



Risk and Protective Factors Associated with Suicidal Thoughts and Behaviors Among Maryland Middle School Students

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Abstract

The aim of this study was to identify independent risk and protective factors associated with self-reported suicidal thoughts and behaviors (STB) among young adolescents by examining self-report data on mental health, substance abuse, violence involvement, social and economic challenges and supports, physical health and demographics in relation to STB. Data from nearly 27,000 students who completed the 2018-19 Maryland Middle School Youth Risk Behavior Survey/Youth Tobacco Survey (YRBS/YTS) were used to identify independent risk and protective factors associated with STB among middle school students (grades 6–8; ages 11-14). Twenty-three percent of students reported lifetime suicidal ideation and nine percent reported lifetime attempt(s). Independent risk factors associated with STB include depression, substance abuse or misuse, violence involvement, bullying victimization at school or electronically, sexual activity, and sleep deprivation. Protective factors include having an adult outside of school to confide in and feeling that teachers care and provide encouragement. Interactive effects by gender and/or race/ethnicity were observed for some factors in relation to STB. These results suggest that evidence-based programs and policies at the universal and selective/indicated levels in school settings are needed and should be introduced earlier on to address the widespread prevalence of STB in young adolescents. Program planners should take into consideration social, cultural and language needs when implementing and developing intervention strategies.

Keywords Suicide, attempted · Prevention · Early adolescence · Middle school · YRBS

Introduction

Implications and contributions

Findings from this study highlight the widespread prevalence of self-reported suicidal thoughts and behaviors (STB) among emerging adolescents, and actionable and modifiable targets for intervention. Coordinated, evidence-based

programs and policies in school settings should be introduced earlier to address the increasing trends of STB in preteens.

Background

Between 1999 and 2019, the suicide death rate increased approximately four-fold among girls ages 10–14 years in the United States and also increased among boys ages 10–14 to a lesser magnitude (Centers for Disease Control & Prevention [CDC], 2021). Further during the COVID-19 pandemic, emergency department visits for suspected suicide attempts began to increase among adolescents aged 12–17 years, especially girls. During February 21–March 20, 2021, suspected suicide attempt emergency department visits were 50.6% higher among girls aged 12–17 years than during the same period in 2019; among boys aged 12–17 years, suspected suicide attempt emergency department visits increased 3.7% (Yard et al., 2021).

Risk and protective factors for suicidal thoughts and behaviors including suicidal ideation and suicide attempt

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(STB) in adolescents are heterogeneous and from multiple domains including demographics such as gender and race/ethnicity (Bridge et al., 2018; Miranda-Mendizabal et al., 2019); depression and hopelessness (King et al., 2013; Okado et al., 2021); substance abuse and impulse control (Miranda-Mendizabal et al., 2019; Nock et al., 2013); violence involvement such as fighting and dating violence (Cheek et al., 2020; Labuhn et al., 2021); peer social issues and connectedness including bullying (Labuhn et al., 2021; Okado et al., 2021), sexual relationships and participation in sports and other extracurricular activities (Cheek et al., 2020; Mata et al., 2012); adult connectedness and stability such as availability of trusted adults at home or school (Pisani et al., 2012); cognitive/neurological factors such as academic performance and adequate sleep (Fitzgerald et al., 2011; Okado et al., 2021); and health and weight management such as being physically active (Sibold et al., 2015). Despite scientific advances, relatively little is known about STB in emerging adolescents (Ayer et al., 2020; Harman et al., 2021; Janiri et al., 2020). To address this gap, the current study uses the CDC's Youth Risk Behavior Surveillance System (YRBSS) Maryland Middle School data to increase our understanding of the factors that could contribute to and provide protection from STB among early adolescents in one ethnically diverse state with high YRBSS participation.

Current Evidence for Understanding Preteen and Early Adolescent STB

The small body of literature on STB among children suggest both the demographic correlates of STB, as well as the risk and protective factors for STB (including individual, family and external factors) might be different from those most salient in adolescence (Ridge Anderson et al., 2016; Sarkar et al., 2010; Sheftall et al., 2016). For example, in 2019 the suicide incidence rate among adolescents aged 12–17 was highest among American Indian/Alaskan Native youth (16.8 deaths per 100,000) followed by White youth (5.8 deaths per 100,000). However, an analysis of suicide decedent data from 2001 through 2015 demonstrated that the suicide rate among those younger than 13 years is approximately 2 times higher for black children compared to white children, a finding observed in boys and girls (Bridge et al., 2018). Further, a study comparing risk factors in child suicide decedents aged 5–11 years with early adolescent suicide decedents aged 12–14 years found that children who died by suicide were more commonly male and Black (relative to White children), more often experienced relationship problems with family members/friends (60.3% vs 46.0%; $P = 0.02$), and less often experienced boyfriend/girlfriend problems (0% vs 16.0%; $P < 0.001$). Among suicide decedents with known mental health problems, childhood decedents more often experienced attention-deficit disorder with

or without hyperactivity (59.3% vs 29.0%; $P = 0.002$) and less often experienced depression/dysthymia (33.3% vs 65.6%; $P = 0.001$) compared with early adolescent decedents (Sheftall et al., 2016).

Two recent studies examined correlates of STB in a U.S. population-based study of older children ages 10 and 11 participating in the Adolescent Brain and Cognitive Development (ABCD) study (DeVillie et al., 2020; Janiri et al., 2020). After covarying by sex, family history, internalizing and externalizing problems, and relevant psychosocial variables, the authors of the first study (DeVillie et al., 2020) found that high family conflict was significantly associated with suicidal ideation (odds ratio [OR], 1.12; 95% CI, 1.07–1.16), and low parental monitoring was significantly associated with ideation (OR, 0.97; 95% CI, 0.95–0.98) and attempts (OR, 0.91; 95% CI, 0.86–0.97). Since the proportions of suicidal plans and attempts were low, the authors of the second study grouped them together with suicidal ideation to create an overall outcome metric of STB referred to as “suicidality”. Their analysis found child psychopathology [i.e., distress, disruptive or impulsive behavior] (OR 1.7–4.8, 95% CI 1.5–7.4) and child-reported family conflict (OR 1.4–1.8, 95% CI 1.1–2.5) were the most robust risk factors for STB. The risk of child-reported STB increased with higher weekend screen use time (OR 1.3, 95% CI 1.2–1.7). In contrast, children reporting higher levels of parental supervision and positive school involvement (for both OR 0.8, 95% CI 0.7–0.9) were less likely to report STB (Janiri et al., 2020).

Theoretical Frameworks

Although rigorously tested theoretical frameworks for child and early adolescent STB are lacking, the application of well-reasoned frameworks can be useful for designing robust studies (Ayer et al., 2020). Modern theoretical models of suicide (Joiner, 2005; Klonsky & May, 2015; O'Connor, 2011) reflect ‘ideation to action’ frameworks which posit that the development of suicidal ideation and progression from ideation to attempt are distinct processes with distinct explanations. Within this framework, a core facilitator of the transition from suicidal thoughts to suicide attempt is the individual’s capacity for suicide. This is defined as the combination of contributing factors that enable an individual to make an attempt to end their life (May & Victor, 2018). This distinction is important as the majority of individuals who experience suicidal ideation do not necessarily make the progression to suicide attempt (May & Klonsky, 2016).

Study Purpose and Aims

The authors of a meta-analysis of suicide risk factors concluded that one of the limitations of prior predictive models was that they incorporated too few factors simultaneously

and did not allow for complex interactive effects (Franklin et al., 2017). To address these gaps and also contribute to the emerging body of evidence for understanding STB in early adolescence, the current study leverages data from a recent, large validated survey of Maryland middle school students with robust racial, cultural and economic diversity to explore a wide range of risk and protective factors and interactive effects for suicidal ideation and suicide attempt among young adolescents based on the current evidence surrounding childhood and adolescent STB (Flores et al., 2020; Hawton et al., 2013; Hawton & Van Heeringen, 2009; Miranda-Mendizabal et al., 2019; Nock et al., 2013; Ridge et al., 2016; Saffer et al., 2014; Sheftall et al., 2016).

Study aims are 1) identify differentiators between adolescents with suicidal ideation and those without ideation in the general Maryland middle school population; 2) identify differentiators between adolescents who attempt and those who do not attempt in the general Maryland middle school population; and 3) identify differentiators between adolescents who report suicidal ideation and attempt, and those who report ideation and do not attempt. Additionally, given variation observed by gender and race/ethnicity in STB outcomes and observed risk factors, interactive effects between gender, as well as race and ethnicity and other variables are also explored. We hypothesized, based on the existing literature on preteen STB, that differentiators of students who escalate to suicide attempts would include age, race/ethnicity, peer and adult connectedness, as well as markers of psychopathology and impulse control such as fighting and substance abuse (Bridge et al., 2018; DeVille et al., 2020; Janiri et al., 2020; Sheftall et al., 2016). Based on learnings from our analysis, we suggest actionable recommendations for educators and policymakers to prevent and intervene with STB during this critical development stage.

Methods

Study Population

Data for this study come from the 2018–2019 academic year administration of the combined Maryland Middle School Youth Risk Behavior Survey and Youth Tobacco Survey [YRBS/YTS] (Maryland Department of Health, 2018a). The Maryland Department of Health (MDH) and the Maryland State Department of Education (MSDE) collaboratively administer this self-report survey biennially in the fall to students in grades 6–8 (ages 11–14). It includes questions about suicidal ideation and attempt(s), and other health risk characteristics and behaviors.

To produce a representative sample of 6th–8th grade students attending Maryland public and charter middle schools, a two-stage cluster sample design is utilized. For 2018, a

sample of 27,299 students was surveyed. The school response rate was 99%, and the student response rate was 84%, yielding an overall response rate of 83% (Maryland Department of Health, 2018b). Since the Maryland YRBS/YTS results are anonymous, publicly available data, this study is exempt from institutional review board approval by the Maryland Department of Health and Mental Hygiene IRB committee.

Identification of Sub-population Cohorts

Students were classified into two primary cohorts for this study: 1) The overall middle school student population and 2) students who reported a history of suicidal ideation. In addition, descriptive frequencies are reported for the cohort of students who reported a history of suicide attempt in Table 1.

Outcome Definitions

Students were identified as having suicidal ideation if they responded affirmatively to the question “Have you ever seriously thought about killing yourself?” Students who responded affirmatively to the question “Have you ever tried to kill yourself?” were identified as having made a suicide attempt.

Selection of Independent Variables

Variables that were either known or hypothesized to be related to suicide-related behaviors based on the review of current evidence were selected from the survey questions, and grouped into eight domains: Demographics, substance abuse, violence involvement, peer relations, adult connectedness and stability, academic performance and cognitive/neurological factors and health and weight management. An additional question about having experienced past-year sadness and hopelessness that lasted 2 weeks or longer, a key depression symptom (Kroenke et al., 2001) was also selected. In some instances, variables that shared similarities were combined to better describe the severity of the behavior. Specifically, current tobacco, vape, marijuana or alcohol use were combined into a three-level current drug use variable, and fighting was analyzed separately and then in conjunction with carrying a weapon.

Statistical Methods

SAS 9.4 was used to generate frequencies of the independent variables from the eight domains, as well as frequencies of suicidal ideation, planning and attempt for overall middle school, suicidal ideation and suicide attempt cohorts of students. To account for YRBS’s stratified cluster survey design

Table 1 Sociodemographic and Risk Characteristics of 2018 Maryland Middle School YRBS/YTS Respondents by Suicide-Related Behaviors

Variable	All Middle School Student Survey Respondents			Students Who Ever Seriously Thought About Killing Self (Ideation)			Students Who Ever Tried to Kill Self (Attempt)		
	Total (N=26,875)	Male (N=13,607)	Female (N=13,268)	Total (N=5872)	Male (N=2260)	Female (N=3612)	Total (N=2202)	Male (N=813)	Female (N=1389)
WEIGHTED %									
<i>Suicidal thoughts & behaviors</i>									
Ever seriously thought about killing self (ideation)	23	18	28	100	100	100	88	83	91
Ever made a plan about how they would kill themselves	14	11	18	51	47	54	72	68	75
Ever tried to kill self (attempt)	9	7	11	34	31	36	100	100	100
<i>Demographics</i>									
Female	49	0	100	60	0	100	61	0	100
<i>Grade*</i>									
6th	33	33	33	27	31	25	27	29	25
7th	34	34	34	34	33	34	32	32	33
8th	34	33	34	39	36	41	41	40	42
<i>Race / Ethnicity</i>									
White	38	39	38	30	30	30	23	25	22
Black or African American	33	33	33	40	41	39	43	46	40
Hispanic/Latino	16	16	17	18	17	19	22	20	24
Asian	6	7	6	6	6	5	5	4	5
Multiple-Non-Hispanic	4	4	5	5	4	6	6	3	7
Am Indian/Alaskan Native	1	2	1	1	1	1	1	1	1
Native Hawaiian/ Other PI	<1	<1	1	1	1	1	1	1	1
Past year prolonged sadness/hopelessness (depression symptom)	25	19	31	62	54	68	72	60	80
<i>Substance abuse</i>									
Currently use one common*** illicit drug	9	9	9	15	13	16	17	17	17
Currently use two or more common illicit drugs	5	5	5	10	11	10	18	19	18
Ever used inhalants	5	5	6	11	11	11	15	15	16
Ever misused prescription pain medication	7	6	8	13	12	14	19	15	21
<i>Violence involvement</i>									
Ever in a physical fight only	31	36	26	36	37	36	36	34	38

Table 1 (continued)

Variable	All Middle School Student Survey Respondents			Students Who Ever Seriously Thought About Killing Self (Ideation)			Students Who Ever Tried to Kill Self (Attempt)		
	Total (N=26,875)	Male (N=13,607)	Female (N=13,268)	Total (N=5872)	Male (N=2260)	Female (N=3612)	Total (N=2202)	Male (N=813)	Female (N=1389)
Ever in a physical fight & have carried a weapon such as a gun, knife or club	15	22	8	26	38	18	33	46	25
Ever physically hurt on purpose by anyone they ever dated or went out with (among dating & non-dating)	5	6	5	9	9	8	13	13	13
<i>Peer social issues & connectedness</i>									
Ever bullied at school	39	34	44	59	54	62	63	58	66
Ever electronically bullied	18	14	23	35	28	39	41	30	48
Ever had sexual intercourse	6	9	3	11	18	7	17	23	12
Participate in any extracurricular activities at school	60	57	63	59	58	59	57	56	58
Play on at least one sports team	58	61	54	50	55	47	49	53	46
<i>Adult connectedness & stability</i>									
Have an adult outside of school they can talk to about things that are important to them	86	87	85	76	79	75	72	77	68
Strongly agree or agree that their teachers really care about them and give them a lot of encouragement	60	63	57	47	53	42	43	52	37
Talked to a teacher or other adult in their school about a personal problem they had	31	29	33	39	38	39	40	39	42
Ever slept away because kicked out, ran away or abandoned	3	3	2	5	6	4	7	9	6
Experienced food Insecurity in past year	15	15	16	25	22	26	30	27	31
<i>Academic performance & cognitive/neurological factors</i>									

Table 1 (continued)

Variable	All Middle School Student Survey Respondents			Students Who Ever Seriously Thought About Killing Self (Ideation)			Students Who Ever Tried to Kill Self (Attempt)		
	Total (N=26,875)	Male (N=13,607)	Female (N=13,268)	Total (N=5872)	Male (N=2260)	Female (N=3612)	Total (N=2202)	Male (N=813)	Female (N=1389)
Made mostly A's or B's in school	82	79	85	76	71	79	69	65	71
Get 8 h or more of sleep per night	56	57	55	41	45	38	38	43	36
Had 4 or fewer hours of sleep per night	6	6	6	11	11	11	15	15	15
Ever had a concussion from playing a sport or being physically active	16	19	14	20	25	17	24	28	21
<i>Health & weight management</i>									
Described themselves as slightly or very overweight	25	24	26	33	28	36	32	30	34
Were trying to lose weight	42	37	48	53	41	61	54	45	61
Were physically active at least 60 min per day on 5 or more days	51	56	46	42	50	37	41	51	35
Played video or computer games or used a computer 3 or more hours per day	54	55	54	64	64	64	66	65	66

*Other or Ungraded omitted from analysis

**Includes current use of any tobacco products, vaping, marijuana, or alcohol

and sample weights, the PROC SURVEYFREQ command was used.

Using the PROC SURVEYLOGISTIC procedure in SAS 9.4, minimally adjusted logistic regression models, adjusted only for gender, grade and race/ethnicity (i.e., “demographic adjusted bivariate associations”), were used to assess the statistical significance of the relationship between each independent variable and the outcomes of reported history of suicidal ideation and reported history of suicide attempt in the overall student cohort, as well as the relationship between each independent variable and suicide attempt in the cohort of students with a history of suicidal ideation. Variables that were found to have significant ($p \leq 0.05$ level) odds ratios in relation to the outcome were analyzed in larger models adjusted for demographics and each domain one at a time. Tests for interaction between gender and/or race/ethnicity in relation to the other variables were conducted during this step given race and sex are conceptualized in the literature as key modifiers and that results from descriptive frequencies were indicative of possible gender-and race/ethnicity-driven

interactions. For race/ethnicity, a 5-level categorical variable for each race/ethnicity grouping (i.e., White, Black, Hispanic, Asian, Other) was paired with each of the other variables to test for interactive effects. When evidence for interaction was apparent using the 5-level variable, subsequent testing was conducted for individual race/ethnicity categories (e.g., White vs non-White, Black vs non-Black) to better describe how specific race/ethnicity groups were impacted.

Full logistic regression models for suicidal ideation and attempt were constructed using demographics and independent variables significant in both minimally adjusted and larger domain-specific models. Interaction terms that were significant in the domain-specific models were added to the full regression models using a manual forward stepwise approach based on their level of significance. Only interaction terms that remained significant when added to the full model were retained.

Missingness ranged from 1 to 15% for the analysis variables. Missing data were imputed using the SAS 9.4 PROC

SURVEYIMPUTE procedure. Multiple imputation ($N=5$ imputations) was accomplished by using approximate Bayesian bootstrap imputation (ABB) in conjunction with hot deck. Imputed data were then analyzed using the PROC SURVEYFREQ or PROC SURVEYLOGISTIC procedures, followed by the MIANALYZE procedure.

Results

Sample characteristics

Table 1 describes sociodemographic and risk characteristics of 2018 Maryland Middle School YRBS/YTS respondents by suicide-related behaviors with combined and gender-specific weighted frequencies presented. Among middle school students in the sample, 23% reported having experienced suicidal ideation, 14% reported having made a plan, and 9% reported having attempted. Past year prolonged sadness and hopelessness was observed in 25% of the overall middle school cohort, 62% of the suicidal ideation cohort and 72% of the suicide attempt cohort.

Risk and Protective Factors Associated with STB Among All MD Middle School Students

Results from the final full logistic regression model describing the relationship between associated risk and protective factors in relation to reported suicidal ideation and attempt, including multiplicative interactive effects, are presented in Tables 2 and 3. Past year prolonged sadness and hopelessness had the largest association with suicidal ideation and attempt of all the indicators, with odds ratios of 5.8 (CI 5.2–6.4) and 5.0 (CI 4.2–5.8), respectively.

Females had higher odds of reporting STB relative to males. Relative to their White peers, students from other racial and ethnic groups had modestly higher odds of ideation, and a notably elevated odds of attempt. Although younger students appeared to be less likely to report ideation and attempt compared to older students in the minimally adjusted models¹, this difference diminished after adjusting for other risk and protective factors in the full model.

All variables for substance misuse were associated with STB. Of note, while there was not a significant difference in suicidal ideation between students who reported current use of one illicit drug (OR 1.4, CI 1.2–1.7) and students who reported current use of two or more illicit drugs (OR 1.6, CI 1.3–1.9), a notable increase in odds of reported attempt was observed between students reporting use of one illicit drug (OR 1.4, CI 1.2–1.7) and those reporting two or more (OR 2.7, 2.1–3.6).

Modest increased odds for ideation and attempt were noted among students who reported ever having been in a

physical fight relative to those who had not been in a fight. However, when fighting was paired with carrying a weapon, the odds ratios of both ideation and attempt increased substantially (OR_{ideation} 1.9, CI 1.6–2.2; OR_{attempt} 1.8, 1.5–2.3). Reporting a history of dating violence was not significantly associated with an increased odds of ideation, but was associated with an increased odds of attempt.

Having been bullied at school or cyberbullied were both significantly associated with elevated odds of self-reported STB, as was history of sexual intercourse. Interaction by gender was observed for sexual intercourse and suicide attempt, with odds ratios significantly greater for females compared to males (OR_{Female} 2.2, CI 1.6–3.1; OR_{Male} 1.4, CI 1.1–1.7). Team sport participation was found to have a modest protective association in relation to suicide ideation, but not attempt. Since extra-curricular activity participation was non-significant in the small and medium-sized models, it was not included in the full model.

Adult connectedness and stability emerged as an important domain in relation to STB in these analyses. Having an adult outside of school to confide in was associated with lower odds of suicidal ideation (OR 0.7, CI 0.6–0.8) for the overall middle school cohort, and was associated with lower odds of suicide attempt for females (OR 0.6, CI 0.5–0.7), but not for males (OR 0.9, CI 1.7–1.2; p -value_{interaction} 0.035). Students who agreed that their teachers really care about them and offered them encouragement were also less likely to report ideation (OR_{non-Black} 0.7, CI 0.6–0.8) with the exception of Black students, where no significant difference was observed (OR_{Black} 0.9, CI 0.8–1.2; p -value_{interaction} 0.043). Feeling that teachers care and offer encouragement had a modest protective association for non-Asian students in relation to attempt (OR_{non-Asian} 0.8, CI 0.7–1.0) and, among students who didn't agree or were unsure that teachers care and offer encouragement, the odds of attempt were markedly higher for Asian students relative to their peers (OR_{Disagree} 2.5, CI 1.7–3.8; p -value_{interaction} 0.008) suggesting that lack of teacher approval and support co-occurs with STB for these students. Notably, students that reported having talked to a teacher or other adult in their school about a personal problem in the prior 12 months had somewhat higher odds of ideation relative to their peers. Students that had slept away from their parents or guardians because they had been kicked out, ran away or abandoned and students that have experienced past year food insecurity also had higher odds of STB.

In terms of academic performance and other cognitive/neurological factors, getting good grades was associated with lower odds of suicide attempt only, sleep deprivation (having 4 or fewer hours of sleep per night) was associated with an elevated odds for both ideation and attempt, and history of concussion was not significantly associated with either outcome.

Table 2 Among All Maryland Middle School Students*, Coefficients & Odds Ratios of Suicide Ideation vs NO Ideation, and Attempt VS NO Attempt

Independent Variable	Suicide Ideation as Outcome				Suicide Attempt as Outcome					
	β	SE β	t value	P value	OR (95% CI)	β	SE β	t value	P value	OR (95% CI)
Constant	-2.6019	0.1390	-18.72	<.001		-4.3219	0.2293	-18.85	<.001	
Female	0.2347	0.0766	3.07	0.002	1.3 (1.1-1.5)†	0.5830	0.1636	3.56	<.001	1.8 (1.3-2.5)†
RACE/ETH Black/African American vs White	0.2411	0.0933	2.58	0.010	1.3 (1.1-1.5)†	0.7433	0.1015	7.32	<.001	2.1 (1.7-2.6)
RACE/ETH Hispanic/Latino vs White	0.1778	0.0734	2.42	0.016	1.2 (1.0-1.4)	0.6691	0.1097	6.10	<.001	2.0 (1.6-2.4)
RACE/ETH Asian vs White	0.3924	0.1278	3.07	0.003	1.5 (1.1-1.9)	0.9255	0.2151	4.30	<.001	2.5 (1.7-3.8)†
RACE/ETH Other [‡] vs White	0.1664	0.0793	2.10	0.038	1.2 (1.0-1.4)	0.5287	0.1278	4.14	<.001	1.7 (1.3-2.2)
GRADE 7th vs 6th	0.0691	0.0610	1.13	0.257	1.1 (1.0-1.2)	-0.0613	0.1067	-0.57	0.566	0.9 (0.8-1.2)
GRADE 8th vs 6th	0.1049	0.0678	1.55	0.122	1.1 (1.0-1.3)	-0.0002	0.1232	0.00	0.999	1.0 (0.8-1.3)
Past year prolonged sadness/hopelessness	1.7532	0.0540	32.50	<.001	5.8 (5.2-6.4)	1.6001	0.0823	19.44	<.001	5.0 (4.2-5.8)
<i>Substance misuse</i>										
Currently use one common† illicit drug	0.3263	0.0921	3.55	<.001	1.4 (1.2-1.7)	0.3540	0.1010	3.50	0.001	1.4 (1.2-1.7)
Currently use two or more common illicit drugs	0.4712	0.0977	4.82	<.001	1.6 (1.3-1.9)	1.0036	0.1348	7.44	<.001	2.7 (2.1-3.6)
Ever used inhalants	0.3870	0.0927	4.17	<.001	1.5 (1.2-1.8)	0.4009	0.1035	3.87	0.000	1.5 (1.2-1.8)
Ever misused prescription pain medication	0.2354	0.0918	2.56	0.010	1.3 (1.1-1.5)	0.2743	0.1181	2.32	0.020	1.3 (1.0-1.7)
<i>Violence involvement</i>										
Were ever in a physical fight only	0.2860	0.0602	4.75	<.001	1.3 (1.2-1.5)	0.2385	0.1080	2.21	0.027	1.3 (1.0-1.6)
Were ever in a physical fight & have carried a weapon such as a gun, knife or club	0.6450	0.0830	7.77	<.001	1.9 (1.6-2.2)	0.6053	0.1072	5.65	<.001	1.8 (1.5-2.3)
Ever physically hurt on purpose by anyone they ever dated or went out with (among dating & non-dating)	0.1522	0.1082	1.41	0.160	1.2 (0.9-1.4)	0.4133	0.1287	3.21	0.001	1.5 (1.2-1.9)
<i>Peer social issues & connectedness</i>										
Ever bullied at school	0.5911	0.0611	9.68	<.001	1.8 (1.6-2.0)	0.5585	0.0801	6.97	<.001	1.7 (1.5-2.0)
Ever electronically bullied	0.4593	0.0585	7.85	<.001	1.6 (1.4-1.8)	0.4633	0.0741	6.25	<.001	1.6 (1.4-1.8)
Ever had sexual intercourse	0.3942	0.0976	4.04	<.001	1.5 (1.2-1.8)	0.3068	0.1250	2.45	0.014	1.4 (1.1-1.7)†
Play on at least one sports team	-0.1594	0.0562	-2.84	0.005	0.9 (0.8-1.0)	-0.1415	0.0900	-1.57	0.117	0.9 (0.7-1.0)

Table 2 (continued)

Independent Variable	Suicide Ideation as Outcome				Suicide Attempt as Outcome					
	β	SE β	t value	P value	OR (95% CI)	β	SE β	t value	P value	OR (95% CI)
<i>Adult connectedness & stability</i>										
Have an adult outside of school they can talk to about things that are important to them	-0.3590	0.0643	-5.58	<.001	0.7 (0.6-0.8)	-0.0798	0.1510	-0.53	0.599	0.9 (0.7-1.2) [†]
Strongly agree or agree that their teachers really care about them and give them a lot of encouragement	-0.3446	0.0653	-5.28	<.001	0.7 (0.6-0.8) [†]	-0.1732	0.0904	-1.91	0.063	0.8 (0.7-1.0) [†]
Talked to a teacher or other adult in their school about a personal problem they had	0.1925	0.0613	3.14	0.004	1.2 (1.1-1.4)	0.1266	0.0849	1.49	0.137	1.1 (1.0-1.3)
Ever slept away because kicked out, ran away or abandoned	0.2995	0.1679	1.78	0.075	1.3 (1.0-1.9)	0.4093	0.1782	2.30	0.022	1.5 (1.1-2.1)
Experienced food insecurity in past year	0.1737	0.0697	2.49	0.013	1.2 (1.0-1.4)	0.1899	0.0931	2.04	0.042	1.2 (1.0-1.5)
<i>Academic performance & cognitive/neurological factors</i>										
Made mostly A's or B's in school	-0.0341	0.0611	-0.56	0.577	1.0 (0.9-1.1)	-0.2969	0.1095	-2.71	0.007	0.7 (0.6-0.9)
Had 4 or fewer hours of sleep per night	0.3457	0.0915	3.78	<.001	1.4 (1.2-1.7)	0.4388	0.1016	4.32	<.001	1.6 (1.3-1.9)
Ever had a concussion from playing a sport or being physically active	-0.0201	0.0564	-0.36	0.722	1.0 (0.9-1.1)	0.0377	0.0778	0.48	0.629	1.0 (0.9-1.2)
<i>Health & weight management</i>										
Described themselves as slightly or very overweight	0.2130	0.0800	2.66	0.008	1.2 (1.1-1.4)	§				§
Were trying to lose weight	-0.1442	0.0836	-1.73	0.085	0.9 (0.7-1.0) [†]	0.0805	0.0767	1.05	0.294	1.1 (0.9-1.3)
Were physically active at least 60 min per day on 5 or more days	-0.1718	0.0558	-3.08	0.003	0.8 (0.8-0.9)	-0.1089	0.0772	-1.41	0.160	0.9 (0.8-1.0)
Watched television or played video/computer games 3 or more hours per day	0.1617	0.0491	3.29	0.001	1.2 (1.1-1.3)	0.1010	0.0837	1.21	0.230	1.1 (0.9-1.3)

Table 2 (continued)

Independent Variable	Suicide Ideation as Outcome				Suicide Attempt as Outcome					
	β	SE β	t value	P value	OR (95% CI)	β	SE β	t value	P value	OR (95% CI)
<i>Multiplicative interaction variables</i>										
Female * Were trying to lose weight	0.3876	0.1226	3.16	0.002	1.5 (1.2 – 1.9) [†]	–	–	–	–	–
Female * Ever had sexual intercourse			–			0.4888	0.2324	2.10	0.037	1.6 (1.0 – 2.7) [†]
Female * Have an adult outside of school they can talk to about things that are important to them			–			–0.3933	0.1826	–2.15	0.035	0.7 (0.5 – 1.0) [†]
Black/African American * Strongly agree or agree that their teachers really care about them and give them a lot of encouragement	0.2840	0.1399	2.03	0.043	1.3 (1.0 – 1.7) [†]					
Asian * Strongly agree or agree that their teachers really care about them and give them a lot of encouragement						–0.9213	0.3483	–2.65	0.008	0.4 (0.2 – 0.8) [†]

Statistically significant values are given in bold ($P \leq 0.05$)

* Sample size for final model: $N = 26,875$

[†] Interaction (IXN) present. See Table 3 for ORs & 95% CIs

[‡] Multiple Non-Hispanic, American Indian/Alaskan Native and Native Hawaiian/Other Pacific Islander racial and ethnic groups aggregated for regression analysis to allow for adequate sample size

[§] Only parameters meeting criteria for final model (i.e., significant association with outcome in both small and mid-sized models) are shown

Table 3 Interactions on Risk of STB Among Maryland Middle School Students

Gender * Trying to lose weight with suicide ideation as outcome			
	Not trying to lose weight	Trying to lose weight	OR for trying to lose weight vs. not, for males and females
Males	1.0 (REF)	0.9 (0.7–1.0)	0.9 (0.7–1.0)
Females	1.3 (1.1–1.5)	1.6 (1.4–1.9)	1.3 (1.1–1.5)
OR for females vs. males, for no and yes responses to “trying to lose weight?”	1.3 (1.1–1.5)	1.9 (1.6–2.2)	
Measure of interaction (multiplicative scale): OR = 1.5 (1.2–1.9), <i>p</i> = 0.002			
Black race * Agree teachers care and provide encouragement with suicide ideation as outcome			
	Disagree/unsure that teachers care & provide encouragement	Agree that teachers care & provide encouragement	OR for agreeing that teachers care vs. disagree/unsure, for non-Black and Black
Non-Black	1.0 (REF)	0.7 (0.6–0.8)	0.7 (0.6–0.8)
Black	1.3 (1.1–1.5)	1.2 (1.0–1.4)	0.9 (0.8–1.2)
OR for Black vs. non-Black, for don’t agree/unsure vs. agree that “teachers care and provide encouragement?”	1.3 (1.1–1.5)	1.7 (1.4–2.0)	
Measure of interaction (multiplicative scale): OR = 1.3 (1.0–1.7), <i>p</i> = 0.043			
Gender * History of sexual intercourse with suicide attempt as outcome			
	Never had sexual intercourse	Ever had sexual intercourse	OR for having had sexual intercourse vs. not, for males and females
Males	1.0 (REF)	1.4 (1.1–1.7)	1.4 (1.1–1.7)
Females	1.5 (1.2–1.8)	3.3 (2.3–4.6)	2.2 (1.6–3.1)
OR for females vs. males, for no and yes responses to “ever had sexual intercourse?”	1.5 (1.2–1.8)	2.4 (1.6–3.6)	
Measure of interaction (multiplicative scale): OR = 1.6 (1.0–2.7), <i>p</i> = 0.037			
Gender * Adult outside of school to talk to with suicide attempt as outcome			
	No Adult Outside of School	Adult Outside of School	OR for adult vs no adult, for males and females
Males	1.0 (REF)	0.9 (0.7–1.2)	0.9 (0.7–1.2)
Females	2.3 (1.7–3.1)	1.4 (1.1–1.9)	0.6 (0.5–0.7)
OR for females vs. males, for no adult and adult	2.3 (1.7–3.1)	1.5 (1.2–2.0)	
Measure of interaction (multiplicative scale): OR = 0.7 (0.5–1.0), <i>p</i> = 0.035			
Asian race * Agree teachers care and provide encouragement with suicide attempt as outcome			
	Disagree/unsure that teachers care & provide encouragement	Agree that teachers care & provide encouragement	OR for agreeing that teachers care vs. disagree/unsure, for non-Asian and Asian
Non-Asian	1.0 (REF)	0.8 (0.7–1.0)	0.8 (0.7–1.0)
Asian	2.5 (1.7– 3.8)	0.8 (0.5–1.5)	0.3 (0.2–0.6)
OR for Asian vs. non-Asian, for don’t agree/unsure vs. agree that “teachers care and provide encouragement?”	2.5 (1.7- 3.8)	1.0 (0.6–1.8)	
Measure of interaction (multiplicative scale): OR = 0.4 (0.2–0.8), <i>p</i> = 0.008			

Statistically significant values are given in bold (*P* ≤ 0.05)

Among the health and weight management variables, regular physical activity had a modest protective association with suicidal ideation whereas describing oneself as slightly or very overweight, watching television or playing

video/computer games for more than three hours per day were associated with a modest increase in odds of ideation. Trying to lose weight was significantly associated with greater odds of ideation for females only (OR 1.3, CI 1.1

– 1.5; p -value_{interaction} 0.002). None of the health and weight management variables were significantly associated with attempt.

Risk and Protective Factors Associated with Attempt Among MD Middle School Students with Suicidal Ideation

Results from the final regression model evaluating the association between the selected indicators and suicide attempt among students with ideation are presented in Tables 4 and 5. Results from this model share similarities with the model evaluating factors associated with suicide attempt for the entire middle school population, except that the magnitude of association is either smaller or no longer significant for many of the variables. A key notable difference between the two models is that the magnitude of past-year prolonged sadness and hopelessness in relation to a history of suicidal attempt is significantly lower in the ideation-only cohort (OR 1.9, CI 1.7 – 2.3) and is surpassed by multi-drug use (OR 2.3, CI 1.8 – 3.0) in magnitude of association with suicide attempt.

Discussion

STB are prevalent among middle school students, as was evidenced by 23% of students reporting having ever experienced suicidal ideation and 9% of students reporting having ever experienced attempt(s) in this large, representative sample of Maryland middle school students. For many students in the general middle school population, having an adult outside of school to confide in and feeling that teachers care and provide encouragement was associated with lower odds of ideation and attempt. For females in particular, having an adult outside of school to confide in had a robust protective association for attempt. These findings are consistent with other studies demonstrating the positive impact of family and school support in mitigating STB for adolescents (Lensch et al., 2021; Miller et al., 2015; Reed et al., 2016), including the aforementioned studies of STB in older children by Janiri and colleagues (2020) and Deville and colleagues (2020). They also corroborate findings by Logan and colleagues (2011) regarding the particularly protective association parental connectedness has for early adolescent females.

Past year prolonged sadness and hopelessness was the most salient risk factor associated with a history of suicide ideation and attempt in the general middle school population and, among students reporting a history of suicide ideation, was significantly associated with higher odds of suicide attempt. Illicit drug use was another notable risk correlate of suicide attempt in the general middle school

population, and multiple-drug use was the most pronounced risk correlate for suicide attempt among students reporting a history of suicide ideation. Drug use can cause an array of cognitive, physical, social and academic challenges that may in turn lead to increased risk for STB including decreased executive function, increased impulsivity and risk-taking behavior, poor relations with family and peers, accidental injury and overdose, poor grades and absenteeism, and involvement with the juvenile justice system (Gakh et al., 2019; Hamidullah et al., 2020; Schulte & Hser, 2014; Wang & Yen, 2017).

Ethnic and racial minoritized student status was another leading indicator associated with attempt in both the general middle school population and the cohort of students reporting suicidal ideation. Racial and ethnic groups differ in their access to culturally appropriate healthcare, experiences of discrimination and historical trauma, familial and societal expectations, and other factors that might be related to suicide risk (Cauce et al., 2002; Goldston et al., 2008; Joe et al., 2008). For example, perceived racism and discrimination have been found to be associated with depression, increased substance use and hopelessness among African American youths (Brody et al., 2006; Nyborg & Curry, 2003; Walker et al., 2017). Additionally, immigrant youth and/or children of immigrants may experience a variety of stressors including language and acculturation challenges, trauma from civil unrest in their countries of origin or from the immigration process itself, lack of familiarity or distrust of the healthcare system and fear of deportation or other legal intervention (Costigan & Dokis, 2006; Goldston et al., 2008; Hinton & Otto, 2006).

In the present study, significant interaction was observed among Asian students with feeling like teachers care and offer support and reported suicide attempt(s) in the general high school population and ideation cohort: Asian students in the ideation cohort who reported disagreeing or being unsure that teachers care and offer support had a two-fold odds of attempt relative to their non-Asian peers, and within the Asian student population, feeling that teachers care and offer support had a highly protective association. In a study of young adults from eight Asian Communities in Maryland, pressure to meet parental expectations of high academic achievement and live up to the “model minority” stereotype were identified as key sources of stress (Lee et al., 2009). It’s plausible that similar expectations held among Asian middle school students is driving the robust association with teacher approval and reported suicide attempt(s).

Interestingly, feeling that teachers care and offer support was not significantly associated with reported suicidal ideation in Black students in the general student population. Although more in-depth qualitative interviews with students would be ideal in the future to better understand this finding, one interpretation could be a lack of meaningful connections

Table 4 Among Maryland Middle School Students* Reporting Suicidal Ideation, Coefficients & Odds Ratios of Suicide Attempt VS NO Attempt

Independent Variable	β	SE $_{\beta}$	<i>t</i> value	<i>P</i> value	OR (95% CI)
Constant	-1.89332	0.18866	-10.04	<.001	
Female	0.14109	0.10483	1.35	0.178	1.2 (0.9–1.4) †
RACE/ETH Black/African American vs White	0.59004	0.11048	5.34	<.001	1.8 (1.5–2.2)
RACE/ETH Hispanic/Latino vs White	0.51714	0.12492	4.14	<.001	1.7 (1.3–2.1)
RACE/ETH Asian vs White	0.72334	0.22630	3.20	0.001	2.1 (1.3–3.2) †
RACE/ETH Other‡ vs White	0.47978	0.14683	3.27	0.001	1.6 (1.2–2.2)
GRADE 7th vs 6th	-0.06068	0.12575	-0.48	0.629	0.9 (0.7–1.2)
GRADE 8th vs 6th	0.02261	0.12753	0.18	0.859	1.0 (0.8–1.3)
Past year prolonged sadness/hopelessness	0.66400	0.08246	8.05	<.001	1.9 (1.7–2.3)
<i>Substance misuse</i>					
Currently use one common‡ illicit drug	0.32298	0.11084	2.91	0.004	1.4 (1.1–1.7)
Currently use two or more common illicit drugs	0.85181	0.13193	6.46	<.001	2.3 (1.8–3.0)
Ever used inhalants	0.23284	0.10863	2.14	0.032	1.3 (1.0–1.6)
Ever misused prescription pain medication	0.22360	0.11595	1.93	0.055	1.3 (1.0–1.6)
<i>Violence involvement</i>					
Were ever in a physical fight only	0.16820	0.11250	1.50	0.135	1.2 (0.9–1.5)
Were ever in a physical fight & have carried a weapon such as a gun, knife or club	0.34846	0.11368	3.07	0.002	1.4 (1.1–1.8)
Ever physically hurt on purpose by anyone they ever dated or went out with (among dating & non-dating)	0.33590	0.14274	2.35	0.019	1.4 (1.1–1.9)
<i>Peer social issues & connectedness</i>					
Ever bullied at school	0.19762	0.08337	2.37	0.018	1.2 (1.0–1.4)
Ever electronically bullied	0.33451	0.08317	4.02	<.001	1.4 (1.2–1.6)
Ever had sexual intercourse	0.13499	0.15010	0.90	0.369	1.1 (0.9–1.5) †
<i>Adult connectedness & stability</i>					
Have an adult outside of school they can talk to about things that are important to them	-0.23520	0.08254	-2.85	0.004	0.8 (0.7–0.9)
Strongly agree or agree that their teachers really care about them and give them a lot of encouragement	-0.09603	0.08579	-1.12	0.267	0.9 (0.8–1.1) †
Talked to a teacher or other adult in their school about a personal problem they had	0.12005	0.08828	1.36	0.174	1.1 (0.9–1.3)
Ever slept away because kicked out, ran away or abandoned	0.35314	0.16730	2.11	0.035	1.4 (1.0–2.0)
Experienced food Insecurity in past year	0.07505	0.10921	0.69	0.492	1.1 (0.9–1.3)
<i>Academic performance & cognitive/neurological factors</i>					
Made mostly A's or B's in school	-0.37075	0.11912	-3.11	0.002	0.7 (0.5–0.9)
Had 4 or fewer hours of sleep per night	0.30416	0.11992	2.54	0.011	1.4 (1.1–1.7)
Ever had a concussion from playing a sport or being physically active	0.04053	0.08975	0.45	0.652	1.0 (0.9–1.2)
<i>Multiplicative interaction variables</i>					
Female * Ever had sexual intercourse	0.47432	0.23269	2.04	0.042	1.6 (1.0–2.5) †
Asian * Strongly agree or agree that their teachers really care about them and give them a lot of encouragement	-0.91718	0.40289	-2.28	0.023	0.4 (0.2–0.9) †

Statistically significant values are given in bold ($P \leq 0.05$)

*Sample size for final model: $N = 5867$

† Interaction (IXN) present. See Table 5 for ORs & 95% CIs

‡ Multiple Non-Hispanic, American Indian/Alaskan Native and Native Hawaiian/Other Pacific Islander racial and ethnic groups aggregated for regression analysis to allow for adequate sample size

developed between some Black students and their teachers. For example, data from 2016 and 2017 indicate that there was a shortage of teachers of color in Maryland (The Education Trust, 2019), yet there is an emerging body of literature showing that having same-race teachers can positively

impact outcomes among Black students including improved academic performance (Dee, 2004; Gershenson et al., 2018), fewer absences (Holt & Gershenson, 2015) and lower rates of school suspensions and expulsion (Holt & Gershenson, 2015; Lindsay & Hart, 2017).

Table 5 Interactions for Risk of Suicide Attempt among Maryland Middle School Students with History of Suicidal Ideation

Gender * History of sexual intercourse with suicide attempt as outcome			
	Never had sexual intercourse	Ever had sexual intercourse	OR for having had sexual intercourse vs. not, for males and females
Males	1.0 (REF)	1.1 (0.9–1.5)	1.1 (0.9–1.5)
Females	1.2 (0.9–1.4)	2.1 (1.5–3.0)	1.8 (1.3–2.6)
OR for females vs. males, for no and yes responses to “ever had sexual intercourse?”	1.2 (0.9–1.4)	1.9 (1.2–2.7)	
Measure of interaction (multiplicative scale): OR = 1.6 (1.0–2.5), $p=0.042$			
Asian race * Agree teachers care and provide encouragement with suicide attempt as outcome			
	Disagree/unsure that teachers care & provide encouragement	Agree that teachers care & provide encouragement	OR for agreeing that teachers care vs. disagree/unsure, for non-Asian and Asian
Non-Asian	1.0 (REF)	0.9 (0.8–1.1)	0.9 (0.8–1.1)
Asian	2.1 (1.3–3.2)	0.7 (0.4–1.4)	0.4 (0.2–0.8)
OR for Asian vs. non-Asian, for don’t agree/unsure vs. agree that teachers care and provide encouragement?	2.1 (1.3–3.2)	0.8 (0.4–1.6)	
Measure of interaction (multiplicative scale): OR = 0.4 (0.2–0.9), $p=0.023$			

Statistically significant values are given in bold ($P \leq 0.05$)

Significant interactions were also observed between gender and history of sexual intercourse in relation to reported suicide attempt(s) in both the overall middle school population and the cohort of students reporting suicidal ideation, with females reporting sexual intercourse having a significantly higher risk of attempt relative to males. One potential explanation of this finding could be that exposure to sexual abuse, which is more common among girls than boys in the United States (Gewirtz-Meydan & Finkelhor, 2019), is strongly linked with STB (Angelakis et al., 2020). Additionally, Wesche and colleagues (2017) observed that girls who initiate sex early are more likely to have experienced early pubertal maturation, which places them at increased risk of responding to negative life events with heightened depressive symptoms (Benoit et al., 2013; Graber, 2013). Further, girls who initiate sex early could be more susceptible than boys to bullying, social exclusion and other cultural and social sanctions for having sexual relations (Dunn et al., 2014; Kreager et al., 2016).

Other notable risk correlates for reported suicidal ideation and attempt include female gender, violence involvement (especially fighting paired with weapon carrying), having been bullied either at school or electronically, having slept away from home due to being kicked out, abandoned or having ran away (attempt only), sleep deprivation and getting good grades (protective for attempt only).

Training, Policies and Resources for School Personnel

Schools can play a strategic role in the prevention of STB given their universal access to youth, significant role in day-to-day life, and availability of counseling and other needed supports for health and well-being that many youth may not otherwise be able to access. The American Foundation for Suicide Prevention [AFSP], American School Counselor Association [ASCA], National Association of School Psychologists [NASP] & The Trevor Project (2019) have noted that “protecting the health and well-being of students is in line with school mandates and is an ethical imperative for all professionals working with youth” (AFSP et al., 2019, p.1). Ensuring school personnel have training, policies and resources to identify students at risk and take timely action to link them to mental health professionals is critical in addressing the increasing trends in youth suicide (AFSP et al., 2019). Findings from this study highlight the need for such policies and programs, given the prevalence of STB and significant association between STB and potentially malleable risk factors such as student perceptions of teachers caring and offering support.

Increasingly, schools are leveraging technology supports such as tip lines to enable students to confidentially share concerns about their safety and well-being or the safety and well-being of others on campus. Although outcomes-based data are not yet available, a recent national survey of perceived benefits of tip lines found that 73% of school administrators saw prevention of self-harm and suicide as a

benefit, and a majority of administrators believed tip lines enabled their schools to better respond to bullying and harassment, prevent violent incidents and better respond to drug use (Planty et al., 2020). Some school districts also use student surveillance software, such as GoGuardian Beacon or Gaggle, to identify digital risk content such as active suicide planning. Although these digital tools appear to have potential to save lives, they can be controversial due to privacy and liability concerns (Chambers, 2020; Stone, 2018).

School-Based Mental Health Supports and Policies for Students

Depression was the most pronounced risk factor associated with STB in the general middle school population in this analysis, yet more than half of youth with major depression do not receive any mental health treatment (Substance Abuse and Mental Health Services Administration [SAMHSA], 2018–2019). This is particularly problematic since depression and other mental illnesses during adolescence can disrupt essential developmental activities such as completion of education, commencing work, establishing intimate relationships and starting a family (Davey & McGorry, 2019). Furthermore, failure to intervene in early episodes of depression increases the likelihood that depression will be more recurrent over the life course (Monroe & Harkness, 2011). School-based mental health professionals play a critical role in ensuring that at-risk students receive access to counseling and other needed mental health supports and services, as was evidenced by recent studies demonstrating a relationship between access to school-based mental health centers and decreased episodes of depression and STBs (Paschall & Bersamin, 2018; Zhang et al., 2018). In addition, as noted in a recent policy update on preventing youth suicide by the National Association of State Boards of Education, improved cross-sector collaboration between schools, state health agencies and other community partners is needed to meet multi-faceted student needs and contribute to a broader whole child-focused policy agenda around suicide prevention (Blanco, 2020).

Sleep deprivation was significantly associated with self-reported STB in this study, and other studies have found insufficient sleep, and associated decreased executive function, to be associated with a range of poor outcomes including suicidal ideation (Bernert et al., 2015; Flores et al., 2020; Wang et al., 2019). Recognizing the importance of good sleep hygiene for students' mental, physical and academic success, many states and school districts are adopting later school starting time policies help ensure academic activities do not cut into needed time for sleep and rejuvenation (Dunster et al., 2018; Galloway et al., 2013; Meltzer et al., 2019).

Educational Programs for Students

Evidence-based educational programs for students are another key component of a comprehensive schoolwide suicide prevention strategy, as was highlighted in a recent, systematic review of strategies for prevention suicide (Mann et al., 2021). Examples of such programs include Youth Aware of Mental Health, (YAM) (Wasserman et al., 2015), Teen Mental Health First Aid [tMHFA] (Hart, Bond, et al., 2019; Hart, Cropper, et al., 2019) and the Adolescent Depression Awareness Program (ADAP) (Swartz et al., 2010, 2017). These programs can be integrated into required health education classes and align with state health education standards. They address underlying causes of STB, including depression, which is the leading indicator of STB in the current study, and help students identify and respond to signs and symptoms of mental health or substance use issues either for themselves or their peers. Such universal programs also avoid stigmatizing at-risk students by identifying them for a targeted intervention (Calear & Christensen, 2010) and have the potential to benefit large numbers of students who may not be symptomatic at the time of the intervention, but may otherwise go on to have problems at a later time, which is particularly relevant to middle school interventions (Robinson et al., 2013). Although these programs are designed for high school students, efforts are currently underway to adapt them for middle school students.

The prevalence of self-reported STB among young adolescents also speaks to the need for improved upstream programs to mitigate risk. The Good Behavior Game (GBG) is an example of an intervention which targets aggressive, disruptive behaviors in elementary school and has been associated with a range of positive social and mental health effects on students through early adulthood. GBG reduces the incidence of STB, as well as reduces the incidence of risk factors for STB identified herein (e.g., GBG reduces the incidence of substance abuse/misuse, violence involvement and high-risk sexual behaviors; Wilcox et al., 2008; Kellam et al., 2011; Kellam et al., 2012). GBG has also been shown to enhance protective factors for STB in the academic domain (e.g., GBG increases standardized achievement tests, high school graduation and college attendance, and reduces odds of special education service use; Bradshaw et al., 2009).

Ensuring a Culturally Competent Approach

As highlighted in this study, risk and protective factors associated with STB can vary significantly across demographic subgroups. Understanding and responding to drivers of variation across different demographic subgroups is important for ensuring that programs are tailored to address student needs. As noted by the Suicide Prevention Resource Center [SPRC] (2021), suicide prevention efforts are more

likely to be effective if they are based on the values, needs, and strengths of the group's interventions are intended to reach. Efforts should be respectful and responsive to groups' beliefs, practices, and cultural and linguistic needs and preferences. Better understanding drivers for variation across different groups are an important first step, and one where more research is needed (Musci et al., 2018). Further, policy makers and program planners should ensure diverse representation from members of the target population are included in all stages of the planning and that open dialog with group members is encouraged such that cultural considerations can be communicated (SPRC, 2021). Schools could consider Sources of Strength to enhance connectedness between various subgroups of students and adults in schools. A study by Pickering and colleagues (2018) evaluating the implementation and dissemination of Sources of Strength in schools found that all minoritized student groups were significantly more isolated from adults vs. white, non-Hispanic youth. One culturally responsive approach to enhance student-adult connectedness in schools could be to intentionally train and engage in the intervention more peer leaders and adults of color.

Strengths and Limitations

This study has limitations that should be considered when interpreting findings. As a cross sectional study, we could not assess temporal relationships between the selected variables and STB and make inferences about causality. We note that not all relevant dimensions of risk were captured in this study, including traumatic childhood events, sexual orientation and identity, and a range of mental and cognitive disorders which may precede STB. Although there was a question about past year prolonged sadness and hopelessness, this single question may not capture all students with depression since depression may manifest as chronic irritability or anger in some younger adolescents (Eyre et al., 2019). Another limitation is the potential for recall bias resulting in over- and understating risk behaviors when completing the self-report survey. Finally, our results may not apply to suicide deaths in this age group.

Our study has several strengths. It is based on recent data from a large, representative sample of middle school students from a state that has robust racial, cultural and economic diversity. YRBS survey tools are typically well-validated (Brener et al., 2003) and the current survey and associated analysis covered a breadth of domains that could contribute to STB. To improve predictive accuracy and clinical relevance, the analysis focused on the overall middle school adolescent cohort in relation to STB, and then looked at adolescents with suicidal ideation only to understand differentiators between adolescents with ideation who attempt, and those who do not attempt. Interactive effects

between risk factors and gender and race/ethnicity were also explored, providing insights into cultural and gender-specific differences in STB risk.

Summary

Findings from this study highlight the widespread prevalence of self-reported STB among young adolescents, and actionable targets for intervention in relation to STB. Coordinated universal, evidence-based programs and policies in school settings are needed and should be introduced earlier on to address the increasing trends of STB in young adolescents. Program planners should take into consideration the changing epidemiology of suicide in young people and social, cultural and language needs when developing intervention strategies.¹

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Declarations

Conflicts of interest The authors have no conflicts of interest to report.

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¹ See online appendix A for demographic-adjusted bivariate associations between independent variables and suicidal ideation and attempt among all middle school students, and suicide attempt among middle school students with ideation.

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