Factors associated with distinct patterns of suicidal thoughts, suicide plans, and suicide attempts among US adolescents

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Abstract

The current study examined demographic, psychosocial, and substance use factors associated with distinct patterns of past 12-month suicide thoughts, plans, and attempts among adolescents drawn from a nationally representative sample of high schoolers. Data were from the 2015, 2017, and 2019 National Youth Risk Behavior Survey. Four mutually exclusive 12-month suicidal behavior patterns were identified: suicide thoughts only (Pattern 1); suicide thoughts and plans without suicide attempt (Pattern 2); suicide attempt with thoughts and/or plans (Pattern 3), and; suicide attempt without thoughts or plans (Pattern 4). Multinomial logistic regression analyses were conducted to examine factors correlated with these distinct patterns. Psychosocial and substance use factors were modeled as independent predictors, controlling for demographic characteristics, as well as simultaneously to represent the potential for co-occurrence. The analytic sample

included 7491 respondents. About 24% (n=1734) of youth endorsed Pattern 1, 38% (n=2779) Pattern 2, 35% (n=2716) Pattern 3, and 3% (n=262) Pattern 4. All psychosocial and substance use factors measured were individually associated with greater odds of suicide attempts with thoughts or plans (Pattern 3) than Patterns 1 or 2. Black and male youth were at greater odds of suicide attempts without thoughts or plans (Pattern 4) than all other Patterns. When modeled simultaneously, respondents who were bullied online, sad or hopeless, had a history of sexual violence, used cigarettes, and misused prescription opiates retained greater odds of suicide attempts with thoughts or plans (Pattern 3) than Patterns 1 or 2. Findings suggest screening for suicidal behaviors should include factors that differentiate between varying suicidal expressions and that may cue providers to intervene in the absence of suicide thoughts and plans.

Introduction

Suicide is the second leading cause of death among United States' (US) youth age 10-19 and a major public health concern (Centers for Disease Control and Prevention, 2019). Recent national data indicated in 2019, 18.8% of adolescents considered attempting suicide, 15.7% made a suicide plan, and 8.9% attempted suicide within the past year (Ivey-Stephenson et al., 2020). The majority of those with suicidal ideation (i.e., consideration or desire to end one's life, ranging from suicidal thoughts to suicide plans; Cha et al., 2018) do not transition to a suicide attempt (Klonsky & May 2014). National trends suggest, however, that although rates of suicidal thoughts and plans are decreasing, rates of suicide attempts are increasing —particularly among certain subgroups of youth (e.g., Black adolescents; Lindsey et al., 2019a). Identifying factors associated with the transition from suicidal ideation to suicide attempt is a priority as suicide attempts are predictive of eventual suicide death (Borges et al., 2010; Glenn & Nock, 2014).

Most research focused on differences between those who think about and plan suicide (i.e., those with suicidal ideation) and those who attempt suicide have only included adult samples, and the differences found are limited (e.g., substance use disorders, sexual abuse history; May & Klonsky 2016; Nock et al., 2008). Research among youth has found some differences such as neurocognitive functioning deficits (Bridge et al., 2012; Sheftall et al., 2015; Witte et al., 2008) and greater anhedonia severity (Auerbach et al., 2015) among youth who have attempted suicide but not among youth who have only expressed ideation. Many studies have drawn from small, homogeneous (e.g., 80% White), and/or clinical samples (McManama O'Brien et al., 2014; Stewart et al., 2017) where generalizability is limited (Nock et al., 2013), and this limits our understanding of demographic differences between adolescent with ideation only and those who have attempted suicide.

Another limitation concerns the grouping of research participants. The majority of research collapses youth with suicidal thoughts, plans, and/or attempts into one group and compares them to non-suicidal youth (controls). This leads to the broad categorization of suicidal

behavior correlates that are not specific to the types of suicidal behavior experienced (e.g., suicidal ideation only vs. suicide attempt history; Cha et al., 2018; May & Klonsky 2016; McBride et al., 2017). It also minimizes the ability to create interventions applicable to the level of severity concerning suicidal behavior (e.g., thoughts vs. plans vs. attempts; Nock et al., 2016) or target groups of adolescents who experience differential severity risks.

The Youth Risk Behavior Survey (YRBS) measures several demographic, psychological and relational (i.e., psychosocial), and substance use factors associated with suicidal ideation and suicide attempts (Becker et al., 2021; Cha et al., 2018; Evans et al., 2004; Poorolajal et al., 2016). Many of these factors have also been shown to distinguish between adolescent suicidal ideation and suicide attempts (Mars et al., 2019a) and been associated with the transition from adolescent suicidal ideation to suicide attempt (Mars et al., 2019b). For example, included psychosocial factors—experiences of bullying, lifetime sexual violence, and hopelessness—are all correlates of suicidal ideation and suicide attempts (Cha et al., 2018), and hopelessness, specifically, has been shown to differentiate adolescents who experience suicidal ideation from those who attempt suicide (Mars et al., 2019a). Substance use factors—alcohol, cannabis, electronic cigarette, cigarette, illicit substance, and prescription opiate use—are correlated with suicidal ideation and suicide attempts (Becker et al., 2021; Evans et al., 2004; Mars et al., 2019a; Poorolajal et al., 2016). Evidence also supports cannabis and illicit substance use as predictors of the transition from ideation to attempt (Mars et al., 2019b). To determine the factors associated with suicidal behaviors along the spectrum (e.g., suicidal ideation vs. suicide attempts), this study examined demographic, psychosocial, and substance use factors associated with distinct patterns of past 12-month suicidal thoughts, suicide plans, and suicide attempts among adolescents drawn from a nationally representative sample of US high school students who responded to the national YRBS. Understanding the specific factors associated with these patterns of suicidal behavior could inform prevention and intervention efforts for youth at high risk for suicide (Klonsky et al., 2018; Klonsky & May 2014; May & Klonsky 2016; Nock et al., 2016, 2013).

Methods

Data and Participants

Data came from the 2015, 2017, and 2019 National Youth Risk Behavior Survey (YRBS). These years were chosen as recent rising trends of suicidality among adolescents (Lindsey et al., 2019a) are present, with peaks particularly pronounced during 2015 and 2019 (Centers for Disease Control and Prevention, 2020a). The Centers for Disease Control and Prevention (CDC) have developed, conducted, and administered the survey biennially since 1991. A three-stage cluster sampling design was used to identify a representative sample of 9th-12th grade students in public and private high schools in the 50 states and the District of Columbia. The first-stage sampling frame consisted of 1,259 (in 2015) and 1,257 (in 2017 and 2019) counties, which were considered as primary sampling units (PSUs) and categorized into 16 strata. The second stage sampled 162 secondary sampling units (SSUs), including 180 (in 2015), 192 (in 2017), and 184 (in 2019) physical schools with grades 9–12. The third stage consisted of random sampling of one or two classrooms, where all

students were eligible to participate. Schools or students choosing not to participate were not replaced. Black and Hispanic students were oversampled. Across years, the school response rate was 69-75%, the student response rate was 80-86%, and the overall response rate was 60%. Detailed descriptions of each stage are reported elsewhere (Kann et al., 2016; Kann et al., 2018; Underwood et al., 2020).

The final combined dataset included 15,624 adolescents in 125 schools in 2015, 14,956 adolescents in 144 schools in 2017 and 13,872 adolescents in 136 schools in 2019. The present study was restricted to students who reported having suicidal thoughts, a suicide plan, and/or a suicide attempt within the past 12 months (N=7,491). Students were excluded in analyses if they were missing on any demographic, psychosocial, and substance use variables (missing < 5% on all variables except electronic cigarette: 8.2%; current alcohol use: 10.7%). Aligning with other CDC analyses, missing data were not statistically imputed. For all years, the CDC's Institutional Review Board (IRB) in Atlanta, GA, approved the YRBS protocol. Survey procedures followed local parental permissions guidance and protected respondents' privacy by allowing anonymous and voluntary participation (Kann et al., 2016; Kann et al., 2018; Underwood et al., 2020).

Measures

Specification of Distinct Suicidal Behavior Patterns—Respondents were asked "During the past 12 months did you ever": 1) "seriously consider attempting suicide?" and 2) "make a plan about how you would attempt suicide?" Those who answered "yes" were identified as having *suicidal thoughts* and *suicide plans,* respectively. Having a *suicide attempt* was identified as responses of 1 time or more to "During the past 12 months, how many times did you actually attempt suicide?"

The YRBS suicide questions are intentional in their time calibration—asking about suicidal ideation and suicide attempts within the past 12 months—as research shows that the highest risk for attempted suicide occurs within the year after the onset of suicidal ideation (Nock et al., 2008). Using questions assessing past-year suicidal thoughts, suicide plans, and suicide attempts, adolescents were categorized into four mutually exclusive groups representing distinct patterns of their past 12-month suicidal behaviors (briefly: suicidal behavior patterns): Pattern 1) suicidal thoughts only; Pattern 2) suicidal thoughts and suicide plans without a suicide attempt; Pattern 3) suicide attempt with ideation (endorsed suicidal thoughts and/or suicide plans AND suicide attempt), and; Pattern 4) suicide attempt without ideation (did not endorse either suicidal thoughts or suicide plans however endorsed suicide attempt). This fourth group of adolescents is a subset who are rarely identified. To our knowledge, limited research exists for this specific group of youth. Recent post-mortem analyses have shown up to 30% of suicide deaths among youth occur seemingly without warning (e.g., no history or expression of suicidal ideation; Rodway et al., 2020). It is imperative to better understand who is in this group and what factors are associated with these types of suicide attempts.

Factors Associated with Distinct Suicidal Behavior Patterns

__Psychosocial Factors.:__ The following psychosocial factors were explored as correlates of suicidal behavior patterns: being *bullied at school,* being *bullied online*, *feeling sad/hopeless,* and *lifetime history of sexual violence*. Regarding bullying, respondents were asked "During the past 12 months, have you ever": 1) "been bullied on school property?" and 2) "been electronically bullied?" Students were classified as being *bullied at school* and *bullied online* if they answered "yes" to these questions, respectively. *Feeling sad/hopeless* was identified if respondents indicated "yes" to "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?" Respondents with a *lifetime history of sexual violence* indicated "yes" to the question, "Have you ever been physically forced to have sexual intercourse when you did not want to?"

__Substance Use Factors.:__ Respondents who indicated using *alcohol*, *cannabis*, *electronic cigarettes*, or *cigarettes* one or more times during the 30 days before the survey were categorized as current users of that substance. *Ever illicit substance use* was calculated for respondents who indicated they had ever used heroin, cocaine, synthetic cannabis, inhalants, hallucinogenic drugs, methamphetamines, or ecstasy in their life. *Ever prescription opiate misuse* was calculated for respondents who indicated that they had ever taken prescription pain medication without a prescription or differently than prescribed.

__Demographic Characteristics.:__ Age, race/ethnicity (White, Hispanic/Latinx, Black/African American, Asian, Other Race [Multiracial, American Indian/Alaska Native, Native Hawaiian/Pacific Islander]), and sex (male/female) were used as demographic correlates.

Statistical Analysis

Analyses were conducted in Stata 16. Weights calculated by CDC were applied based on student sex, race/ethnicity, and grade to account for school, student nonresponse, and oversampling of Black and Hispanic students. The Stata "svy" set of commands were used to adjust for complex survey design and produce nationally representative estimates. Because pooled YRBS data from 2015, 2017, and 2019 were used, the current study accounted for the following analysis guidance: 1) National YRBS data are weighted to sample size, thus there was no need to adjust weights when combining the multiple datasets, and; 2) Stata design/nesting statements accounted for PSU or stratum values that may have been the same for multiple years of data (Centers for Disease Control and Prevention, 2020b).

Unweighted frequencies and weighted percentages for demographic characteristics were calculated, and differences in the factors and demographic characteristics across the four adolescent suicidal behavior patterns were compared using *Chi-square* (χ^2) tests (Table 1). Two series of multinomial logistic regression analyses were conducted to examine factors associated with distinct patterns of past 12-month suicidal thoughts, suicide plans, and suicide attempts. First, multinomial logistic regression was used to estimate the degree to which each demographic, psychosocial, and substance use factor was independently associated with suicidal behavior patterns, adjusting for sex, race/ethnicity, and age (Table

2). Next, given the likelihood for concurrent experiences of the measured psychosocial and substance use factors among adolescents (e.g., bullying and illicit substance use, Moore et al., 2017; electronic cigarette and cannabis use, Chadi et al., 2019; Jacobs et al., 2021), a multivariable multinomial logistic regression model was run to test all variables in the model simultaneously, adjusting for demographic factors (Table 3). Two-sided p-values < 0.05 were considered significant.

Results

Overall, most respondents were female, White, and age 15 or 16. See Table 1 for unadjusted frequencies and weighted percentages of all psychosocial and substance use characteristics of the analytic sample (N=7491). Table 1 also displays differences in demographic, psychosocial, and substance use characteristics across the four adolescent suicidal behavior patterns. Within-group differences showed significantly higher percentages of female respondents among all suicidal behavior patterns except among those who reported suicide attempts without ideation (Pattern 4) where a significantly higher percentage of male respondents (63.8%) were observed compared to females. Also, for Pattern 4, a racial difference was present. Although Black/African American adolescents comprised only 10.6% of the total sample, Black/African American youth represented over a quarter of the respondents who attempted suicide without ideation (n=81; 26.4%), and Pattern 4 had the highest percentage for Black/African American youth overall. For psychosocial characteristics, 32% of respondents within Pattern 4 reported feeling sad/hopeless, whereas respondents reporting all other Patterns endorsed these feelings at much higher rates (see Table 1). Greater prevalence of school and electronic bullying, sexual violence histories, and all substance use factors were observed among adolescents who attempted suicide with ideation (Pattern 3).

Individual Correlates of Suicidal Behavior Patterns

Table 2 displays all results of the multinomial logistic regression models, including adjusted odds ratios (*AOR*) and 95% confidence intervals (95% CI), of the individual demographic, psychosocial, and substance use factors associated with distinct patterns of past 12-month suicidal behaviors. Significant results are highlighted below.

Reference Group: Suicidal Thoughts Only (Pattern 1)—The following results describe factors associated with Patterns 2, 3, and 4 with Pattern 1 as the reference group. Male respondents were at lower odds of attempting suicide with ideation (Pattern 3; *AOR*: 0.77; 95% CI: 0.66, 0.91), but at greater odds of attempting suicide without ideation (Pattern 4; *AOR*: 3.50; 95% CI: 2.33, 5.27). Compared to White respondents, Black/African American (*AOR*: 1.60; 95% CI: 1.20, 2.14), other race (*AOR*: 1.67; 95% CI: 1.37, 2.04), and Hispanic/Latinx (*AOR*: 1.57; 95% CI: 1.08, 2.28) respondents were at greater odds to report a suicide attempt with ideation (Pattern 3). Black/African American respondents, compared to White respondents, also had 4.3-times greater odds of attempting suicide without ideation (Pattern 4; 95% CI: 2.37, 7.78). Seventeen-year-old respondents were at lower odds than those age 14 and under to attempt suicide with ideation (Pattern 3; *AOR*: 0.67; 95% CI: 0.51, 0.89) and without ideation (Pattern 4; *AOR*: 0.44; 95% CI: 0.22, 0.86).

Controlling for demographic characteristics, respondents who currently use electronic cigarettes (*AOR*: 1.27; 95% CI: 1.07, 1.51), have used illicit substances (*AOR*: 1.34; 95% CI: 1.07, 1.67), or misused prescription opiates (*AOR*: 1.28; 95% CI: 1.04, 1.57) were at greater odds of endorsing suicide thoughts and plans (Pattern 2). All psychosocial and substance use factors measured were independently associated with greater odds for a suicide attempt with ideation (Pattern 3; see Table 2 for *AOR* and 95% CI). History of sexual violence (*AOR*: 2.26; 95% CI: 1.32, 3.88), current cannabis (*AOR*: 1.95; 95% CI: 1.25, 3.05) and cigarette use (*AOR*: 1.92; 95% CI: 1.05, 3.51), illicit substance use (*AOR*: 2.33; 95% CI: 1,42, 3.82), and prescription opiate misuse (*AOR*: 1.73; 95% CI: 1.06, 2.81) were each associated with greater odds for attempted suicide without ideation (Pattern 4). Those who felt sad/hopeless, however, were at lower odds for attempted suicide without ideation (Pattern 4; *AOR*: 0.23; 95% CI: 0.15, 0.36).

Reference Group: Suicidal Thoughts and Suicide Plans (Pattern 2)—The following results describe factors associated with Patterns 3 and 4 with Pattern 2 as the reference group. Compared to female respondents, males were at lower odds to attempt suicide with ideation (Pattern 3; *AOR*: 0.80, 95% CI: 0.66, 0.97), but greater odds of attempting suicide without ideation (Pattern 4; *AOR*: 3.63, 95% CI: 2.48, 5.33). Black/ African American (*AOR*: 1.44; 95% CI: 1.14, 1.81), other race (*AOR*: 1.47; 95% CI: 1.24, 1.74), and Hispanic/Latinx respondents (*AOR*: 1.37; 95% CI: 1.01, 1.85), compared to White respondents, were at greater odds of attempting suicide with ideation (Pattern 3). Only Black/African American respondents (relative to White youth) were at greater odds of attempting suicide without ideation (Pattern 4; *AOR*: 3.85; 95% CI: 2.15, 6.89). Those age 16 (*AOR*: 0.78; 95% CI: 0.61, 0.99), 17 (*AOR*: 0.64; 95% CI: 0.51, 0.81), and 18 and older (*AOR*: 0.66; 95% CI: 0.49, 0.89) were at lower odds of attempting suicide with ideation (Pattern 3) compared to those age 14 and under. Seventeen-year-olds were also at lower odds to attempt suicide without ideation (Pattern 4; *AOR*: 0.42; 95% CI: 0.21, 0.83).

Adjusting for demographic characteristics, each psychosocial and substance use factor examined was independently associated with greater odds for attempted suicide with ideation (Pattern 3). Respondents who endorsed a history of sexual violence (*AOR*: 2.15; 95% CI: 1.27, 3.66), current cannabis use (*AOR*: 1.79; 95% CI: 1.14, 2.80), and ever using illicit substances (*AOR*: 1.75; 95% CI: 1.06, 2.88) were at greater odds of attempted suicide without ideation (Pattern 4). Lower odds of attempted suicide without ideation (Pattern 4) were observed among respondents who endorsed feeling sad/hopeless (*AOR*: 0.24; 95% CI: 0.15, 0.37).

Reference Group: Suicide Attempts with Ideation (Pattern 3)—The following results describe factors associated with Pattern 4 with Pattern 3 as the reference group. Relative to female respondents, males had 4.5-times greater odds for attempted suicide without ideation (Pattern 4; *AOR*: 95% CI: 3.07, 6.71). Black/African American respondents had 2.7-times greater odds than White respondents of attempting suicide without ideation (Pattern 4; 95% CI: 1.53, 4.70). Considering individual psychosocial factors, youth who had been bullied at school (*AOR*: 0.54; 95% CI: 0.33, 0.87) and online (*AOR*: 0.31; 95% CI:

0.17, 0.55) and reported feeling sad/hopeless (*AOR*: 0.10; 95% CI: 0.06, 0.16) had lower odds of reporting suicide attempts without ideation (Pattern 4).

Simultaneous Correlates of Suicidal Behavior Patterns

Table 3 presents results of the second multinomial logistic regression analysis examining factors associated with distinct patterns of suicidal behaviors. Variables were entered into the model simultaneously to represent possible concurrent psychosocial and substance use factors experienced by adolescents. Significant psychosocial and substance use correlates are described below; all *AOR,* 95% CI, and results related to demographic factors are reported in Table 3.

When considering all factors simultaneously, only respondents who used electronic cigarettes retained greater odds of suicide thoughts and plans (Pattern 2) rather than suicide thoughts only (Pattern 1). Respondents who endorsed the following psychosocial and substance use factors were at greater odds for attempted suicide with ideation (Pattern 3) rather than suicide thoughts only (Pattern 1): being bullied online, feeling sad/hopeless, history of sexual violence, current cigarette use, ever illicit substance use, and ever prescription opiate misuse. Only feeling sad/hopeless remained significant to distinguish Pattern 4 from Pattern 1, with respondents who endorsed feeling sad/hopeless having lower odds for attempted suicide without ideation.

Respondents who endorsed the following factors were at greater odds for attempted suicide with ideation (Pattern 3) rather than suicide thoughts and plans (Pattern 2): being bullied at school, being bullied online, feeling sad/hopeless, a history of sexual violence, current cannabis use, current cigarette use, and ever prescription opiate misuse. Respondents who currently used cannabis and cigarettes were also at greater odds for attempted suicide without ideation (Pattern 4), rather than suicide thoughts and plans only (Pattern 2). In contrast, those who endorsed feeling sad/hopeless were at lower odds of attempted suicide without ideation.

Among psychosocial and substance use factors tested, only feeling sad/hopeless significantly distinguished youth who attempted suicide without ideation (Pattern 4) from those who attempted with ideation (Pattern 3); youth who felt sad/hopeless had lower odds of an attempt without ideation than an attempt with ideation.

Discussion

The present study aimed to examine factors that differentiate youth who engaged in various patterns of suicidal behaviors. The majority of research compares youth with suicidal thoughts, plans, and/or attempts to non-suicidal individuals, limiting our knowledge of profiles associated with distinct patterns of suicidal behavior (May & Klonsky 2016; Nock et al., 2016). This analysis of US adolescents indicated specific demographic, psychosocial, and substance use factors associated with four distinct groups of adolescents with varying levels of past 12-month suicidal behavior engagement. These findings can inform efforts to accurately screen and prevent youth suicidal behaviors among those who may be at risk.

Key findings suggest that compared to White youth, Black/African American youth were consistently at greater odds of attempting suicide without the presence of typical suicide precursors (i.e., thoughts or plans; Pattern 4) that alert providers to the need for intervention. These results align with research showing the rise in attempted suicide, yet decreasing trends of suicidal thoughts and suicide plans, found among Black youth (Lindsey et al., 2019a). Screening protocols for suicide attempts primarily mark suicidal thoughts and suicide plans as potential risk indicators (Bryan et al., 2009). If Black youth are not validating these common suicide-risk indicators or Black youth are experiencing unique presentations of these common indicators of risk, practitioners may miss the opportunity to provide necessary intervention. Future research should consider the development of suicide assessments that evaluate additional factors that could cue providers to the need for intervention even in the absence of formulated suicidal thoughts and plans. For example, literature has suggested depression in Black youth may manifest as externalizing behaviors, somatic concerns, or relational issues (Lu et al., 2017); however, suicide screening questions often do not include these facets. This dearth of more nuanced assessments for Black adolescents is cause for concern, as recently highlighted in the Congressional Black Caucus report on Black Youth Suicide (Lindsey et al., 2019b).

Findings also suggest sex differences between the distinct patterns. Specifically, males were at greater odds to attempt suicide without endorsing suicidal ideation (Pattern 4), persisting even when considering psychosocial and substance use factors simultaneously. Rodway et al. (2020) found male youth were overrepresented among suicide deaths categorized as having no history or expression of suicidal ideation. This group in Rodway's study had lower rates of other known suicide risk indicators, such as mental health diagnoses—similar to Pattern 4's lower odds of sadness/hopelessness. These feelings may be concealed by male youth due to socialization, or alternatively, males could experience a rapid onset of suicidality (Rodway et al., 2020). Higher levels of behavioral impulsivity exist among males (Cross et al., 2011), but findings on adolescents' impulsivity and suicide are mixed (McHugh et al., 2019; Witte et al., 2008). Research must continue to identify specific suicide attempt risks among male youth in order to develop tailored suicide prevention interventions and policies (e.g., addressing lethal means safety and restriction). This is critical as, ultimately, males experience higher rates of suicide death (Curtin et al., 2017).

Lifetime history of sexual violence was consistently correlated with suicide attempts with ideation (Pattern 3) relative to ideation only patterns of suicidal behaviors (Pattens 1 and 2), even when modeling possible concurrent psychosocial and substance use factors. These results may highlight the particular salience of this factor on suicidal behaviors and are consistent with previous research concerning adult with suicidal ideation compared to those who have attempted suicide (May & Klonsky 2016; Dworkin et al., 2017). Although clinical assessments and hospitals may screen for a history of sexual violence, physicians and clinicians may not understand the link between this history and suicidal behaviors (Betz & Boudreaux 2016). Further, in models controlling for demographic characteristics, respondents with a history of sexual violence had over two-times greater odds of attempted suicide without ideation (Pattern 4) than reporting suicide thoughts only (Pattern 1) or suicidal thoughts and plans only (Pattern 2). Educating physicians and clinicians on the connection between sexual violence and suicide is essential so practitioners can accurately

assess suicide risk among youth who present with trauma histories but without suicidal ideation.

Notably, youth who reported feeling sad/hopeless were at greater odds of reporting suicide attempts with ideation (Pattern 3) rather than suicide thoughts only (Pattern 1) across all models tested. These results are supported by past research indicating adolescents experiencing hopelessness and those diagnosed with a depressive disorder (of which sadness/hopelessness is a key diagnostic criterion; American Psychological Association, 2013) had greater odds of attempting suicide than only having suicidal thoughts (Mars et al., 2019a). Yet, our findings also show youth who felt sad/hopeless were at lower odds of attempting suicide without ideation (Pattern 4) than all other suicidal behavior patterns. It may be these youth have other non-depressive mental health disorders (e.g., post-traumatic stress disorder, eating disorder; Gili et al., 2019; Panagioti et al., 2015) associated with suicidal behaviors.

Research shows that substance use disorders may be more common among those who attempt suicide than those with suicidal thoughts only (May & Klonsky, 2016). The current study assessed the potential for the association of any level of use in the past 30 days for several unique substances, ever using illicit substances, or misusing prescription opiates with adolescent suicidal behavior patterns. When tested simultaneously, cigarette and cannabis use were both associated with greater odds of attempted suicide with (Pattern 3) and without ideation (Pattern 4) rather than suicide thoughts and plans only (Pattern 2). Illicit substances and prescription opiates were also associated with greater odds of attempted suicide with ideation (Pattern 3). Substance use may directly increase vulnerabilities for attempted suicide through both acute and long-term alterations in judgment, inhibition, impulse control, and behavioral, affective, and cognitive processing (Dawes et al., 2008). It should be considered, however, that substance use can co-occur with mental health, psychosocial (e.g., social isolation), and some chronic pain concerns, and these are also correlated with suicidal behaviors (Pompili et al., 2012; Racine, 2018). Adolescents may use substances to cope with intense psychological, emotional, or physical pain associated with these concerns (Pompili et al., 2012; Racine, 2018) and suicide may be viewed as a means to ending pain (Oravecz & Moore, 2006). Robust suicide risk assessments should address the use of substances. In particular assessments should ask about cigarette, cannabis, and illicit substance use given the intersection of current findings and aligned research regarding these substances' association with attempted suicide (see Mars et al., 2019a; 2019b).

Limitations

Limitations must be considered when interpreting findings. Due to the cross-sectional nature of the data, the results do not imply causality. It is possible, for example, that some psychosocial factors may have occurred following the endorsed suicidal ideation or suicide attempt (e.g., bullying following a suicide attempt). To truly understand adolescents' trajectories from suicidal ideation to suicide attempts, longitudinal data are necessary. Though a strength of the YRBS is that it is nationally representative, a greater proportion of female youth compared to male youth endorse suicidal behaviors on the survey (e.g., 2019 prevalence: suicide thoughts-24.1% female vs. 13.3% male; suicide plans: 19.9% female

vs. 11.3% male; suicide attempt: 11.0% female vs. 6.6% male; Ivey-Stephenson et al., 2020), which impacted ratio of male and female respondents for the current analytic sample. Although the reports of suicidal ideation and suicide attempts align with the epidemiology of suicide (Cha et al., 2018), it is necessary to determine what unique factors are related to suicidal behavior patterns in order to design responsive screenings and prevention interventions.

The current study included a limited number of predictors. Systemic factors associated with suicide (e.g., poverty; Cha et al., 2018) were not included, nor were specific mental health diagnoses. Furthermore, indicators of potential distress (e.g., feeling sad/hopeless) and suicidality were all self-report, which may result in bias. It is prudent to consider how social desirability bias may have influenced responses to or skipping over survey questions given stigma related to mental health and suicide. Because the creation of the four distinct patterns relied on the self-reported responses, it is possible youth's pattern status could shift if we had access to medical histories or if there were no missing data on suicide indicators. Errors in respondents' classifications may also impact analyses and results. For example, confidence intervals are likely narrower than if response bias had been accounted for. Additionally, because the YRBS data is limited to students enrolled in traditional high schools, the results may not reflect vulnerable youth who are not enrolled in school or these types of schools. These may be youth who are or will be eventually served by alternative or option high schools (i.e., schools for students who have been expelled, dropped out from school, or are at risk of dropping out/failing high school). Several states have administered the YRBS to alternative high schools and have found heightened involvement in many of the psychosocial, substance use, and suicidal behaviors measured compared to the traditional high school student surveys (e.g., Alaska Department of Health and Social Services, 2017). In excluding these youth, we may be overlooking those at particularly elevated risk for suicide.

Finally, only past-year suicidal ideation and suicide attempts were considered in the analysis, and lifetime experiences of suicidality were unmeasured. Because the YRBS does not ask questions surrounding lifetime suicide thoughts, plans, or attempts, we could not control for this in analyses, and it could have affected youth's suicidal behavior patterns. For instance, an adolescent may have attempted suicide prior to the past 12 months, making their lifetime suicide behavior pattern different than their current pattern for this study. Thus, each pattern is representative of the adolescents' experiences with suicidal thoughts, suicide plans, and suicide attempts within the past-year only. It is important to note, however, that this 12-month time period is critical to clinicians and researchers alike as research shows transitions to suicide attempts typically occur within the year after the onset of suicidal thoughts or plans (Nock et al., 2008). Although future research should incorporate lifetime suicidality into an assessment of adolescents' distinct suicidal behavior patterns, the results of the current study remain critical, especially for adolescents who might experience a rapid onset of behaviors without prior history of suicidal ideation.

Conclusions

This study examined demographic, psychosocial, and substance use correlates of four distinct patterns of past 12-month suicidal behaviors. Substance use correlates, such as cigarette and cannabis use, emerged as salient factors differentiating suicide attempts both with and without ideation from patterns of suicidal behavior encompassing only suicidal ideation. Additionally, feeling sad/hopeless was consistently associated with lower odds for attempted suicide without ideation. It is important to identify other emotional and cognitive processes of these youth that may underly suicidal behaviors. Of particular concern, Black and male youth were consistently at greater odds of suicide attempts without reported thoughts or plans of suicide, which are typical signs of the need for mental health treatment. Taken together, findings can inform future efforts to accurately screen for suicidal behaviors to prevent youth suicide.

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Table 1:

Sample Characteristics by Suicidal Behavior Pattern (Unweighted frequency and weighted percent)

Characteristic	Total Sample	Pattern 1[a]	Pattern 2[b]	Pattern 3[c]	Pattern 4[d]	χ^2	p value
N (% weighted) of Sample	7491 (100)	1734 (24.4)	2779 (38.1)	2716 (34.8)	262 (2.7)		
Sex, n (%)							
Male	2624 (36.5[e])	651 (38.9)	1019 (37.6)	799 (31.5)	155 (63.8)	139.29	0.001
Female	4776 (62.2)	1072 (60.8)	1722 (60.8)	1881 (67.2)	101 (31.6)		
Race/Ethnicity, n (%)							
White	3355 (52.4)	891 (58.6)	1320 (54.6)	1062 (46.3)	82 (38.5)	158.34	0.001
Black/African American	914 (10.6)	175 (9.1)	272 (9.3)	386 (11.7)	81 (26.4)		
Asian	313 (4.0)	68 (3.9)	148 (4.8)	90 (3.3)	7 (3.7)		
Other	1970 (22.6)	413 (19.8)	684 (20.9)	813 (26.8)	60 (20.6)		
Hispanic/Latinx	770 (8.3)	161 (7.4)	292 (7.9)	295 (9.4)	22 (7.2)		
Age, n (%)							
14 & under	881 (11.2)	195 (10.2)	287 (9.8)	366 (13.1)	33 (16.1)	63.50	0.002
15 years old	1820 (24.9)	380 (22.8)	662 (23.6)	711 (27.9)	67 (23.1)		
16 years old	1955 (25.7)	459 (26.4)	724 (25.6)	710 (25.3)	61 (24.7)		
17 years old	1850 (23.9)	456 (26.1)	718 (25.7)	612 (20.7)	64 (21.0)		
18 & older	948 (13.9)	238 (14.2)	371 (14.8)	304 (12.5)	35 (14.9)		
Bullied at School: Yes, n (%)	2861 (39.6)	580 (35.0)	948 (34.3)	1274 (49.1)	59 (31.0)	161.19	0.001
Bullied Online: Yes, n (%)	2329 (32.1)	439 (24.8)	734 (27.2)	1118 (43.8)	38 (17.1)	264.14	0.001
Sad or hopeless: Yes, n (%)	5744 (76.4)	1276 (72.3)	2041 (72.6)	2352 (86.5)	75 (31.8)	413.67	0.001
History of Sexual Violence: Yes, n (%)	1390 (18.4)	209 (12.6)	374 (13.2)	761 (27.9)	46 (21.8)	260.18	0.001
Current Alcohol Use: Yes, n (%)	2854 (39.2)	606 (35.8)	985 (36.8)	1186 (44.9)	77 (28.7)	190.35	0.001
Current Cannabis Use: Yes, n (%)	2415 (32.1)	458 (25.9)	776 (27.6)	1085 (40.7)	96 (38.2)	233.22	0.001
Current Electronic Cigarette Use: Yes, n (%)	2305 (31.3)	433 (25.1)	766 (28.2)	1037 (39.0)	69 (22.0)	197.60	0.001
Current Cigarette Use: Yes, n (%)	1062 (15.3)	176 (10.7)	296 (11.8)	564 (22.4)	26 (12.9)	364.59	0.001
Ever Illicit Substance Use: Yes, n (%)	2199 (29.1)	355 (20.1)	683 (24.9)	1075 (39.3)	86 (36.5)	250.71	0.001

	Total Sample	Pattern 1[a]	Pattern 2[b]	Pattern 3[c]	Pattern 4[d]	
Ever Prescription Opiate Misuse: Yes, *n* (%)	2136 (27.9)	356 (19.7)	684 (23.9)	1031 (38.0)	65 (29.4)	225.51	0.001

[a]Pattern 1: Suicidal thoughts only;

[b]Pattern 2: Suicidal thoughts & suicide plans;

[c]Pattern 3: Suicide attempt with ideation;

[d]Pattern 4: Suicide attempt without ideation

[e]All *n* and weighted percentages account for missing data

Table 2

Multinomial Logistic Regression Results: Individual Demographic, Psychosocial, and Substance Use Correlates of Suicidal Behavior Patterns

Characteristics	Reference Group: Pattern 1[a] versus			Reference Group: Pattern 2[b] versus		Reference Group: Pattern 3[c] versus
	Pattern 2 AOR[e] [95% CI]	Pattern 3 AOR[e] [95% CI]	Pattern 4[d] AOR[f] [95% CI]	Pattern 3 AOR[e] [95% CI]	Pattern 4 AOR[e] [95% CI]	Pattern 4 AOR[f] [95% CI]
Sex: Male (ref: female)	0.96 [0.80, 1.15]	**0.77 [0.66, 0.91]**	**3.50 [2.33, 5.27]**	**0.80 [0.66, 0.97]**	**3.63 [2.48, 5.33]**	**4.54 [3.07, 6.71]**
Race/Ethnicity (ref: white)						
Black/African American	1.12 [0.80, 1.55]	**1.60 [1.20, 2.14]**	**4.30 [2.37, 7.78]**	**1.44 [1.14, 1.81]**	**3.85 [2.15, 6.89]**	**2.68 [1.53, 4.70]**
Asian	1.35 [0.97, 1.90]	1.10 [0.70, 1.73]	1.44 [0.41, 5.05]	0.81 [0.58, 1.14]	1.06 [0.28, 3.96]	1.31 [0.39, 4.41]
Other	1.14 [0.95, 1.37]	**1.67 [1.37, 2.04]**	1.66 [1.00, 2.78]	**1.47 [1.24, 1.74]**	1.46 [0.90, 2.38]	0.99 [0.60, 1.64]
Hispanic/Latinx	1.15 [0.85, 1.55]	**1.57 [1.08, 2.28]**	1.48 [0.78, 2.83]	**1.37 [1.01, 1.85]**	1.29 [0.64, 2.59]	0.94 [0.46, 1.93]
Age (ref: 14 & under)						
15 years old	1.11 [0.82, 1.51]	1.00 [0.77, 1.31]	0.57 [0.26, 1.26]	0.90 [0.72, 1.12]	0.51 [0.25, 1.05]	0.57 [0.27, 1.21]
16 years old	1.05 [0.77, 1.44]	0.82 [0.60, 1.12]	0.64 [0.31, 1.32]	**0.78 [0.61, 0.99]**	0.61 [0.32, 1.18]	0.78 [0.40, 1.52]
17 years old	1.04 [0.76, 1.44]	**0.67 [0.51, 0.89]**	**0.44 [0.22, 0.86]**	**0.64 [0.51, 0.81]**	**0.42 [0.21, 0.83]**	0.65 [0.34, 1.27]
18 & older	1.15 [0.82, 1.60]	0.75 [0.54, 1.05]	0.60 [0.27, 1.31]	**0.66 [0.49, 0.89]**	0.52 [0.24, 1.11]	0.79 [0.37, 1.70]
	AOR[f] [95% CI]	AOR[f] [95% CI]	AOR[f] [95% CI]	AOR[f] [95% CI]	AOR[f] [95% CI]	AOR[f] [95% CI]
Bullied at School: Yes (ref: No)	1.00 [0.85, 1.19]	**1.79 [1.50, 2.15]**	0.96 [0.59, 1.56]	**1.78 [1.52, 2.10]**	0.96 [0.60, 1.53]	**0.54 [0.33, 0.87]**
Bullied Online: Yes (ref: No)	1.15 [0.96, 1.39]	**2.40 [1.98, 2.89]**	0.74 [0.41, 1.32]	**2.08 [1.73, 2.50]**	0.64 [0.35, 1.16]	**0.31 [0.17, 0.55]**
Sad or hopeless: Yes (ref: No)	0.98 [0.82, 1.18]	**2.43 [1.91, 3.10]**	**0.23 [0.15, 0.36]**	**2.47 [2.04, 2.99]**	**0.24 [0.15, 0.37]**	**0.10 [0.06, 0.16]**
History of Sexual Violence: Yes (ref: No)	1.05 [0.82, 1.35]	**2.77 [2.21, 3.46]**	**2.26 [1.32, 3.88]**	**2.63 [2.20, 3.15]**	**2.15 [1.27, 3.66]**	0.82 [0.48, 1.39]
Current Alcohol Use: Yes (ref: No)	1.06 [0.89, 1.27]	**1.80 [1.49, 2.18]**	1.29 [0.78, 2.14]	**1.70 [1.43, 2.02]**	1.21 [0.72, 2.03]	0.72 [0.42, 1.21]
Current Cannabis Use: Yes (ref: No)	1.09 [0.92, 1.30]	**2.14 [1.75, 2.60]**	**1.95 [1.25, 3.05]**	**1.96 [1.66, 2.31]**	**1.79 [1.14, 2.80]**	0.91 [0.61, 1.38]
Current Electronic Cigarette Use: Yes (ref: No)	**1.27 [1.07, 1.51]**	**2.21 [1.84, 2.66]**	1.32 [0.79, 2.22]	**1.74 [1.47, 2.07]**	1.04 [0.62, 1.76]	0.60 [0.36, 1.00]
Current Cigarette Use: Yes (ref: No)	1.17 [0.89, 1.54]	**3.01 [2.29, 3.94]**	**1.92 [1.05, 3.51]**	**2.57 [2.09, 3.16]**	1.64 [0.92, 2.91]	0.64 [0.36, 1.12]
Ever Illicit Substance Use: Yes (ref: No)	**1.34 [1.07, 1.67]**	**2.73 [2.25, 3.31]**	**2.33 [1.42, 3.82]**	**2.05 [1.71, 2.45]**	**1.75 [1.06, 2.88]**	0.85 [0.52, 1.40]
Ever Prescription Opiate Misuse: Yes (ref: No)	**1.28 [1.04, 1.57]**	**2.57 [2.08, 3.17]**	**1.73 [1.06, 2.81]**	**2.01 [1.72, 2.35]**	1.35 [0.83, 2.18]	0.67 [0.42, 1.08]

[a] Pattern 1: Suicidal thoughts only;

[b]Pattern 2: Suicidal thoughts & suicide plans;

[c]Pattern 3: Suicide attempt with ideation;

[d]Pattern 4: Suicide attempt without ideation

[e]Sex adjusted for race/ethnicity and age; Race/ethnicity adjusted for sex and age; Age adjusted for sex and race/ethnicity.

[f]All adjusted for sex, race/ethnicity, and age.

Note. AOR: adjusted odds ratio. 95% CI: 95% confidence interval. Ref: reference group. Bold denotes *p* < 0.05.

Table 3

Multinomial Logistic Regression Results: Simultaneous Demographic, Psychosocial, and Substance Use Correlates of Suicidal Behavior Patterns

Characteristics	Reference Group: Pattern 1[a] versus			Reference Group: Pattern 2[b] versus		Reference Group: Pattern 3[c] versus
	Pattern 2 AOR [95% CI]	Pattern 3 AOR [95% CI]	Pattern 4[d] AOR [95% CI]	Pattern 3 AOR [95% CI]	Pattern 4 AOR [95% CI]	Pattern 4 AOR [95% CI]
Sex: Male (ref: female)	0.97 [0.81, 1.17]	1.06 [0.89, 1.23]	**3.27 [2.19, 5.30]**	1.08 [0.88, 1.34]	**3.36 [2.12, 5.31]**	**2.32 [1.11, 4.85]**
Race/Ethnicity (ref: white)						
Black/African American	1.20 [0.84, 1.66]	**2.08 [1.41, 3.05]**	**3.32 [1.35, 8.13]**	**1.73 [1.23, 2.29]**	**2.77 [1.14, 6.71]**	1.60 [0.68, 3.73]
Asian	1.47 [0.94, 2.31]	**1.81 [1.09, 2.99]**	3.20 [0.59, 17.40]	1.23 [0.23, 1.82]	2.17 [0.38, 12.25]	1.77 [0.34, 9.19]
Other	1.15 [0.94, 1.40]	**1.80 [1.43, 2.27]**	2.16 [0.88, 5.34]	**1.57 [1.27, 1.94]**	1.88 [0.76, 4.66]	1.20 [0.48, 3.02]
Hispanic/Latinx	1.18 [0.84, 1.66]	**1.84 [1.22, 2.78]**	2.29 [0.88, 5.39]	**1.56 [1.10, 2.21]**	1.94 [0.71, 5.27]	1.24 [0.46, 3.37]
Age (ref: 14 & under)						
15 years old	1.08 [0.76, 1.53]	1.03 [0.76, 1.40]	0.58 [0.19, 1.77]	0.96 [0.73, 1.25]	0.54 [0.19, 1.56]	0.57 [0.19, 1.66]
16 years old	1.09 [0.76, 1.55]	0.76 [0.52, 1.11]	0.72 [0.22, 2.37]	0.70 [0.51, 0.96]	0.67 [0.22, 2.03]	0.96 [0.32, 2.90]
17 years old	1.02 [0.73, 1.43]	**0.64 [0.45, 0.91]**	**0.34 [0.12, 0.94]**	0.63 [0.47, 0.85]	**0.33 [0.12, 0.91]**	0.53 [0.19, 1.47]
18 & older	1.12 [0.77, 1.64]	**0.58 [0.42, 0.81]**	0.37 [0.11, 1.31]	0.52 [0.35, 0.75]	0.33 [0.10, 1.15]	0.64 [0.19, 2.19]
Bullied at School: Yes (ref: No)	0.95 [0.77, 1.16]	1.15 [0.91, 1.46]	1.14 [0.46, 2.80]	**1.22 [1.01, 1.48]**	1.20 [0.49, 2.94]	0.99 [0.41, 2.41]
Bullied Online: Yes (ref: No)	1.22 [0.95, 1.57]	**1.87 [1.47, 2.39]**	1.46 [0.51, 4.17]	**1.54 [1.22, 1.93]**	1.20 [0.42, 3.40]	0.78 [0.28, 2.21]
Sad or hopeless: Yes (ref: No)	0.94 [0.76, 1.15]	**2.33 [1.72, 3.17]**	**0.28 [0.15, 0.53]**	**2.49 [1.94, 3.19]**	**0.30 [0.16, 0.57]**	**0.12 [0.06, 0.25]**
History of Sexual Violence: Yes (ref: No)	0.95 [0.74, 1.22]	**1.77 [1.34, 2.33]**	1.14 [0.53, 2.49]	**1.85 [1.48, 2.32]**	1.20 [0.54, 2.66]	0.65 [0.29, 1.45]
Current Alcohol Use: Yes (ref: No)	0.92 [0.71, 1.20]	0.99 [0.77, 1.28]	0.59 [0.25, 1.40]	1.08 [0.87, 1.34]	0.64 [0.27, 1.52]	0.59 [0.24, 1.44]
Current Cannabis Use: Yes (ref: No)	0.92 [0.74, 1.14]	1.25 [0.97, 1.60]	2.43 [0.96, 6.17]	**1.36 [1.08, 1.71]**	**2.65 [1.03, 6.83]**	1.95 [0.79, 4.82]
Current Electronic Cigarette Use: Yes (ref: No)	**1.33 [1.04, 1.70]**	1.28 [0.98, 1.67]	0.84 [0.41, 1.71]	0.96 [0.77, 1.19]	0.63 [0.30, 1.31]	0.66 [0.31, 1.41]
Current Cigarette Use: Yes (ref: No)	0.89 [0.64, 1.23]	**1.48 [1.08, 2.03]**	2.23 [0.93, 5.34]	**1.66 [1.29, 2.14]**	**2.51 [1.03, 6.08]**	1.51 [0.64, 3.55]
Ever Illicit Substance Use: Yes (ref: No)	1.28 [0.98, 1.67]	**1.42 [1.08, 1.87]**	0.90 [0.39, 2.11]	1.11 [0.84, 1.47]	0.71 [0.30, 1.67]	0.64 [0.27, 1.52]
Ever Prescription Opiate Misuse: Yes (ref: No)	1.07 [0.85, 1.35]	**1.34 [1.05, 1.72]**	1.46 [0.63, 3.38]	**1.25 [1.02, 1.54]**	1.36 [0.60, 3.11]	1.09 [0.46, 2.56]

[a] Pattern 1: Suicidal thoughts only;

[b] Pattern 2: Suicidal thoughts & suicide plans;

[c] Pattern 3: Suicide attempt with ideation;

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*d*Pattern 4: Suicide attempt without ideation

Note. All demographic, psychosocial, substance use factors entered into multivariable model simultaneously. *AOR:* adjusted odds ratio. 95% CI: 95% confidence interval. Ref: reference group. Bold denotes $p < 0.05$.