Examining the association between prescription opioid misuse and suicidal behaviors among adolescent high school students in the United States

Article *in* Journal of Psychiatric Research · March 2019

DOI: 10.1016/j.jpsychires.2019.02.018

CITATIONS
0

READS
98

5 authors, including:

Philip Baiden
University of Texas at Arlington
40 PUBLICATIONS **266** CITATIONS

SEE PROFILE

Journal of Psychiatric Research 112 (2019) 44–51

Contents lists available at ScienceDirect

Journal of Psychiatric Research

journal homepage: www.elsevier.com/locate/jpsychires

Examining the association between prescription opioid misuse and suicidal behaviors among adolescent high school students in the United States

Philip Baiden[a,*], Genevieve Graaf[a], Mariama Zaami[b], Charles K. Acolatse[c], Yvonne Adeku[d]

[a] The University of Texas at Arlington, School of Social Work, 211 S. Cooper St., Box 19129, Arlington, TX, 76019, USA
[b] University of Ghana, Department of Geography & Resource Development, P.O. Box LG 59, Legon, Accra, Ghana
[c] University of North Texas Health Science Center, School of Public Health, 3500 Camp Bowie Blvd, Fort Worth, TX, 76107, USA
[d] University of Ghana, Department of Social Work, P. O. Box LG 419, Legon, Accra, Ghana

ARTICLE INFO

Keywords:
Prescription opioid misuse
Suicidal ideation
Suicide plan
Suicide attempt
Adolescents

ABSTRACT

Although some studies have examined the association between prescription opioid misuse and mental health outcomes, few studies have examined the effects of prescription opioid misuse on suicidal behaviors among adolescents. The objective of this study was to examine the association between prescription opioid misuse and suicidal ideation, suicide plan, and suicide attempt among adolescents. Data for this study came from the 2017 Youth Risk Behavior Surveillance System. A sample of 8830 adolescents aged 14–18 years (50.9% female) were analyzed using logistic regression with suicidal ideation, suicide plan, and suicide attempt as outcome variables and prescription opioid misuse as the main explanatory variable. Of the 8830 adolescents, 13.3% ever misused prescription opioids; 17.7% experienced suicidal ideation, 13.3% made a suicide plan, and 6.5% attempted suicide during the past 12 months. In the multivariate logistic regression models, adolescent students who misused prescription opioids were 1.50 times more likely to have experienced suicidal ideation, 1.44 times more likely to have made a suicide plan, and 1.58 times more likely to have attempted suicide during the past 12 months when compared to their counterparts who did not misuse prescription opioids. Other significant predictors of suicidal behaviors include sexual minority, history of sexual assault, traditional bullying and cyberbullying victimization, feeling sad or hopeless, cigarette smoking, and illicit drug use. The findings of the present study demonstrate the harmful effects of prescription opioid misuse and its association with suicidal behaviors among adolescents.

1. Introduction

Suicide has been identified as the second leading cause of death among adolescents aged 10–18 years in the United States (US) (Centers for Disease Control and Prevention (CDC), 2016). Suicidal behaviors refers to suicidal ideation, suicide plan, and suicide attempt (Posner et al., 2007). Data from the 2015 Youth Risk Behavior Surveillance System (YRBSS) shows that about 17% of adolescents had thoughts about suicide, 14.6% made a specific suicide plan, and 8.6% attempted suicide during the past 12 months (Kann et al., 2016). Notwithstanding the fact that firearm remains one of the most common methods of death by suicide in the US (Anestis, 2016; Lubell et al., 2004; Stanley et al., 2017), intentional overdose of drugs, including prescription drugs, accounts for a substantial number of suicides per year (CDC, 2012). Seth et al. (2018) analyzed data from the National Vital Statistics Systems and found that the age-adjusted rate of overdose death as a result of prescription opioids increased by 10.6% from 2016 to 2017. Recent surge in opioid-related overdose among adolescents (Caupp et al., 2018; Center for Behavioral Health Statistics and Quality, 2016; Schepis et al., 2018) poses a major concern about the potential harmful effects of prescription opioid misuse on suicidal behaviors. Consequently, it is important to understand the effects of prescription opioid misuse on suicidal behaviors among adolescents.

Prescription opioid misuse is often defined as taking opioid in a manner or dose other than prescribed, taking someone else's prescription opioid, even if for a legitimate medical reason such as for pain relief purposes, or taking prescription opioid for the feelings and euphoria that it produce (i.e., to get high) (National Institute of Drug Abuse, 2018). Prescription opioid misuse is a major and growing public health concern in the US (Bohnert and Ilgen, 2019). Data from the National Survey on Drug Use and Health (NSDUH) showed that in 2016, about 11.8 million individuals aged 12 and older misused

* Corresponding author. School of Social Work, The University of Texas at Arlington, 211 S. Cooper St., Box 19129, Arlington, TX, 76019, USA.
E-mail address: philip.baiden@uta.edu (P. Baiden).

https://doi.org/10.1016/j.jpsychires.2019.02.018
Received 23 September 2018; Received in revised form 7 February 2019; Accepted 21 February 2019

prescription opioid during the past year (SAMHSA, 2017). Lifetime prevalence estimates of prescription opioid misuse among adolescents in the US varies between 5 and 20% (Havens et al., 2011; Johnston et al., 2018; McCabe et al., 2015; Zullig et al., 2015). Analyzing data from the Monitoring the Future (MTF) study, McCabe et al. (2015) found that among past-year prescription opioid abusers, 51% co-ingested prescription opioids with cannabis and 48% co-ingested prescription opioids with alcohol.

The notion that prescription opioids are less harmful than street drugs and the fact that prescription opioids could be obtained from conventional sources have been cited as some of the reasons for the misuse of prescription opioids (Johnston et al., 2018; Schulenberg et al., 2018; Stewart et al., 2013). In addition to using prescription opioids as self-medication to relieve physical pain symptoms (SAMHSA, 2017), other motives behind why adolescents misuse prescription opioids include the desire to feel good or get high, to increase the effects of some other drugs, and for purposes of experimentation (Johnston et al., 2018; McCabe et al., 2019; Upadhyaya et al., 2010).

Studies have found significant associations between prescription opioid misuse and mental health outcomes including anxiety (Jeffers et al., 2015) and depression (Guo et al., 2018; Wang et al., 2017). Prescription opioid misuse has also been linked to poor academic performance (Arria et al., 2017; Garnier-Dykstra et al., 2012) and risky sexual behaviors such as early sexual debut (Berenson and Rahman, 2011), and unprotected sexual intercourse (Johnson et al., 2013). Prescription opioid misuse is also known to co-occur with cigarette use (Cerdá et al., 2018), alcohol use (McCabe et al., 2015; Teesson et al., 2012), and illicit drug use (Heck et al., 2014). However, there is a dearth of studies examining the effects of prescription opioid misuse on suicidal behaviors among adolescents.

Other known risk factors of suicidal behaviors among adolescents includes depression (Capron et al., 2015; Reed et al., 2015) and loneliness (Gallagher et al., 2014). Strong association has also been observed between sexual assault and suicidal ideation (Baiden et al., 2019; Yoon et al., 2018) and suicide attempt (Baiden et al. 2017; Stewart et al., 2015). Numerous studies (Mitchell et al., 2016; Moon et al., 2015; Reed et al., 2015; Roberts et al., 2016) and systematic reviews and meta-analytic studies (Gini and Espelage, 2014; Holt et al., 2015) have also documented the adverse effects of both traditional bullying and cyberbullying on suicidal behaviors among adolescents. The extant literature has also established an association between substance use and suicidal behaviors. In particular cigarette smoking (Rodelli et al., 2018), alcohol use (Gart and Kelly, 2015; O'Brien et al., 2014; Tomek et al., 2015), binge drinking (Behnken et al., 2010), cannabis use (Borges et al., 2017), and illicit drug use such as cocaine, heroine, and ecstasy (Freedenthal et al., 2007; Garlow et al., 2007) have all been found to be associated with suicidal behaviors among adolescents.

1.1. Current study

Current understanding of the relationship between prescription opioid misuse and suicidal behavior among adolescents is minimal and existing studies are limited in external validity (e.g., Zullig et al., 2015). This study seeks to contribute to the existing knowledge base by drawing on a large nationally representative sample to examine the association between prescription opioid misuse and suicidal behaviors among adolescents in the US. We hypothesized that controlling for the effects of known risk factors for suicidal behaviors (e.g., history of sexual assault, bullying, cyberbullying, feeling sad or hopeless), there would be an association between prescription opioid misuse and suicidal ideation, suicide plan, and suicide attempt.

2. Data and methods

2.1. Data source and participants

Data for this study came from the 2017 YRBSS, a national study conducted biennially by the CDC to examine health-risk behaviors that contribute to the leading causes of death and disability among youth in the US (YRBSS, 2018). The YRBSS utilized a three-stage cluster sample design to produce a nationally representative sample of high school students in grades 9 through 12 from both public and private schools in the 50 states and the District of Columbia. Schools were selected systematically with probability proportional to enrollment in grades 9 through 12 using a random start. In all, 192 schools were sampled to participate in the 2017 YRBSS. The 2017 YRBSS had a school response rate of 75%, a student response rate of 81%, producing an overall response rate of 60% (YRBSS, 2018). Detailed information about the YRBSS including the objectives, methodology, and sampling procedure are available at www.cdc.gov/yrbss and in other publications (Baiden et al., 2019; Kann et al., 2018). There were 14,765 respondents in the YRBSS. As most of the missing data were on categorical demographic variables and suicide attempt, listwise deletion was used in handling missing data. Complete data on all variables included in the analysis for this study was available for 8830 respondents.

2.2. Variables

2.2.1. Outcome variables

The outcome variables examined in this study included suicidal ideation, suicide plan, and suicide attempt and were measured as binary variables. Suicidal ideation was measured based on response to the question “During the past 12 months, did you ever seriously consider attempting suicide?” Suicide plan was measured based on response to the question “During the past 12 months, did you make a plan about how you would attempt suicide?” Suicide attempt was measured based on response to the question “During the past 12 months, how many times did you actually attempt suicide?” Adolescents who attempted suicide at least once during the past 12 months were coded as 1 whereas adolescents who did not attempt suicide during the past 12 months were coded as 0.

2.2.2. Explanatory variables

The main explanatory variable examined in this study was prescription opioid misuse and was measured as a binary variable based on response to the question “During your life, how many times have you taken prescription pain medicine without a doctor's prescription or differently than how a doctor told you to use it? (Count drugs such as Codeine, Vicodin, OxyContin, Hydrocodone, and Percocet)”. Following the recommendation of the CDC (Kann et al., 2016), adolescents who took prescription pain medicine without a doctor's prescription at least once were recoded as 1; whereas those who have never taken prescription pain medicine without a doctor's prescription were coded as 0.

2.3. Covariates

Covariates examined included history of sexual assault, traditional bullying, cyberbullying, feeling sad or hopeless, binge drinking, cigarette smoking, marijuana use, and illicit drug use. Adolescents who answered “yes” to the question “Have you ever been physically forced to have sexual intercourse when you did not want to?” were coded as 1; whereas those who answered “no” were coded as 0. Traditional bullying was measured based on response to the question “During the past 12 months, have you ever been bullied on school property?” whereas cyberbullying was measured based on response to the question “During the past 12 months, have you ever been electronically bullied? (Count being bullied through texting, Instagram, Facebook, or other social media).” Both were measured as binary variables (0 = no versus

1 = yes). With respect to feeling sad or hopeless, adolescents who answered "yes" to the question "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?" were coded as 1; whereas those who answered "no" were coded as 0. Adolescents who had 4 or more alcoholic drinks (for a female) or 5 or more alcoholic drinks (for a male) in a single seating within a couple of hours at least once during the past 30 days were considered to have engaged in binge drinking and were coded as 1; otherwise they were coded as 0. Adolescents who smoked cigarette at least once during the past 30 days were considered as smokers and were coded as 1; otherwise they were considered as non-smokers and were coded as 0. Adolescents who reported ever using marijuana at least once were coded as 1; whereas those who have never used marijuana were coded as 0. A measure of illicit drug use was included as a binary variable (0 = no illicit drug use versus 1 = illicit drug use) based on a positive response to ever having used any of the following illicit drugs: cocaine (powder, crack, or freebase); inhalants (glue, aerosol spray cans, paints); heroine (smack, junk, or China White); methamphetamines (speed, crystal, crank, or ice); ecstasy (MDMA); hallucinogenic drugs (LSD, acid, PCP, angel dust, mescaline, or mushrooms); synthetic marijuana (K2, Spice, fake weed, King Kong, Yucatan Fire, Skunk, or Moon Rocks); and steroid pills.

2.4. Control variables

The following control variables were also examined. Age was measured in years whereas sex was coded as "male = 0" and "female = 1". Adolescents who self-identified as lesbian, gay, or bisexual were coded as 1; otherwise they were coded as 0. Grade level was coded into "9th grade", "10th grade", "11th grade", and "12th grade". Race/ethnicity was coded as a nominal variable into the following categories "0 = non-Hispanic White", "1 = Black/African American", "2 = American Indian/Native Hawaiian/Pacific Islander", "3 = Hispanic/Multiple Hispanic", "4 = Asian", and "5 = Multiple non-Hispanic".

2.5. Data analyses

Descriptive, bivariate, and multivariate analytic techniques were employed. Descriptive statistics was first conducted to examine the general distribution of all the variables included in the analysis. The association between prescription opioid misuse and suicidal behaviors was then examined using Pearson chi-square test of association. The main analysis involves the use of binary logistic regression to examine the association between prescription opioid misuse and suicidal behaviors, while controlling for other known predictors of suicidal behaviors. The proportion of variance in the outcome variable explained by the set of predictors was assessed using the pseudo R square. The predictive performance of the model was estimated using the area under a receiver operating characteristic (ROC) curve for binary outcomes (Cook, 2008). Generally, the area under the ROC curve values ranges from 0.5 to 1.0, with a value of 1 indicating a perfect fit model, whereas values close to 0.5 indicate that the model is no better than that which could have been obtained by chance (Cook, 2008). Adjusted odds ratios (AOR) are reported together with their 95% Confidence Intervals (C.I.). Variables were considered significant if the *p*-value was less than 0.05. Stata's "svy" command was used to account for the weighting and complexity of the cluster sampling design employed by the YRBSS. All analyses were performed using STATA version 14 (Stata Corp., College Station, Texas, USA).

3. Results

3.1. Sample characteristics

Table 1 below shows the general distribution of the study variables.

Table 1
Sample characteristics (N = 8830).

Variables	N (%)
Outcome variables	
Suicidal ideation	
No	7271 (82.3)
Yes	1559 (17.7)
Suicide plan	
No	7658 (86.7)
Yes	1171 (13.3)
Suicide attempt	
No	8258 (93.5)
Yes	571 (6.5)
Main explanatory variable	
Prescription opioid misuse	
No	7654 (86.7)
Yes	1176 (13.3)
Control variables	
Age	
14 years	1013 (11.5)
15 years	2225 (25.2)
16 years	2251 (25.5)
17 years	2174 (24.6)
18 years or older	1167 (13.2)
Sex	
Male	4338 (49.1)
Female	4492 (50.9)
Self-identified as Lesbian, Gay, or bisexual	
No	7600 (86.1)
Yes	1230 (13.9)
Grade level	
9th grade	2386 (27.0)
10th grade	2257 (25.6)
11th grade	2132 (24.1)
12th grade	2055 (23.3)
Race/ethnicity	
Non-Hispanic White	4999 (56.6)
Black or African-American	927 (10.5)
American Indian/Native Hawaiian/Pacific Islander	101 (1.2)
Hispanic/Multiple Hispanic	1957 (22.2)
Asian	330 (3.7)
Multiple non-Hispanic	516 (5.8)
History of sexual assault	
No	8247 (93.4)
Yes	583 (6.6)
Traditional bullying victimization	
No	7095 (80.4)
Yes	1735 (19.6)
Cyberbullying victimization	
No	7453 (84.4)
Yes	1377 (15.6)
Felt sad or hopeless	
No	6046 (68.5)
Yes	2784 (31.5)
Cigarette smoking	
Non-smoker	8119 (91.9)
Smoker	711 (8.1)
Binge drinking	
No	7603 (86.1)
Yes	1227 (13.9)
Ever used marijuana	
No	5794 (65.6)
Yes	3035 (34.4)
Ever used illicit drug	
No	7669 (86.9)
Yes	1161 (13.1)

Of the 8830 adolescents, 13.3% reported ever misusing prescription opioids such as Codeine, Vicodin, OxyContin, Hydrocodone, and Percocet; 17.7% experienced suicidal ideation; 13.3% made a suicide plan; and 6.5% attempted suicide during the past 12 months. The sample was evenly distributed by sex (female = 50.9%), and about 14% self-identified as lesbian, gay, or bisexual. A little over 6% had a history of sexual assault; about one in five were bullied on school property, and 15.6% were cyberbullied.

Table 2
Prescription opioid misuse by suicidal behaviors (N = 8830).

Variables	Prescription Opioid Misuse		χ^2 value
	No (%)	Yes (%)	
Outcome variables			
Suicidal ideation			313.92 ($p < .0001$)
No	6566 (88.2)	738 (64.0)	
Yes	1116 (14.8)	410 (36.0)	
Suicide plan			280.37 ($p < .0001$)
No	6852 (89.1)	819 (71.3)	
Yes	830 (10.9)	329 (28.7)	
Suicide attempt			279.66 ($p < .0001$)
No	7309 (95.2)	940 (82.3)	
Yes	373 (5.8)	208 (17.7)	

3.2. Bivariate association between prescription opioid misuse and suicidal behaviors

As seen in Table 2, there was significant bivariate association between prescription opioid misuse and all three suicidal behaviors. More than a third (36%) of adolescents who misused prescription opioids compared to 14.8% of adolescents who did not misuse prescription opioids experienced suicidal ideation (χ^2 (2) = 313.92, $p < .0001$). About 29% of adolescents who misused prescription opioids compared to 10.9% of adolescents who did not misuse prescription opioids made a suicide plan (χ^2 (2) = 280.37, $p < .0001$). About 18% of adolescents who misused prescription opioids compared to 5.8% of adolescents who did not misuse prescription opioids attempted suicide (χ^2 (2) = 279.66, $p < .0001$).

3.3. Logistic regression results examining the association between prescription opioid misuse and suicidal behaviors

Although there was a significant association between prescription opioid misuse and all three suicidal behaviors at the bivariate level, because there were no controls at this level, we were unable to ascertain the effects of prescription opioid misuse on these suicidal behaviors, net of other covariates. Hence, in the multivariate logistic regression, we control for the effects of other covariates. Table 3 shows the results of the multivariate logistic regression results between prescription opioid misuse and suicidal ideation, suicide plan, and suicide attempt.

3.3.1. Suicidal ideation

Adolescents who misused prescription opioids had 50% greater odds of experiencing suicidal ideation during the past 12 months when compared to their counterparts who did not misuse prescription opioids (AOR = 1.50, $p < .001$, 95% CI = 1.25–1.82). Odds were almost three times greater for adolescents who self-identified as lesbian, gay, or bisexual to report experiencing suicidal ideation when compared to their heterosexual/straight counterparts (AOR = 2.96, $p < .001$, 95% CI = 2.51–3.49). Other factors associated with suicidal ideation include history of sexual assault, traditional bullying victimization, cyberbullying victimization, feeling sad or hopeless, and marijuana use.

3.3.2. Suicide plan

Controlling for other factors, odds were 1.44 times greater for adolescents who misused prescription opioids to report making a suicide plan during the past 12 months when compared to their counterparts who did not misuse prescription opioids (AOR = 1.44, $p < .001$, 95% CI = 1.19–1.75). Similar to the association between lesbian, gay, or bisexual and suicidal ideation, adolescents who self-identified as lesbian, gay, or bisexual were 2.64 times more likely to have made a suicide plan when compared to their heterosexual/straight counterparts (AOR = 2.64, $p < .001$, 95% CI = 2.24–3.11). Asians or multiple non-Hispanics adolescents had about 45% higher odds of making a suicide plan both when compared to their non-Hispanic White counterparts. Adolescents were more likely to have made a suicide plan if they: had a history of sexual assault, were bullied, were cyberbullied, felt sad or hopeless, are smokers, or use marijuana.

3.3.3. Suicide attempt

The adjusted logistic regression model predicting suicide attempt indicate that adolescents who misused prescription opioids had 1.58 times greater odds of attempting suicide during the past 12 months when compared to their counterparts who did not misuse prescription opioids (AOR = 1.58, $p < .001$, 95% CI = 1.25–2.01). Adolescents who self-identified as lesbian, gay, or bisexual had 1.89 times greater odds of attempting suicide when compared to their heterosexual/straight counterparts (AOR = 1.89, $p < .001$, 95% CI = 1.52–2.34). With respect to race/ethnicity, the odds were more than doubled for suicide attempt among Black/African American and American Indian/Native Hawaiian/Pacific Islander adolescents compared to their non-Hispanic White counterparts. Multiple non-Hispanic adolescents had 1.54 times greater odds of attempting suicide when compared to non-Hispanic White adolescents. Other factors associated with suicide attempt include: history of sexual assault, traditional bullying, cyberbullied, feeling sad or hopeless, cigarette smoking, binge drinking, marijuana use, and illicit drug use.

3.4. Model fitness

Model fitness indices indicated that the multivariate models was fit and the predictors included made significant contributions to the model. Based on the pseudo R square, all the variables cumulatively explained 29.01% of the variance in suicidal ideation, 25.07% of the variance in suicide plan, and 27.27% of the variance in suicide attempt. Based on the area under the ROC curve statistic from Fig. 1a, b, and 1c, 85.4% of adolescents were correctly classified as having experienced suicidal ideation versus no suicidal ideation (area under the ROC curve = 0.854), 84.04% were correctly classified as having made a suicide plan versus no suicide plan (area under the ROC curve = 0.8404), and 87.24% were correctly classified as having attempted suicide versus no suicide attempt (area under the ROC curve = 0.8724).

4. Discussion

Using a large nationally representative sample of adolescents from the US, this study sought to examine the association between prescription opioid misuse and suicidal behaviors. We found that 13.3% of adolescents reported ever misusing prescription opioids and 17.7% experienced suicidal ideation, 13.3% made a suicide plan, and 6.5% attempted suicide during the past 12 months. The proportion of adolescents who misused prescription opioids is consistent with some past studies (e.g., 10–13%; Havens et al., 2011; McCabe et al., 2015) but at the same time lower than what has been found in other studies (e.g., 22%; Divin and Zullig, 2014; Zullig et al., 2015). Differences in sampling procedure, population examined (adolescent high school students versus college students), and "reference period" or time frame used in measuring prescription opioid misuse (e.g., past year versus lifetime) may account for some of the differences in prevalence estimates. Also the fact that quite a number of respondents had missing data on demographic variables and suicide attempt may have impacted the prevalence estimates of prescription opioid misuse and suicidal behaviors. The proportion of adolescents who experienced suicidal ideation, made a suicide plan, or attempted suicide is also consistent with past studies (see e.g., Gart and Kelly, 2015; Kann et al., 2016; Yoon et al., 2018).

The findings of this study suggest that controlling for other key predictors of suicidal behaviors, adolescents who reported misusing prescription opioids had greater odds of experiencing suicidal ideation, making a suicide plan, or attempting suicide. This finding is consistent

Table 3
Multivariate logistic regression results predicting suicidal behaviors (N = 8830).

Variables	Suicidal ideation		Suicide plan		*Suicide attempt*	
	AOR (95% C.I.)	*p*-value	AOR (95% C.I.)	*p*-value	AOR (95% C.I.)	*p*-value
Prescription opioid misuse (No)						
Yes	1.50 (1.25–1.82)	.001	1.44 (1.19–1.75)	.001	1.58 (1.25–2.01)	.001
Age in years	1.02 (0.90–1.15)	.762	1.04 (0.91–1.18)	.595	1.07 (0.90–1.28)	.432
Sex (Male)						
Female	1.03 (0.89–1.19)	.687	0.94 (0.80–1.10)	.432	0.98 (0.79–1.21)	.829
Self-identified as Lesbian, Gay, or bisexual (No)						
Yes	2.96 (2.51–3.49)	.001	2.64 (2.24–3.11)	.001	1.89 (1.52–2.34)	.001
Grade level (9th grade)						
10th grade	0.88 (0.71–1.11)	.281	1.01 (0.79–1.29)	.939	0.84 (0.62–1.13)	.258
11th grade	0.93 (0.69–1.26)	.647	0.93 (0.68–1.29)	.670	0.59 (0.39–0.89)	.011
12th grade	0.81 (0.54–1.21)	.306	0.88 (0.57–1.35)	.552	0.44 (0.26–0.77)	.004
Race/ethnicity (White)						
Black or African-American	0.89 (0.72–1.10)	.285	1.09 (0.87–1.36)	.463	2.10 (1.58–2.79)	.001
American Indian/Native Hawaiian/Pacific Islander	1.53 (0.96–2.44)	.074	1.52 (0.91–2.52)	.110	2.04 (1.06–3.93)	.033
Hispanic/Multiple Hispanic	0.84 (0.71–0.99)	.036	1.03 (0.86–1.22)	.775	1.25 (0.99–1.58)	.067
Asian	1.01 (0.74–1.37)	.948	1.45 (1.06–1.99)	.020	1.28 (0.77–2.13)	.337
Multiple non-Hispanic	1.10 (0.84–1.44)	.495	1.44 (1.09–1.92)	.012	1.54 (1.06–2.22)	.022
History of sexual assault (No)						
Yes	2.10 (1.68–2.62)	.001	1.94 (1.56–2.42)	.001	2.48 (1.92–3.22)	.001
Traditional bullying victimization (No)						
Yes	1.75 (1.47–2.08)	.001	1.57 (1.31–1.90)	.001	1.65 (1.30–2.09)	.001
Cyberbullying victimization (No)						
Yes	1.31 (1.08–1.59)	.005	1.43 (1.18–1.75)	.001	1.64 (1.27–2.11)	.001
Felt sad or hopeless (No)						
Yes	9.08 (7.81–10.57)	.001	7.32 (6.19–8.66)	.001	7.75 (5.98–10.04)	.001
Cigarette smoking (Non-smoker)						
Smoker	1.25 (0.98–1.61)	.072	1.33 (1.03–1.70)	.028	1.41 (1.04–1.92)	.001
Binge drinking (No)						
Yes	1.02 (0.83–1.26)	.851	1.07 (0.87–1.33)	.500	1.38 (1.06–1.79)	.017
Marijuana use (No)						
Yes	1.21 (1.03–1.42)	.023	1.23 (1.04–1.45)	.017	1.44 (1.16–1.80)	.001
Illicit drug use (No)						
Yes	1.21 (0.99–1.49)	.068	1.28 (1.04–1.57)	.021	1.45 (1.12–1.86)	.004
Pseudo R square	29.01		25.07		27.27	
Area under the ROC curve	85.4		84.04		87.24	

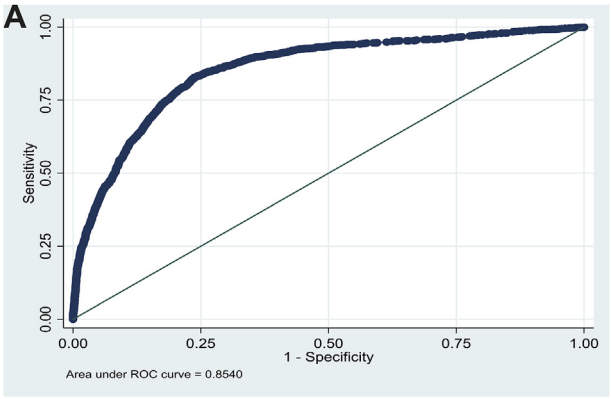

Fig. 1a. Area under the ROC curve for suicidal ideation.

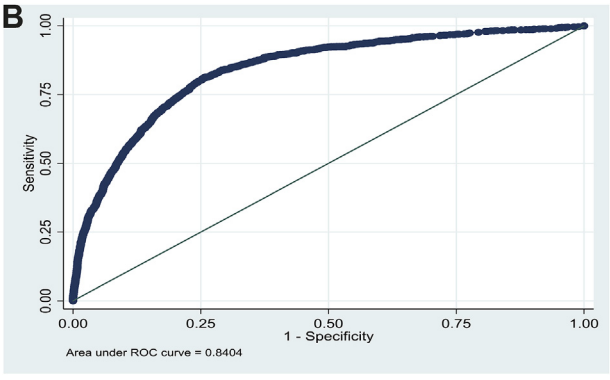

Fig. 1b. Area under the ROC curve for suicide plan.

with some past studies that have also found significant association between prescription opioid misuse and suicidal behaviors among adolescents (Divin and Zullig, 2014; Zullig et al., 2015), college students (Zullig and Divin, 2012), and adults (Ashrafioun et al., 2017). Divin and Zullig (2014) in their study found that lifetime misuse of prescription opioids was significantly associated with suicidal ideation, suicide plan, and suicide attempt in a convenience sample of adolescent males and females in grades 9–12 in the U.S.

The use of central nervous system depressants such as benzodiazepines, alcohol, and illicit drugs are known to be associated with increased risk of suicide (Freedenthal et al., 2007; Gart and Kelly, 2015; Zullig et al., 2015). Although benzodiazepines are more often prescribed to older individuals than children and adolescents (Witek et al., 2005), their use are associated with increased risk of suicide among adolescents (Palamar et al., 2018) and older adults (Jones and McAninch, 2015). A recent study by Schepis et al. (2019) found that controlling for sociodemographic, physical health, mental health, and substance use factors, individuals who misused benzodiazepines in the past year had double the odds of experiencing suicidal ideation when compared to those who did not misuse benzodiazepines.

Some reasons have been offered to explain the association between opioid misuse and suicidal behaviors. One of such reasons is what Case and Deaton (2017) referred to as the "Deaths of Despair." Case and Deaton (2017) posits that rising incidents of opioid use among individuals in the US could be attributed to long-standing process of

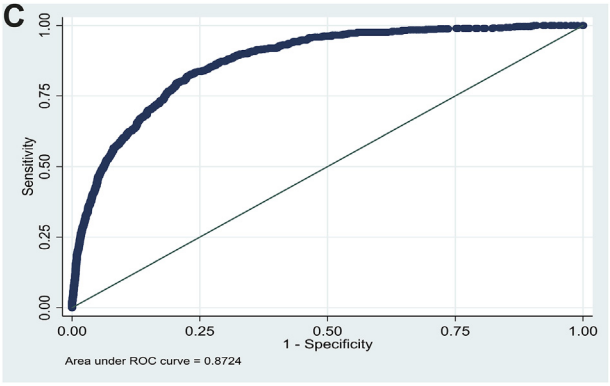

Fig. 1c. Area under the ROC curve for suicide attempt.

cumulative disadvantage that makes some individuals to use opioid to cope with feelings of despair and hopelessness. Opioid use then exacerbates the onset and maintenance of depressive symptoms which can then lead to suicidal behaviors and overdose (Case and Deaton, 2017). Misuse of opioids could also negatively impact ones family and social relations (Oviedo-Joekes et al., 2011) and consequently leads to being alienated from family, friends, loved ones, and other valued social groups. Such feelings of alienation and social isolation could have profound influence on engaging in suicidal behaviors. Another reason offered for the association between prescription opioid misuse and suicidal behaviors has to do with the fact that demographic and mental health factors associated with opioid use and suicide are similar (Bohnert and Ilgen, 2019).

It is also possible that adolescents may be misusing prescription opioids as a way of dealing with past pain and trauma, a factor which has also been found to be associated with suicidal ideation (Romanowicz et al., 2013) and suicide attempt (Koenig et al., 2015) among adolescents. A burgeoning number of studies suggests that prescription opioid misuse is associated with depressive symptoms among individuals with a history of traumatic experience (Garland et al., 2013, 2016). In a similar way, adolescents with a history of trauma have been found to self-medicate using prescription opioids as a means of dealing with past trauma that they are unable to control (SAMHSA, 2017; Stewart et al., 2013). In support of the self-medication theory, Müller et al. (2015) found that individuals with a history of sexual abuse manifest more severe responses to symptoms of post-traumatic stress which in turn, make them more vulnerable to increased use of alcohol and other illicit drugs as self-medication.

In the YRBSS, there are no measures of pain and pain-related factors, hence we were unable to control for the effects of pain and pain-related variables to understand their effects on suicidal behaviors. We addressed this shortcoming by controlling for history of sexual assault, traditional bullying, and cyberbullying victimization as adolescents with history of sexual assault or who have been victimized are more likely to experience pain-related difficulties (Santerre-Baillargeon et al., 2017; Underwood and Ehrenreich, 2017; Vervoort et al., 2014).

The findings that adolescents with a history of sexual assault, were bullied, or experienced cyberbullying were more likely to engage in suicidal behaviors is consistent with previous studies and underscores the harmful effects of childhood victimization. Analyzing data from Waves 6 and 7 of the Longitudinal Studies on Child Abuse and Neglect (LONGSCAN), Yoon et al. (2018) recently found that compared to adolescents with no history of sexual abuse, odds were three times greater for adolescents with sexual abuse histories to experience suicidal ideation, net of the effects of demographic factors, symptoms of depression, and coping skills. Similarly, Reed et al. (2015) in their study found that the effects of traditional bullying and cyberbullying victimization on suicidal ideation, suicide plan, and suicide attempts were partially mediated by violent behavior, substance abuse, and depression.

With respect to treatment intervention for suicidal behaviors, Segal et al. (2002) proposed Mindfulness-Based Cognitive Therapy (MBCT) as a potentially promising treatment intervention for individuals at risk for suicidal behaviors. MBCT is a group-based 8-weeks meditation practice that combines mindfulness-based stress reduction (MBSR) and cognitive behavioral techniques (Segal et al., 2002). A key component of MBCT is meditation which may be a viable intervention for individuals with suicidal ideation who may be dealing with distracting thoughts and worries (Segal et al., 2002). MBCT has been proven to be successful in reducing depressive symptoms (Barnhofer et al., 2015; van der Velden et al., 2015), postpartum depression and anxiety (Shulman et al., 2018), and enhancing positive therapeutic change (Cairns and Murray, 2015). Although Segal et al. (2002) proposed the use of MBCT as a treatment intervention for individuals at risk for suicidal behaviors, few empirical studies support the use of MBCT for this purpose. Forkmann et al. (2014) undertook a randomized control trial to test the efficacy of MBCT in reducing suicidal ideation in patients with depressive symptomatology and found that, MBCT was associated with a significant reduction in suicidal ideation during a 2-month post-intervention period. A systematic review conducted by Chesin et al. (2016) also found support for the usefulness of mindfulness-based interventions to prevent suicidal behaviors among individuals at risk for suicidal behaviors. Additional studies are needed to test the use of MBCT among adolescents who are at risk for suicidal behaviors.

At the school level, MBCT could be incorporated into pre-existing school based interventions such as Advancing Wellness and Resilience Education (AWARE) to bolster mindful awareness among adolescent high school students. Alternatively, MBCT could be delivered as a targeted stand-alone intervention for students needing support for mental health services. The role of incorporating MBCT in schools would fall within the scope of school social workers and school mental health counsellors as these individuals work with students in addressing their behavioral and mental health needs and are increasingly getting trained on how to introduce effective interventions in schools such as those aimed at preventing substance use behaviors and suicide (Schmidt et al., 2015).

4.1. Limitations

This study has some limitations that are worth noting. First, the use of secondary data limits our ability to examine other theoretically relevant predictors that are known to influence suicidal ideation such as history of prior suicide attempt, mood disorders, bipolar disorders, and pain related factors. Also measures of socioeconomic status and family characteristics were not available in the 2017 YRBSS to be included in the analysis. Future studies should examine the effects of these factors, especially the impact of mental disorders and chronic pain on suicidal behaviors among adolescents. Second, the 2017 YBRSS made no specific mention of the type of opioid that was misused. Future studies should examine the misuse of opiates (i.e., Codeine, Vicodin, OxyContin, Hydrocodone, Percocet) and benzodiazepines such as Xanax, Valium, Ativan, and Klonopin as these are some of the common drugs linked to overdose deaths and many adolescents use these drugs to cope with mental and emotional problems. Third, the cross-sectional nature of the data limits us from making any causal claims between prescription opioid misuse and suicidal behaviors. It is possible that some adolescents may have engaged in suicidal behaviors prior to misusing prescription opioids. A study utilizing longitudinal design is needed to establish the temporal order between prescription opioid misuse and the onset and maintenance of suicidal behaviors. Also, longitudinal studies might help to empirically reveal how all these health risk behaviors are interrelated and what interventions might be helpful in breaking the link between substance use and suicidal behaviors among adolescents. Such studies over time can also help us understand other plausible factors related to the onset of prescription

opioid misuse and suicidal behaviors. Lastly, although nationally representative, data for this study are based on self-reports and may be subject to recall bias. However, the possibility of recall bias or false reporting was addressed in the YRBSS by screening the data for responses that conflict in logical terms (Brener et al., 2013). For instance, if a student responds to one question that he or she has never smoked but then responds to a subsequent question that he or she has smoked two cigarettes during the previous 30 days, the processing system sets both responses to missing, and data are not imputed. For instance, in the 2011 YRBSS, 179 logical edits were performed on each standard questionnaire and a total of 78 representing less than 1% of questionnaires in the national survey failed quality-control checks and therefore were excluded from the dataset (Brener et al., 2013).

5. Conclusion

In conclusion, the findings of the present study demonstrate an association between prescription opioid misuse and suicidal behaviors among adolescents. Understanding the effects of prescription opioid misuse and its association with suicidal behaviors among adolescents will contribute towards early prevention and intervention efforts that can help reduce prescription opioid misuse and its negative mental health consequences of suicidal behaviors among adolescents.

Conflict of interest declaration

The authors declare that they have no conflicts of interests with respect to the authorship and/or the publication of this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2019.02.018.

References

Anestis, M.D., 2016. Prior suicide attempts are less common in suicide decedents who died by firearms relative to those who died by other means. J. Affect. Disord. 189, 106–109.

Arria, A.M., Caldeira, K.M., Vincent, K.B., O'Grady, K.E., Cimini, M.D., Geisner, I.M., Fossos-Wong, N., 2017. Do college students improve their grades by using prescription stimulants nonmedically? Addict. Beyond Behav. 65, 245–249.

Ashrafioun, L., Bishop, T.M., Conner, K.R., Pigeon, W.R., 2017. Frequency of prescription opioid misuse and suicidal ideation, planning, and attempts. J. Psychiatr. Res. 92, 1–7.

Baiden, P., Stewart, S.L., Fallon, B., 2017. The mediating effect of depressive symptoms on the relationship between bullying victimization and non-suicidal self-injury among adolescents: Findings from community and inpatient mental health settings in Ontario. Canada. Psychiat. Res. 255, 238–247.

Baiden, P., Mengo, C., Boateng, G.O., Small, E., 2019. Investigating the association between age at first alcohol use and suicidal ideation among high school students: evidence from the youth risk behavior survey. J. Affect. Disord. 242, 60–67.

Barnhofer, T., Crane, C., Brennan, K., Duggan, D.S., Crane, R.S., Eames, C., Radford, S., 2015. Mindfulness-based cognitive therapy (MBCT) reduces the association between depressive symptoms and suicidal cognitions in patients with a history of suicidal depression. J. Consult. Clin. Psychol. 83, 1013–1020.

Behnken, M.P., Le, Y.L., Temple, J.R., Berenson, A.B., 2010. Forced sexual intercourse, suicidality, and binge drinking among adolescent girls. Addict. Behav. 35, 507–509.

Berenson, A.B., Rahman, M., 2011. Prevalence and correlates of prescription drug misuse among young, low-income women receiving public healthcare. J. Addict. Dis. 30, 203–215.

Bohnert, A.S., Ilgen, M.A., 2019. Understanding links among opioid use, overdose, and suicide. N. Engl. J. Med. 380 (1), 71–79.

Borges, G., Benjet, C., Orozco, R., Medina-Mora, M., Menendez, D., 2017. Alcohol, cannabis and other drugs and subsequent suicide ideation and attempt among young Mexicans. J. Psychiatr. Res. 91, 74–82.

Brener, N.D., Kann, L., Shanklin, S., Kinchen, S., Eaton, D.K., Hawkins, J., Flint, K.H., 2013. Methodology of the youth risk behavior surveillance system-2013. MMWR Recommen. Rep 62 (1), 1–20.

Cairns, V., Murray, C., 2015. How do the features of mindfulness-based cognitive therapy contribute to positive therapeutic change? A meta-synthesis of qualitative studies. Behav. Cognit. Psychother. 43, 342–359.

Capron, D.W., Allan, N.P., Ialongo, N.S., Leen-Feldner, E., Schmidt, N.B., 2015. The depression distress amplification model in adolescents: a longitudinal examination of anxiety sensitivity cognitive concerns, depression and suicidal ideation. J. Adolesc. 41, 17–24.

Case, A., Deaton, A., 2017. Mortality and morbidity in the 21st century. Brook. Pap. Econ. Act. 397–476 2017.

Caupp, S., Steffan, J., Shi, J., Wheeler, K.K., Spiller, H.A., Casavant, M.J., Xiang, H., 2018. Opioid drug poisonings in Ohio adolescents and young adults, 2002–2014. Clin. Toxicol. 56, 765–772.

Center for Behavioral Health Statistics and Quality, 2016. Key Substance Use and Mental Health Indicators in the United States: Results from the 2015 National Survey on Drug Use and Health (HHS Publication No. SMA 16-4984, NSDUH Series H-51). Retrieved from. http://www.samhsa.gov/data/.

Centers for Disease Control and Prevention (CDC), 2012. Vital signs: unintentional injury deaths among persons aged 0-19 years - United States, 2000-2009. MMWR-Morbid. Mortal. W. 61, 270–276.

Centers for Disease Control and Prevention (CDC), 2016. National Center for Injury Prevention and Control Welcome to WISQARS. Retrieved from. https://webappa.cdc.gov/sasweb/ncipc/leadcause.html.

Cerdá, M., Sarvet, A.L., Wall, M., Feng, T., Keyes, K.M., Galea, S., Hasin, D.S., 2018. Medical marijuana laws and adolescent use of marijuana and other substances: alcohol, cigarettes, prescription drugs, and other illicit drugs. Drug Alcohol Depend. 183, 62–68.

Chesin, M., Interian, A., Kline, A., Benjamin-Phillips, C., Latorre, M., Stanley, B., 2016. Reviewing mindfulness-based interventions for suicidal behavior. Arch. Suicide Res. 20, 507–527.

Cook, N.R., 2008. Statistical evaluation of prognostic versus diagnostic models: beyond the ROC curve. Clin. Chem. 54, 17–23.

Divin, A.L., Zullig, K.J., 2014. The association between non-medical prescription drug use and suicidal behavior among United States adolescents. AIMS Public Health 1, 226–240.

Forkmann, T., Wichers, M., Geschwind, N., Peeters, F., van Os, J., Mainz, V., Collip, D., 2014. Effects of mindfulness-based cognitive therapy on self-reported suicidal ideation: results from a randomised controlled trial in patients with residual depressive symptoms. Compr. Psychiatr. 55, 1883–1890.

Freedenthal, S., Vaughn, M.G., Jenson, J.M., Howard, M.O., 2007. Inhalant use and suicidality among incarcerated youth. Drug Alcohol Depend. 90, 81–88.

Gallagher, M., Prinstein, M.J., Simon, V., Spirito, A., 2014. Social anxiety symptoms and suicidal ideation in a clinical sample of early adolescents: examining loneliness and social support as longitudinal mediators. J. Abnorm. Child Psychol. 42, 871–883.

Garland, E.L., Pettus-Davis, C., Howard, M.O., 2013. Self-medication among traumatized youth: structural equation modeling of pathways between trauma history, substance misuse, and psychological distress. J. Behav. Med. 36, 175–185.

Garland, E.L., Roberts-Lewis, A., Tronnier, C.D., Graves, R., Kelley, K., 2016. Mindfulness-oriented recovery enhancement versus CBT for co-occurring substance dependence, traumatic stress, and psychiatric disorders: proximal outcomes from a pragmatic randomized trial. Behav. Res. Ther. 77, 7–16.

Garlow, S.J., Purselle, D.C., Heninger, M., 2007. Cocaine and alcohol use preceding suicide in African American and white adolescents. J. Psychiatr. Res. 41, 530–536.

Garnier-Dykstra, L.M., Caldeira, K.M., Vincent, K.B., O'Grady, K.E., Arria, A.M., 2012. Nonmedical use of prescription stimulants during college: four-year trends in exposure opportunity, use, motives, and sources. J. Am. Coll. Health 60, 226–234.

Gart, R., Kelly, S., 2015. How illegal drug use, alcohol use, tobacco use, and depressive symptoms affect adolescent suicidal ideation: a secondary analysis of the 2011 youth risk behavior survey. Issues Ment. Health Nurs. 36, 614–620.

Gini, G., Espelage, D.L., 2014. Peer victimization, cyberbullying, and suicide risk in children and adolescents. JAMA Pediatr 312, 545–546.

Guo, L., Huang, Y., Xu, Y., Huang, G., Gao, X., Lei, Y., Luo, M., 2018. The mediating effects of depressive symptoms on the association of childhood maltreatment with non-medical use of prescription drugs. J. Affect. Disord. 229, 14–21.

Havens, J.R., Young, A.M., Havens, C.E., 2011. Nonmedical prescription drug use in a nationally representative sample of adolescents: evidence of greater use among rural adolescents. Arch. Pediatr. Adolesc. Med. 165, 250–255.

Heck, N.C., Livingston, N.A., Flentje, A., Oost, K., Stewart, B.T., Cochran, B.N., 2014. Reducing risk for illicit drug use and prescription drug misuse: high school gay-straight alliances and lesbian, gay, bisexual, and transgender youth. Addict. Behav. 39, 824–828.

Holt, M.K., Vivolo-Kantor, A.M., Polanin, J.R., Holland, K.M., DeGue, S., Matjasko, J.L., Wolfe, M., 2015. Bullying and suicidal ideation and behaviors: a meta-analysis. Pediatrics 135, e496–e509.

Jeffers, A.J., Benotsch, E.G., Green, B.A., Bannerman, D., Darby, M., Kelley, T., Martin, A.M., 2015. Health anxiety and the non-medical use of prescription drugs in young adults: a cross-sectional study. Addict. Behav. 50, 74–77.

Johnson, K.M., Fibbi, M., Langer, D., Silva, K., Lankenau, S.E., 2013. Prescription drug misuse and risk behaviors among young injection drug users. J. Psychoact. Drugs 45, 112–121.

Johnston, L.D., Miech, R.A., O'Malley, P.M., Bachman, J.G., Schulenberg, J.E., Patrick, M.E., 2018. Monitoring the Future National Survey Results on Drug Use: 1975-2017: Overview, Key Findings on Adolescent Drug Use. Institute for Social Research, The University of Michigan, Ann Arbor. http://www.monitoringthefuture.org/pubs/monographs/mtf-overview2017.pdf.

Jones, C.M., McAninch, J.K., 2015. Emergency department visits and overdose deaths from combined use of opioids and benzodiazepines. Am. J. Prev. Med. 49 (4), 493–501.

Kann, L., McManus, T., Harris, W.A., Shanklin, S.L., Flint, K.H., Hawkins, J., Queen, B., 2016. Youth risk behavior surveillance—United States, 2015. MMWR-Morbid. Mortal. W. 65, 1–174.

Kann, L., McManus, T., Harris, W.A., Shanklin, S.L., Flint, K.H., Queen, B., ... Ethier, K.A., 2018. Youth risk behavior surveillance - United States, 2017. MMWR Surveill Summ

67 (8), 1–114.
Koenig, J., Oelkers-Ax, R., Parzer, P., Haffner, J., Brunner, R., Resch, F., Kaess, M., 2015. The association of self-injurious behaviour and suicide attempts with recurrent idiopathic pain in adolescents: evidence from a population-based study. Child Adol. Psych. Men. 9, 32. https://doi.org/10.1186/s13034-015-0069-0.
Lubell, K., Swahn, M., Crosby, A., Kegler, S., 2004. Methods of suicide among persons aged 10-19 years-United States, 1992-2001. J. Am. Med. Assoc. 292, 427–428.
McCabe, S.E., Veliz, P.T., Boyd, C.J., Schepis, T.S., McCabe, V.V., Schulenberg, J.E., 2019. A prospective study of nonmedical use of prescription opioids during adolescence and subsequent substance use disorder symptoms in early midlife. Drug Alcohol Depend. 194, 377–385.
McCabe, S.E., West, B.T., Schepis, T.S., Teter, C.J., 2015. Simultaneous co-ingestion of prescription stimulants, alcohol and other drugs: a multi-cohort national study of US adolescents. Hum. Psychopharm. Clin. 30, 42–51.
McManama O'Brien, K.H., Becker, S.J., Spirito, A., Simon, V., Prinstein, M.J., 2014. Differentiating adolescent suicide attempters from ideators: examining the interaction between depression severity and alcohol use. Suicide Life-Threat 44, 23–33.
Mitchell, S.M., Seegan, P.L., Roush, J.F., Brown, S.L., Sustaíta, M.A., Cukrowicz, K.C., 2016. Retrospective cyberbullying and suicide ideation: the mediating roles of depressive symptoms, perceived burdensomeness, and thwarted belongingness. J. Interpers Violence 33, 2602–2620.
Moon, S.S., Karlson, A., Kim, Y.J., 2015. Peer victimization and adolescent suicide: the mediating effect of risk behaviors. Child Adolesc. Soc. Work. J. 32, 257–268.
Müller, M., Vandeleur, C., Rodgers, S., Rössler, W., Castelao, E., Preisig, M., Ajdacic-Gross, V., 2015. Posttraumatic stress avoidance symptoms as mediators in the development of alcohol use disorders after exposure to childhood sexual abuse in a swiss community sample. Child Abuse Neglect 46, 8–15.
National Institute of Drug Abuse, 2018. Misuse of Prescription Drugs. Retrieved from. https://www.drugabuse.gov/publications/research-reports/misuse-prescription-drugs/summary.
Oviedo-Joekes, E., Marchand, K., Guh, D., Marsh, D.C., Brissette, S., Krausz, M., ... Schechter, M.T., 2011. History of reported sexual or physical abuse among long-term heroin users and their response to substitution treatment. Addict. Beyond Behav. 36 (1–2), 55–60.
Palamar, J.J., Le, A., Mateu-Gelabert, P., 2018. Not just heroin: extensive polysubstance use among US high school seniors who currently use heroin. Drug Alcohol Depend. 188, 377–384.
Posner, K., Oquendo, M.A., Gould, M., Stanley, B., Davies, M., 2007. Columbia classification algorithm of suicide assessment (C-CASA): classification of suicidal events in the FDA's pediatric suicidal risk analysis of antidepressants. Am. J. Psychiatry 164, 1035–1043.
Reed, K.P., Nugent, W., Cooper, R.L., 2015. Testing a path model of relationships between gender, age, and bullying victimization and violent behavior, substance abuse, depression, suicidal ideation, and suicide attempts in adolescents. Child. Youth Serv. Rev. 55, 128–137.
Roberts, N., Axas, N., Nesdole, R., Repetti, L., 2016. Pediatric emergency department visits for mental health crisis: prevalence of cyber-bullying in suicidal youth. Child Adolesc. Soc. Work. J. 33, 469–472.
Rodelli, M., De Bourdeaudhuij, I., Dumon, E., Portzky, G., DeSmet, A., 2018. Which healthy lifestyle factors are associated with a lower risk of suicidal ideation among adolescents faced with cyberbullying? Prev. Med. 113, 32–40.
Romanowicz, M., O'Connor, S.S., Schak, K.M., Swintak, C.C., Lineberry, T.W., 2013. Use of the suicide status form-II to investigate correlates of suicide risk factors in psychiatrically hospitalized children and adolescents. J. Affect. Disord. 151, 467–473.
Santerre-Baillargeon, M., Vézina-Gagnon, P., Daigneault, I., Landry, T., Bergeron, S., 2017. Anxiety mediates the relation between childhood sexual abuse and genito-pelvic pain in adolescent girls. J. Sex Marital Ther. 43, 774–785.
Schepis, T.S., Teter, C.J., McCabe, S.E., 2018. Prescription drug use, misuse and related substance use disorder symptoms vary by educational status and attainment in US adolescents and young adults. Drug Alcohol Depend. 189, 172–177.
Schepis, T.S., Simoni-Wastila, L., McCabe, S.E., 2019. Prescription opioid and benzodiazepine misuse is associated with suicidal ideation in older adults. Int. J. Geriatr. Psychiatry 34 (1), 122–129.
Schmidt, R.C., Iachini, A.L., George, M., Koller, J., Weist, M., 2015. Integrating a suicide prevention program into a school mental health system: a case example from a rural school district. Child. Sch. 37 (1), 18–26.
Schulenberg, J.E., Johnston, L.D., O'Malley, P.M., Bachman, J.G., Miech, R.A., Patrick, M.E., 2018. Monitoring the Future National Survey Results on Drug Use, 1975-2017. Volume II, College Students & Adults Ages 19-55. Institute for Social Research.
Segal, Z.V., Williams, J.M.G., Teasdale, J.D., 2002. Mindfulness-based Cognitive Therapy for Depression: A New Approach to Preventing Relapse. Guilford Press, New York, NY.
Seth, P., Scholl, L., Rudd, R.A., Bacon, S., 2018. Overdose deaths involving opioids, cocaine, and psychostimulants - United States, 2015-2016. Am. J. Transplant. 18 (6), 1556–1568.
Shulman, B., Dueck, R., Ryan, D., Breau, G., Sadowski, I., Misri, S., 2018. Feasibility of a mindfulness-based cognitive therapy group intervention as an adjunctive treatment for postpartum depression and anxiety. J. Affect. Disord. 235, 61–67.
Stanley, I.H., Hom, M.A., Rogers, M.L., Anestis, M.D., Joiner, T.E., 2017. Discussing firearm ownership and access as part of suicide risk assessment and prevention: "means safety" versus "means restriction". Arch. Suicide Res. 21 (2), 237–253.
Stewart, J.G., Kim, J.C., Esposito, E.C., Gold, J., Nock, M.K., Auerbach, R.P., 2015. Predicting suicide attempts in depressed adolescents: clarifying the role of disinhibition and childhood sexual abuse. J. Affect. Disord. 187, 27–34.
Stewart, S.L., Baiden, P., den Dunnen, W., 2013. Prescription medication misuse among adolescents with severe mental health problems in Ontario, Canada. Subst. Use Misuse 48, 404–414.
Substance Abuse and Mental Health Services Administration, 2017. Key Substance Use and Mental Health Indicators in the United States: Results from the 2016 National Survey on Drug Use and Health (HHS Publication No. SMA 17-5044, NSDUH Series H-52). Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, Rockville, MD Retrieved from. https://store.samhsa.gov/system/files/sma17-5044.pdf.
Teesson, M., Farrugia, P., Mills, K., Hall, W., Baillie, A., 2012. Alcohol, tobacco, and prescription drugs: the relationship with illicit drugs in the treatment of substance users. Subst. Use Misuse 47, 963–971.
Tomek, S., Hooper, L.M., Church, W.T., Bolland, K.A., Bolland, J.M., Wilcox, K., 2015. Relations among suicidality, recent/frequent alcohol use, and gender in a black American adolescent sample: a longitudinal investigation. J. Clin. Psychol. 71, 544–560.
Underwood, M.K., Ehrenreich, S.E., 2017. The power and the pain of adolescents' digital communication: cyber victimization and the perils of lurking. Am. Psychol. 72, 144–158.
Upadhyaya, H.P., Kroutil, L.A., Deas, D., Durell, T.M., Van Brunt, D.L., Novak, S.P., 2010. Stimulant formulation and motivation for nonmedical use of prescription Attention-Deficit/Hyperactivity disorder medications in a College-Aged population. Am. J. Addict. 19 (6), 569–577.
van der Velden, A.M., Kuyken, W., Wattar, U., Crane, C., Pallesen, K.J., Dahlgaard, J., Fjorback, L.O., 2015. A systematic review of mechanisms of change in mindfulness-based cognitive therapy in the treatment of recurrent major depressive disorder. Clin. Psychol. Rev. 37, 26–39.
Vervoort, T., Logan, D.E., Goubert, L., De Clercq, B., Hublet, A., 2014. Severity of pediatric pain in relation to school-related functioning and teacher support: an epidemiological study among school-aged children and adolescents. Pain 155, 1118–1127.
Wang, J., Xu, Y., Guo, L., Deng, J., Huang, J., Huang, G., Gao, X., 2017. The mediating effects of depressive symptoms and sleep quality on the relationship between the nonmedical use of prescription drugs and suicidal behaviors among Chinese adolescents. Drug Alcohol Depend. 178, 20–27.
Witek, M.W., Rojas, V., Alonso, C., Minami, H., Silva, R.R., 2005. Review of benzodiazepine use in children and adolescents. Psychiat. Quart. 76 (3), 283–296.
Yoon, Y., Cederbaum, J.A., Schwartz, A., 2018. Childhood sexual abuse and current suicidal ideation among adolescents: problem-focused and emotion-focused coping skills. J. Adolesc. 67, 120–128.
Youth Risk Behavior Surveillance System (YRBSS), 2018. 2017 YRBS Data User's Guide. Centers for Disease Control and Prevention. https://www.cdc.gov/healthyyouth/data/yrbs/pdf/2017/2017_YRBS_Data_Users_Guide.pdf.
Zullig, K.J., Divin, A.L., 2012. The association between non-medical prescription drug use, depressive symptoms, and suicidality among college students. Addict. Beyond Behav. 37, 890–899.
Zullig, K.J., Divin, A.L., Weiler, R.M., Haddox, J.D., Pealer, L.N., 2015. Adolescent non-medical use of prescription pain relievers, stimulants, and depressants, and suicide risk. Subst. Use Misuse 50, 1678–1689.