfriend/girlfriend	1.00	(0.75, 1.34)	1.07	(0.75, 1.53)
Forced to have sex	1.01	(0.96, 1.05)	1.04	(1.00, 1.07)
School Related Violence				
Carried a weapon on school property	0.99	(0.98, 1.01)	1.02	(1.00, 1.04)
In a physical fight on school property	**1.01**	**(1.00, 1.03)**	**1.02**	**(1.00, 1.03)**
Bullied at school	1.04	(0.98, 1.09)	1.02	(0.93, 1.12)
Missed school because they felt unsafe	0.99	(0.96, 1.01)	1.00	(0.97, 1.02)
Threatened at school	1.00	(0.98, 1.01)	1.01	(0.99, 1.03)
Substance Use				
Current alcohol use	1.00	(0.99, 1.01)	1.02	(1.01, 1.04)
Current marijuana use	1.00	(0.99, 1.01)	1.00	(0.99, 1.02)
Ever used cocaine	0.99	(0.98, 1.01)	1.01	(0.99, 1.03)
Ever used methamphetamine	0.96	(0.93, 0.99)	1.04	(1.01, 1.07)
Ever injected drugs	0.99	(0.96, 1.02)	1.02	(0.99, 1.05)
Sexual Health				
Ever had sexual intercourse	0.99	(0.98, 1.00)	0.99	(0.98, 1.01)
Had sex before the age of 13	**1.02**	**(1.00, 1.03)**	**1.00**	**(1.00, 1.03)**
Four or more sex partners	0.99	(0.98, 1.00)	1.00	(0.99, 1.02)
Currently sexually active	0.99	(0.98, 1.00)	1.00	(0.99, 1.02)
No condom use at last sex[c]	1.00	(0.99, 1.02)	1.03	(1.01,1.05)
Weight Related Issues				
Obese (BMI >=95th percentile)	1.01	(0.99, 1.04)	1.01	(0.98, 1.04)
Self-perception of being overweight	1.01	(1.00, 1.02)	1.00	(0.98, 1.01)
Weight loss	1.01	(1.00, 1.02)	1.00	(0.99, 1.02)
Physical/Sedentary Activities				
Not physically active for more than 60 minutes daily[c]	1.04	(0.93, 1.16)	1.15	(1.01,1.31)
Did not play on a sports team[c]	1.03	(1.01, 1.04)	0.98	(0.96, 1.01)
Watched TV for >= 3 hours a day	0.99	(0.97, 1.01)	1.00	(0.98, 1.03)

Computer/video games for >=3 hours a day	1.01	(0.99, 1.04)	0.97	(0.93, 1.00)
Slept<8 hours per night[c]	1.03	(0.98, 1.08)	0.98	(0.91, 1.05)
Personal Characteristics				
Feelings of sadness or hopelessness in past two weeks or more	**1.02**	**(1.00, 1.04)**	1.02	(0.99, 1.05)
Driving while intoxicated	1.26	(1.02, 1.57)	0.93	(0.65, 1.33)
Fights resulting in injury	1.01	(0.99, 1.02)	1.03	(1.01, 1.04)
Lack of seatbelt use	1.00	(0.98, 1.01)	1.02	(1.0, 1.03)
Substance use before the last sexual activity	0.98	(0.96, 1.00)	0.99	(0.97, 1.01)
Academic Performance at school	0.99	(0.97, 1.01)	1.02	(0.99, 1.05)

BMI = body mass index; CI = Confidence Interval

[a] Low Risk as reference category.

[b] Models adjusted for age, grade and race/ethnicity.

[c] Reverse coded

Table 17. Multivariable Logistic Modeling with Interaction of Covariate by Time Results Displayed for Variables found to be Statistically Significant in Previous Modeling Steps, Females: 1991 to 2015 (N=95,129).

Behavior by Time Interaction among Female Students	Moderate Risk[a]		High Risk[a]	
	Odds Ratio[b]	95% CI	Odds Ratio[b]	95% CI
Carrying Weapon in the community	1.02	(0.98, 1.06)	0.98	(0.94, 1.01)
Missed school because they felt unsafe	1.00	(0.96, 1.05)	1.02	(0.98, 1.06)
No condom use at last sex[c]	1.02	(0.99, 1.05)	1.02	(0.99, 1.05)
Self-perception of being overweight	1.01	(0.99, 1.03)	0.99	(0.97, 1.02)
Feeling of hopelessness or sadness	1.02	(0.99, 1.05)	1.03	(1.00, 1.06)
Fights resulting in injury	1.04	(0.98, 1.10)	1.01	(0.96, 1.06)

CI = Confidence Interval

[a] Low Risk as reference category.

[b] Models adjusted for age, grade and race/ethnicity.

[c] Reverse coded.

Table 18. Multivariable Logistic Modeling with Interaction of Covariate by Time Results Displayed for Variables found to be Statistically Significant in Previous Modeling Steps, Males: 1991 to 2015 (N=95,129).

Behavior by Time Interaction among Male students	Moderate Risk[a]		High Risk[a]	
	Odds Ratio[b]	95% CI	Odds Ratio[b]	95% CI
Involved in physical fight on the school property	1.00	(0.97, 1.02)	0.99	(0.96, 1.03)
Had sex before the age of 13	1.00	(0.96, 1.03)	0.98	(0.94, 1.02)
Feelings of Hopelessness or sadness	1.02	(1.00, 1.04)	1.04	(1.00, 1.08)

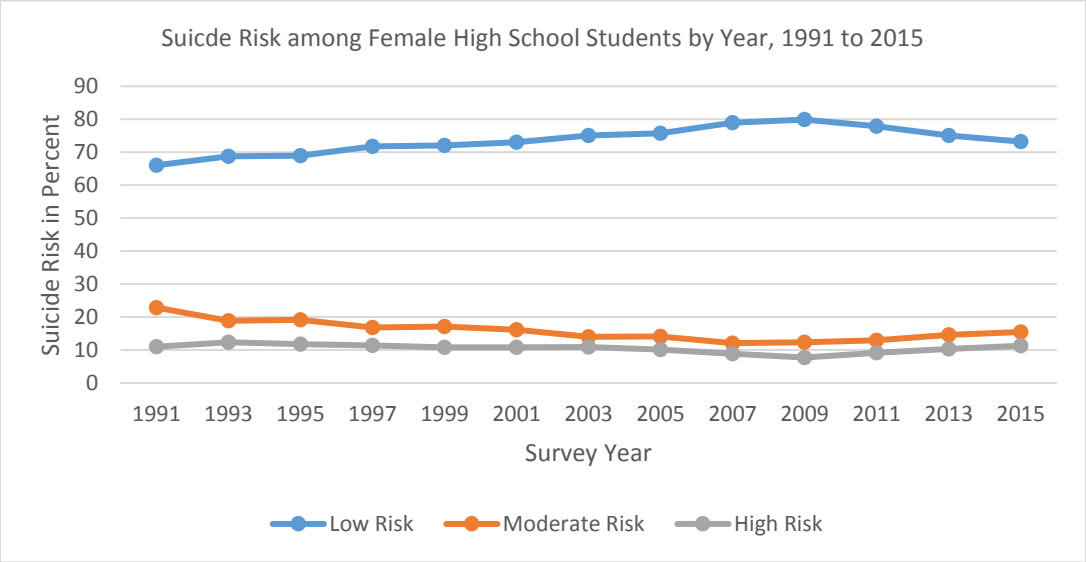
CI = Confidence Interval.

[a] Low Risk as reference category.

[b] Models adjusted for age, grade and race/ethnicity

Figure 1. Suicide Risk by Sex and Year: 1991 to 2015 (N = 188,898).

a.



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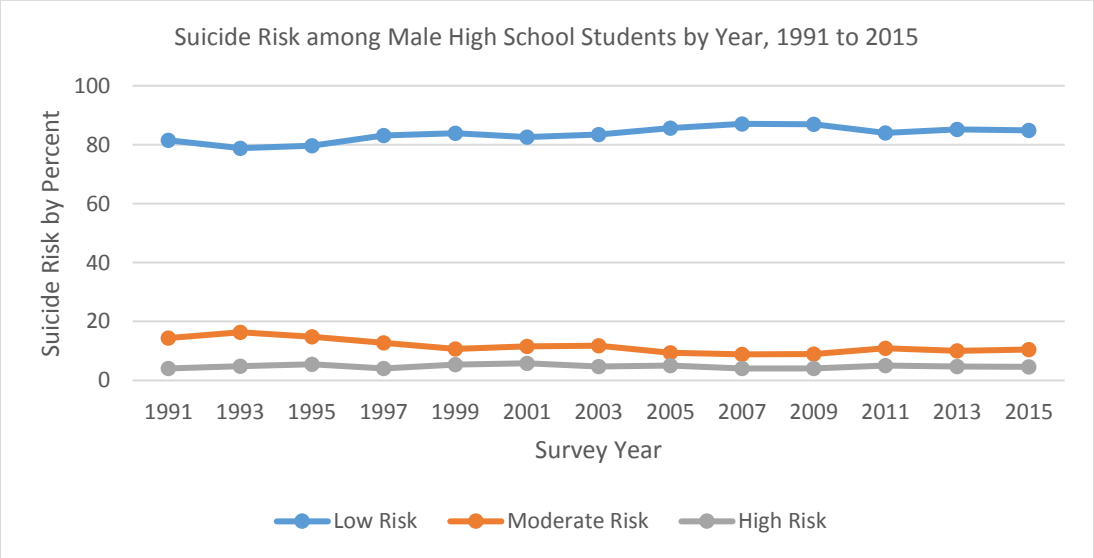
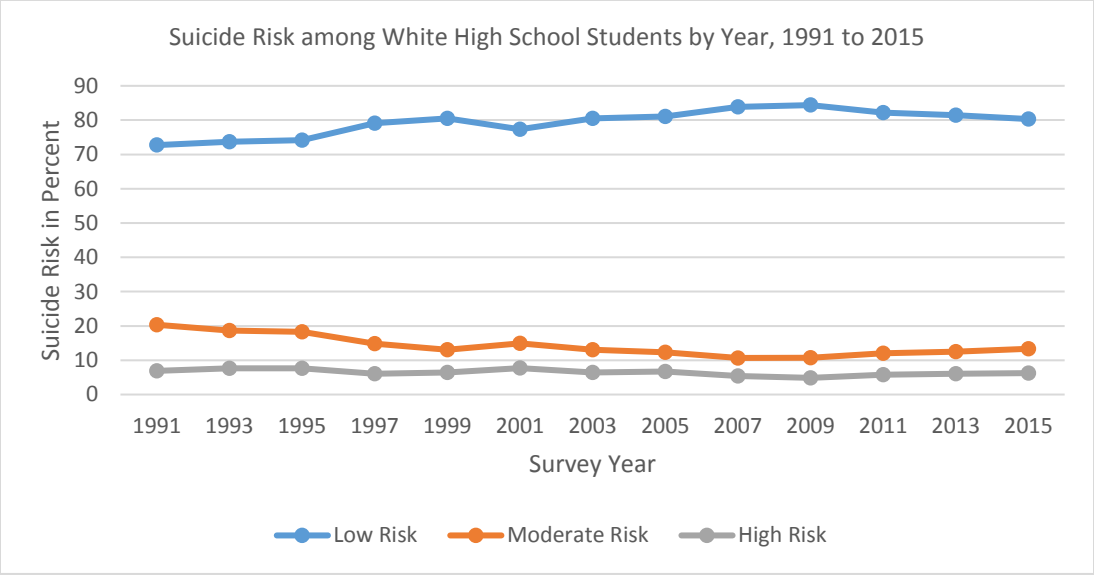
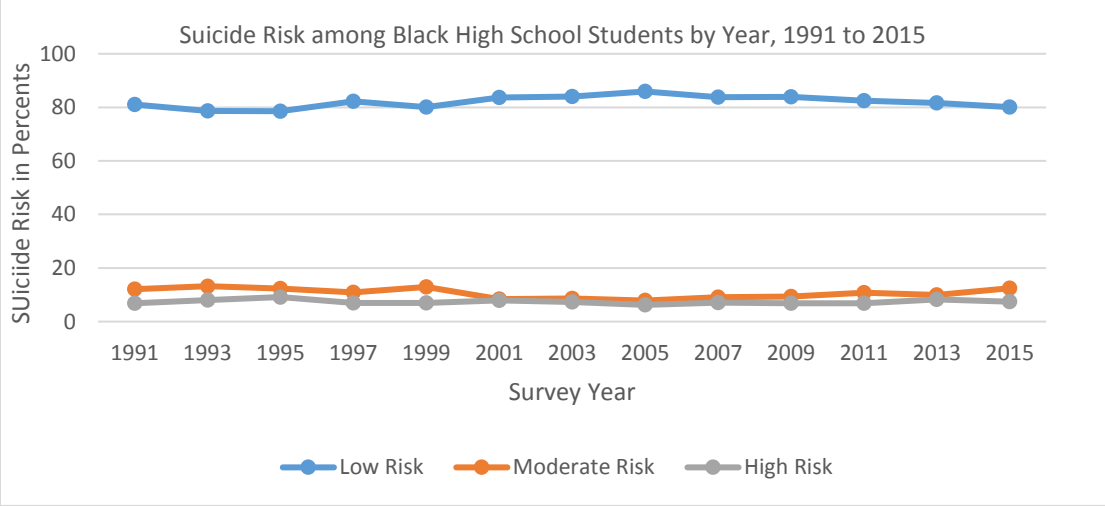


Figure 2. Suicide Risk by Race: 1991 to 2015 (N = 188,898).

a.



b.



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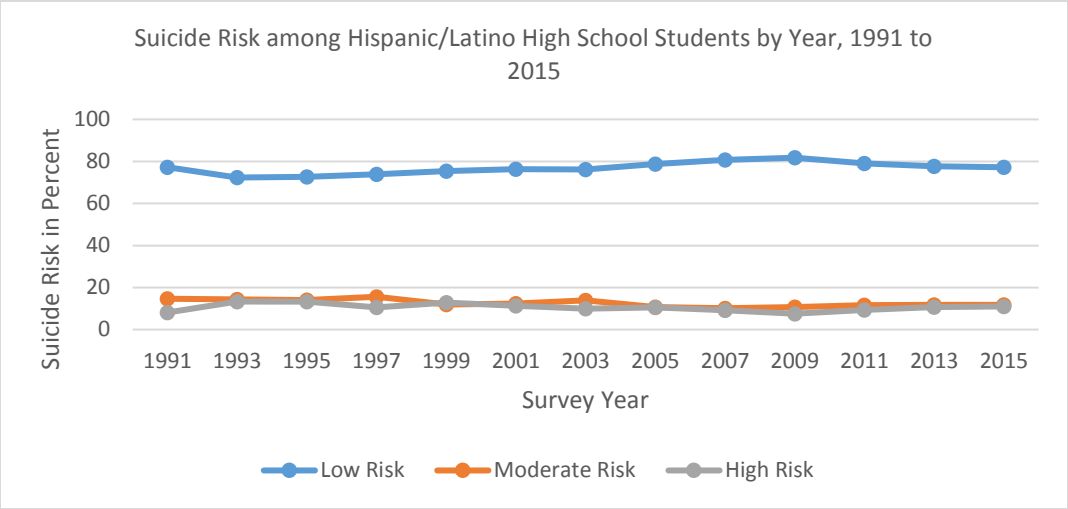

Suicide Risk among Hispanic/Latino High School Students by Year, 1991 to 2015
Suicide Risk in Percent
100
80
60
40
20
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

d.

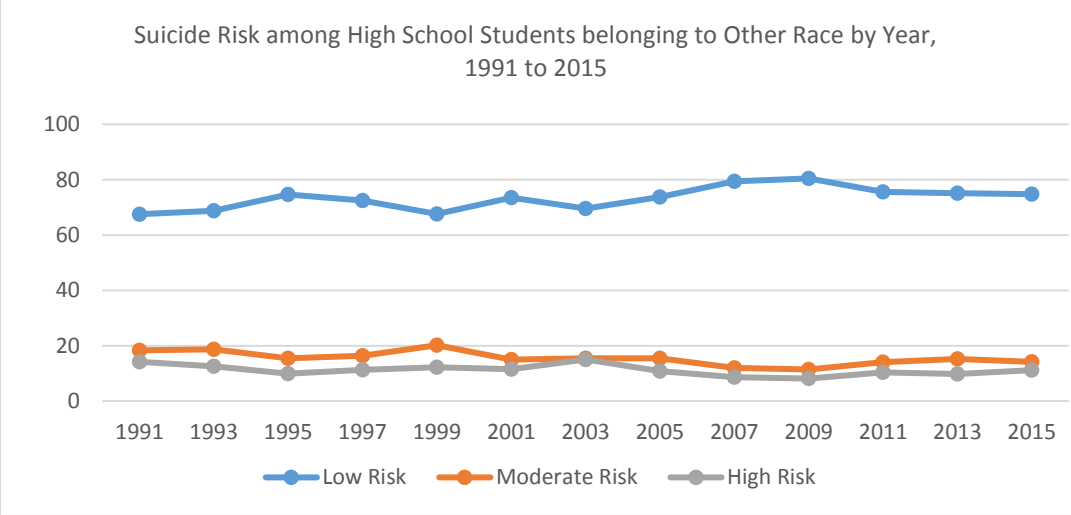
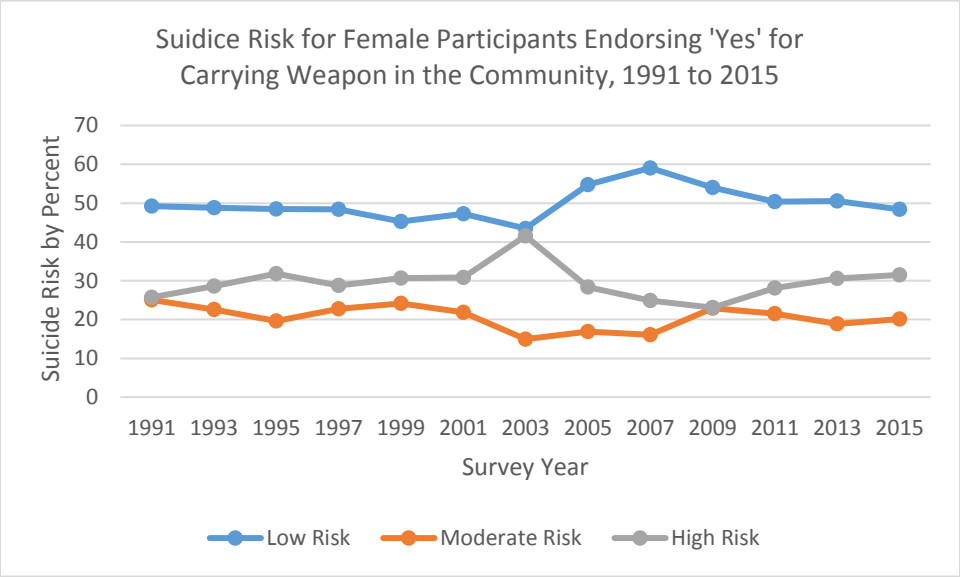

Suicide Risk among High School Students belonging to Other Race by Year, 1991 to 2015
100
80
60
40
20
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Low Risk
Moderate Risk
High Risk

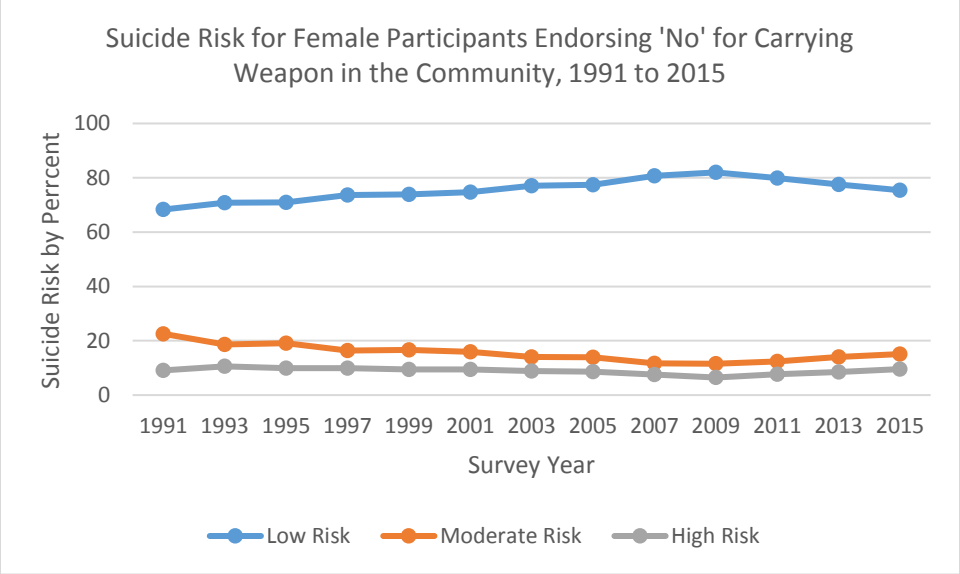
Figure 3. Suicide Risk for Female Participants with Significantly Associated Risk Factors from Bivariate Analysis: 1991 to 2015 (N = 95,129)[a].

a.

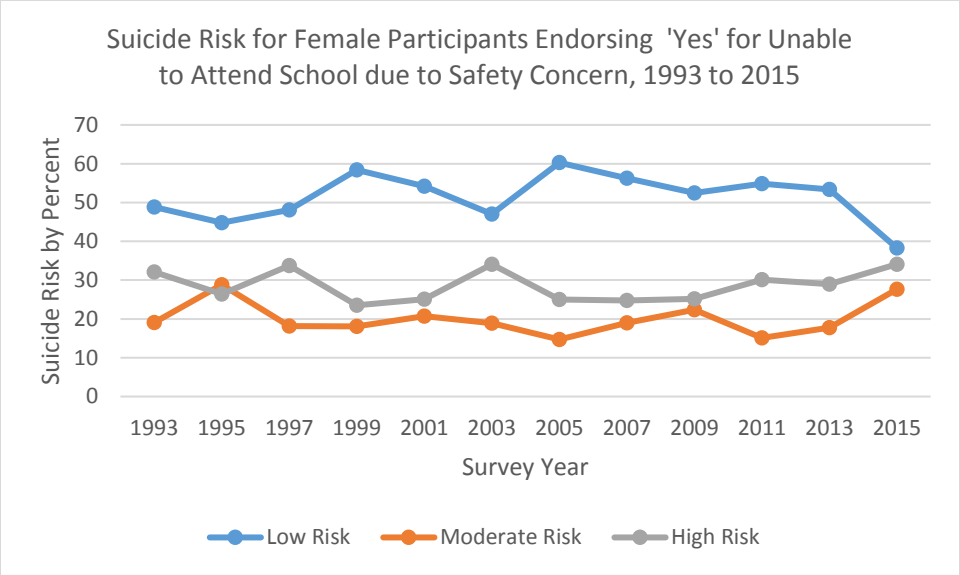


[a] Weighted percentages

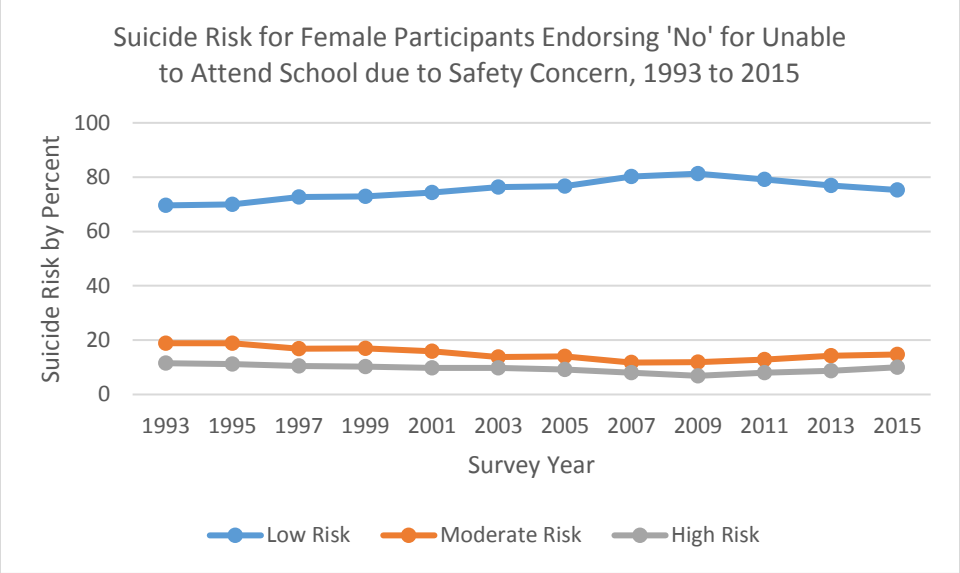
b.



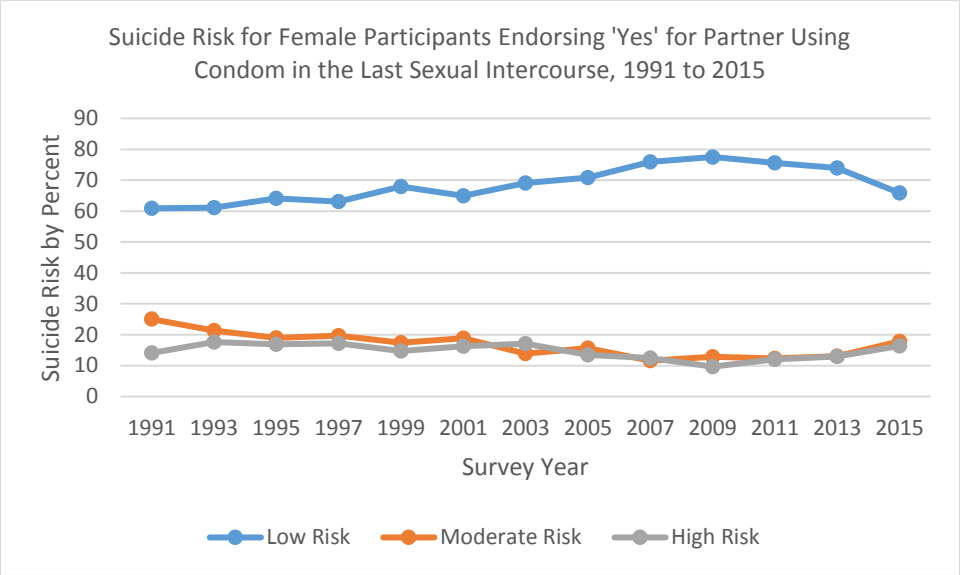
c.


Suicide Risk for Female Participants Endorsing 'Yes' for Unable to Attend School due to Safety Concern, 1993 to 2015
Suicide Risk by Percent
70
60
50
40
30
20
10
0
1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

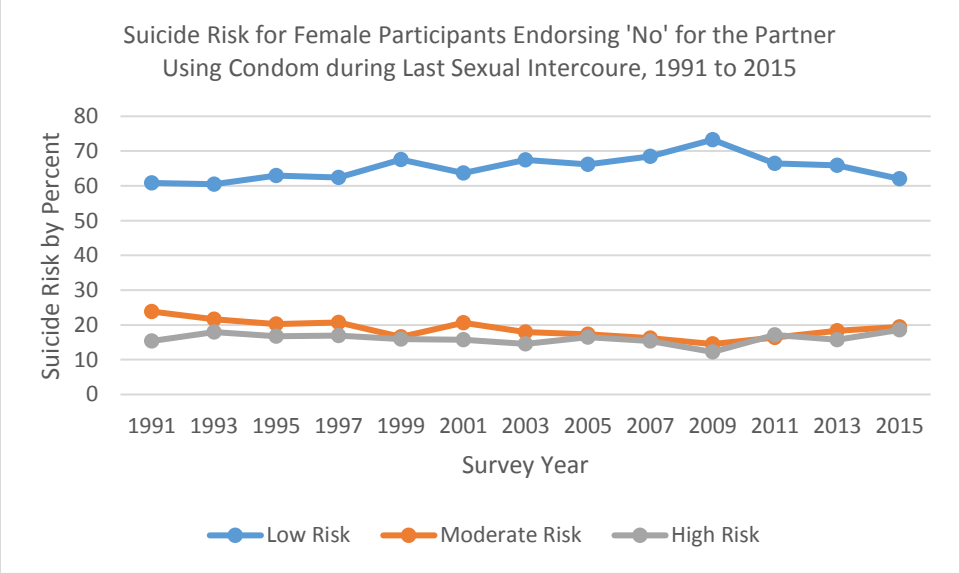
d.


Suicide Risk for Female Participants Endorsing 'No' for Unable to Attend School due to Safety Concern, 1993 to 2015
Suicide Risk by Percent
100
80
60
40
20
0
1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

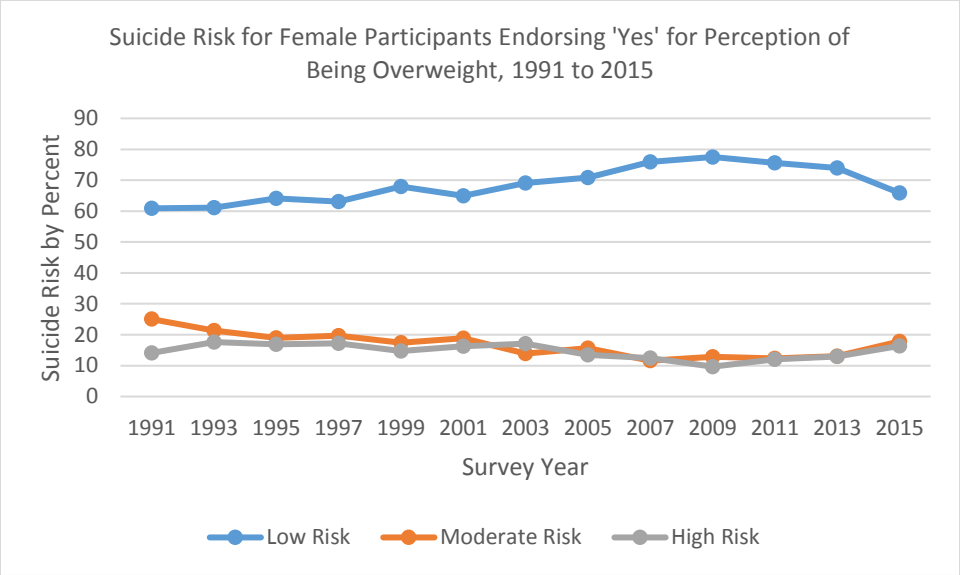
e.


Suicide Risk for Female Participants Endorsing 'Yes' for Partner Using Condom in the Last Sexual Intercourse, 1991 to 2015
Suicide Risk by Percent
90
80
70
60
50
40
30
20
10
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

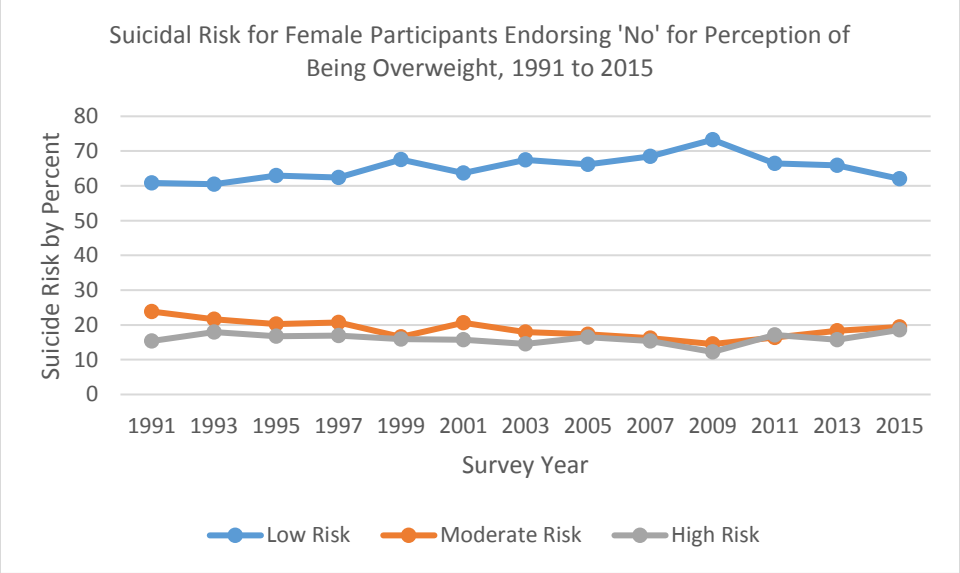
f.


Suicide Risk for Female Participants Endorsing 'No' for the Partner Using Condom during Last Sexual Intercoure, 1991 to 2015
Suicide Risk by Percent
80
70
60
50
40
30
20
10
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

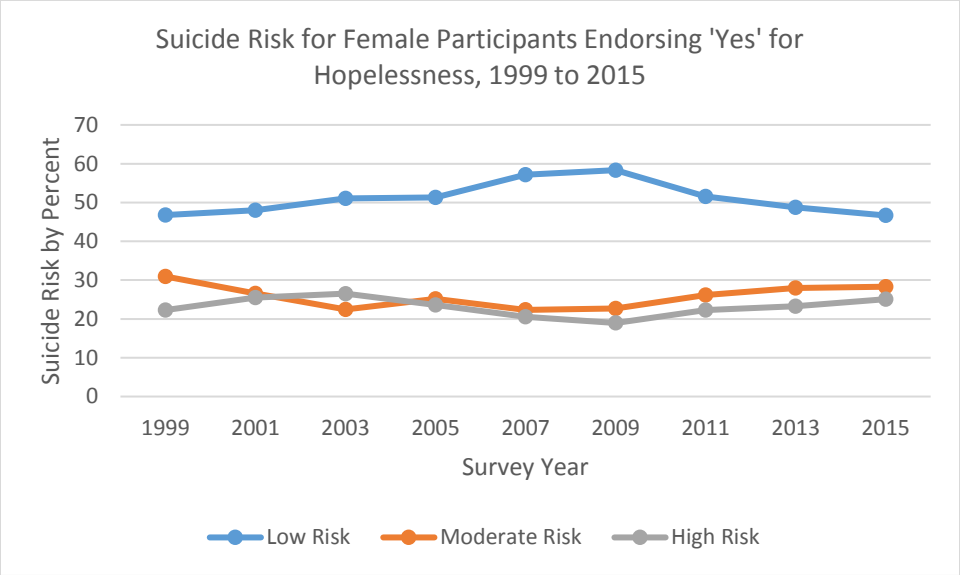
g.


Suicide Risk for Female Participants Endorsing 'Yes' for Perception of Being Overweight, 1991 to 2015
Suicide Risk by Percent
90
80
70
60
50
40
30
20
10
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

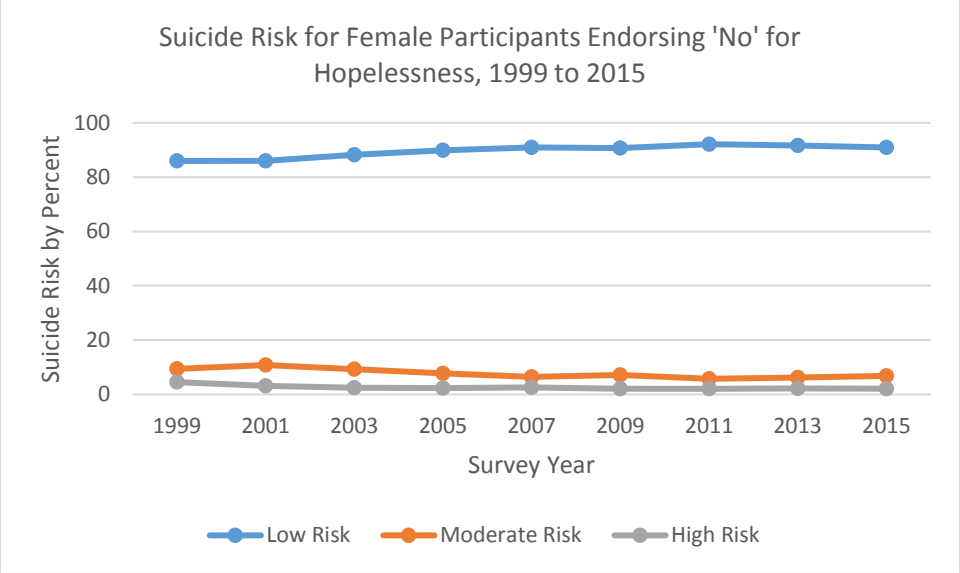
h.


Suicidal Risk for Female Participants Endorsing 'No' for Perception of Being Overweight, 1991 to 2015
Suicide Risk by Percent
80
70
60
50
40
30
20
10
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

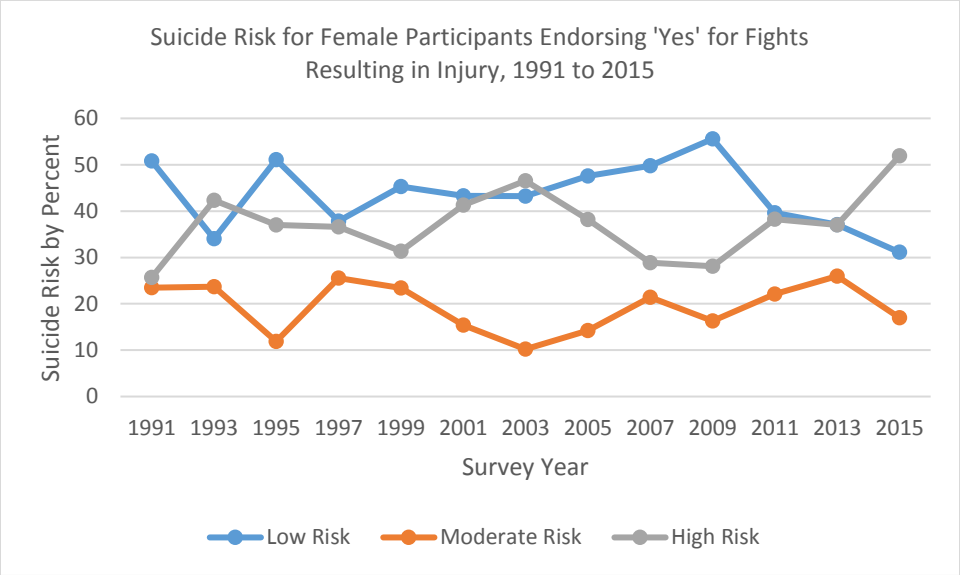
i.


Suicide Risk for Female Participants Endorsing 'Yes' for Hopelessness, 1999 to 2015
Suicide Risk by Percent
70
60
50
40
30
20
10
0
1999
2001
2003
2005
2007
2009
2011
2013
2015
Survey Year
Low Risk
Moderate Risk
High Risk

j.


Suicide Risk for Female Participants Endorsing 'No' for Hopelessness, 1999 to 2015
Suicide Risk by Percent
100
80
60
40
20
0
1999
2001
2003
2005
2007
2009
2011
2013
2015
Survey Year
Low Risk
Moderate Risk
High Risk

k.


Suicide Risk for Female Participants Endorsing 'Yes' for Fights Resulting in Injury, 1991 to 2015
Suicide Risk by Percent
60
50
40
30
20
10
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

l.

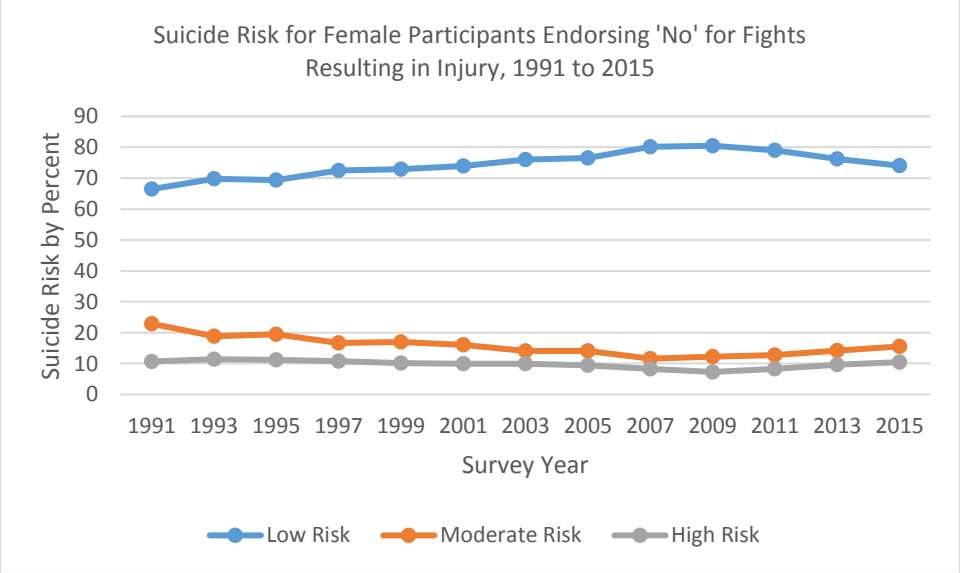
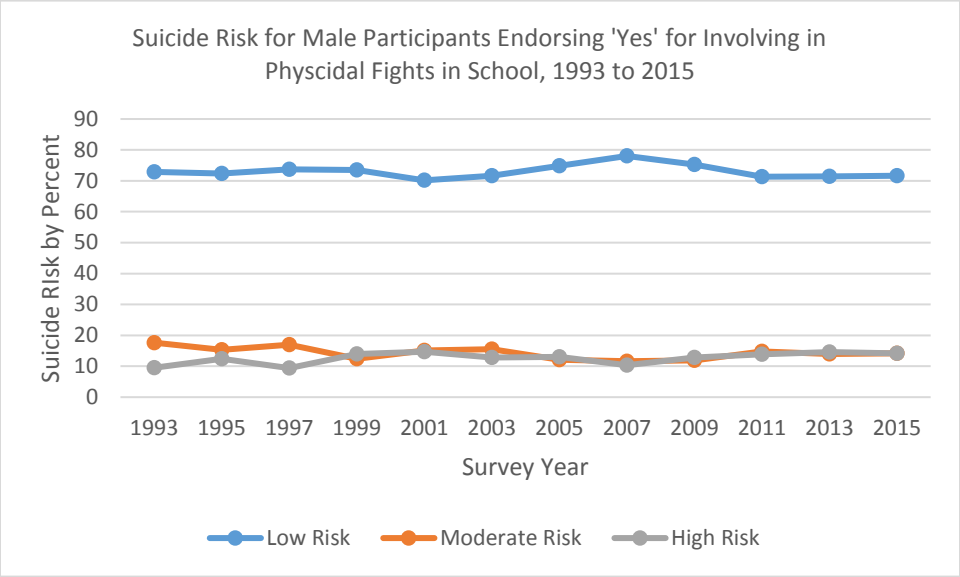

Suicide Risk for Female Participants Endorsing 'No' for Fights Resulting in Injury, 1991 to 2015
Suicide Risk by Percent
90
80
70
60
50
40
30
20
10
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

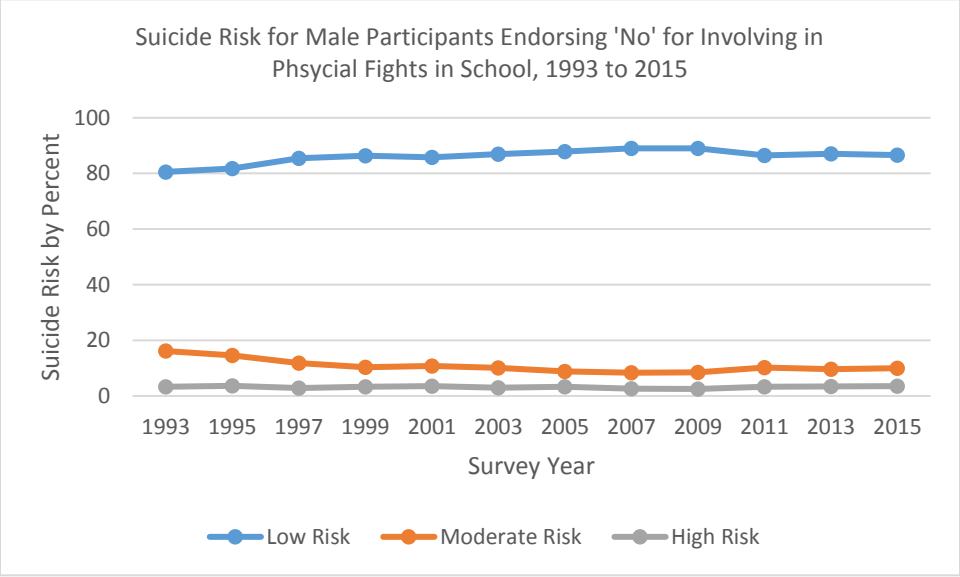
Figure 4. Suicide Risk among Male Participants with on Significantly Associated Risk Factors from Bivariate Analysis: 1991 to 2015 (N = 93,138)[a].

a.

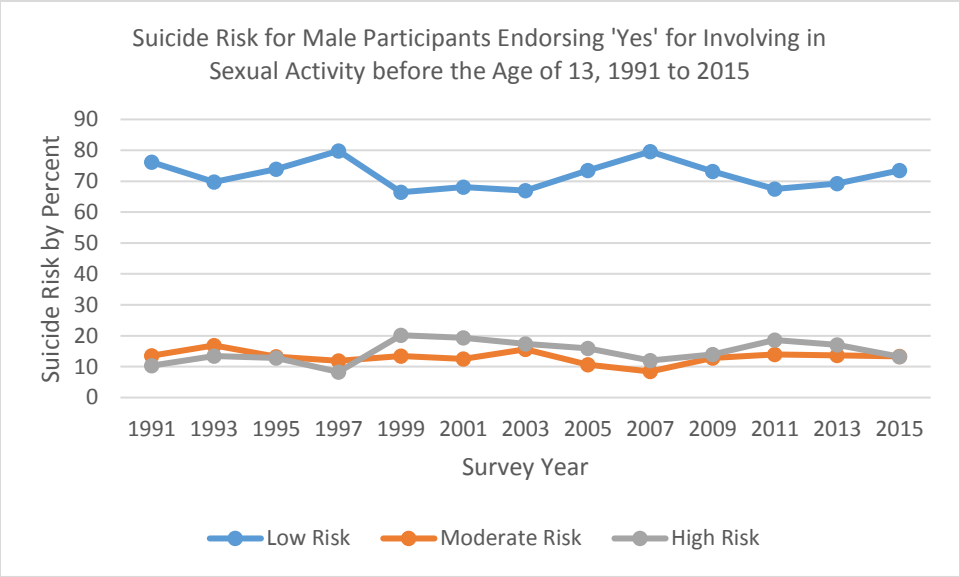


[a] Weighted percentage.

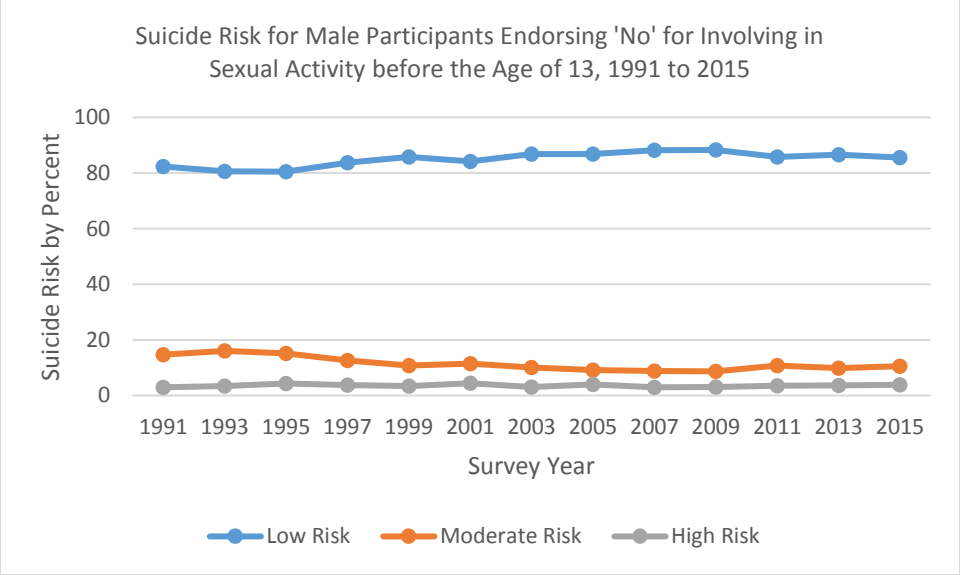
b.



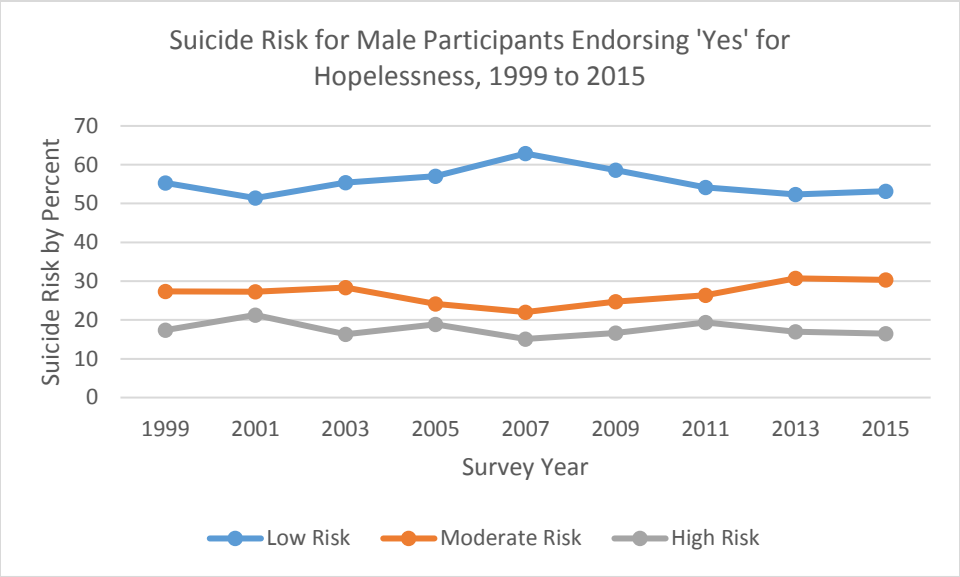
c.


Suicide Risk for Male Participants Endorsing 'Yes' for Involving in Sexual Activity before the Age of 13, 1991 to 2015
Suicide Risk by Percent
90
80
70
60
50
40
30
20
10
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

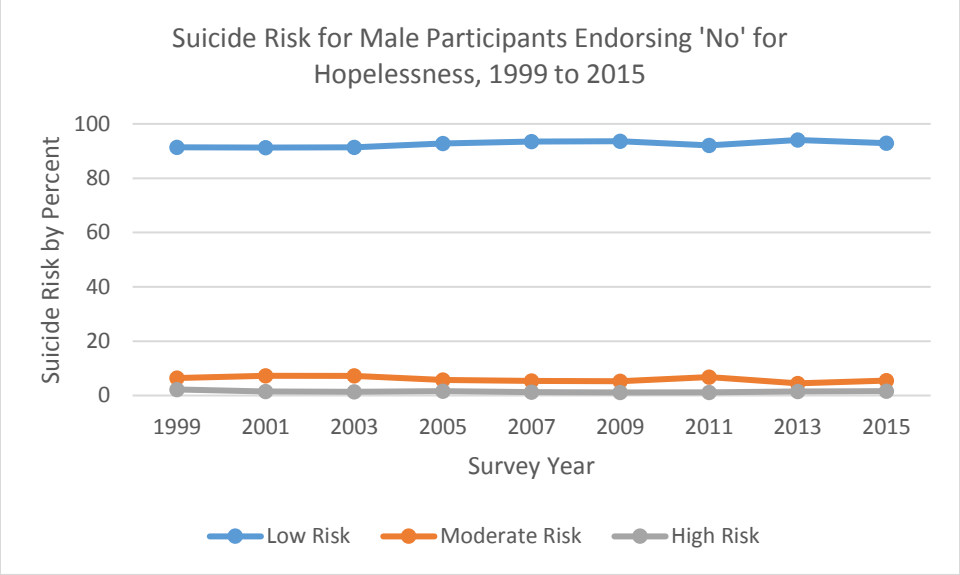
d.


Suicide Risk for Male Participants Endorsing 'No' for Involving in Sexual Activity before the Age of 13, 1991 to 2015
Suicide Risk by Percent
100
80
60
40
20
0
1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Survey Year
Low Risk
Moderate Risk
High Risk

e.


Suicide Risk for Male Participants Endorsing 'Yes' for Hopelessness, 1999 to 2015
Suicide Risk by Percent
70
60
50
40
30
20
10
0
1999
2001
2003
2005
2007
2009
2011
2013
2015
Survey Year
Low Risk
Moderate Risk
High Risk

f.


Suicide Risk for Male Participants Endorsing 'No' for Hopelessness, 1999 to 2015
Suicide Risk by Percent
100
80
60
40
20
0
1999
2001
2003
2005
2007
2009
2011
2013
2015
Survey Year
Low Risk
Moderate Risk
High Risk