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Alcohol and marijuana use as daily predictors of suicide ideation and attempts among adolescents prior to psychiatric hospitalization

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ABSTRACT

Objective: Little research has been conducted on alcohol use, marijuana use, and suicide ideation and attempts on a daily level, and specifically among adolescents prior to inpatient hospitalization. The purpose of this study was to examine the within (over time) and between (between adolescents) effects of alcohol use and marijuana use on suicide ideation and attempts.

Methods: Participants included 50 adolescents (80% female; M_{age} = 15.8). All participants reported drinking alcohol in the prior three months and were receiving treatment in an inpatient psychiatric hospital. Random and mixed-effect models were used to test study hypotheses.

Results: Results from the random effect model indicated that alcohol use, marijuana use, hospitalization and sexual orientation were significant predictors of suicide attempts. Results from the mixed-effect model indicated that marijuana use, hospitalization, and sexual orientation were significant predictors of suicide ideation.

Conclusions: Study findings extend current knowledge about the longitudinal and day-to-day relationship between alcohol and marijuana use and suicide ideation and attempts. Results underscore the importance of addressing alcohol and marijuana use in interventions with suicidal adolescents, recognizing that sexual minority youth may be at elevated risk for suicide ideation.

1. Introduction

Suicide is the second leading cause of death among adolescents, accounting for over one in ten deaths within this age group in the United States (Kann et al., 2018). In addition, alcohol and marijuana are the two most widely used substances by adolescents with 62% of students having used alcohol (Johnston et al., 2018) and 39% having used marijuana (Kann et al., 2018) by senior year of high school. Alcohol use, marijuana use, and suicide are three pervasive preventable public health problems encountered by adolescents today (Bagge and Sher, 2008; Goldston, 2004). Although alcohol and marijuana use have been identified as risk factors for suicide (Schilling et al., 2009), the directionality of the relationship is unclear. Focusing on the vulnerable time period preceding hospitalization, we aimed to understand the role of alcohol and marijuana use over time in relation to adolescents' suicide ideation and attempts using daily data by examining the within and between effects of alcohol and marijuana use on suicide ideation and attempts.

1.1. Alcohol use and suicide among adolescents

Research has demonstrated alcohol use; both acute and chronic, is a risk factor for suicide (Schilling et al., 2009). Alcohol use can result in disinhibition of behavior and greater impulsivity, which can increase the odds of acting on suicide ideation (Bagge et al., 2013). Alcohol use can also increase risk for suicide attempts, by heightening psychological distress and impulsivity, while temporarily decreasing cognitive processing and problem-solving (Zhang and Wu, 2014). The effects of alcohol use on suicide outcomes are often long lasting. One nationally representative longitudinal study of public school attending adolescents

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showed that students who used alcohol within the past year were at an increased risk of endorsing suicide ideation in that same year (Zhang and Wu, 2014).

Acute alcohol use has been implicated as a risk factor for suicide. Bagge et al. (2014) examined the extent to which acute alcohol use was associated with suicide ideation in the hours leading up to a suicide attempt. They found that alcohol use predicted next-hour suicide ideation, suggesting that alcohol use may enhance the severity of suicide ideation and increases the odds of acting on those thoughts (Bagge et al., 2014). Other research evidence indicates that this relationship holds across racial and ethnic subgroups (Tomek et al., 2015). For instance, a longitudinal study of Black adolescents found the recency and frequency of alcohol use to be significantly positively related to suicide ideation and attempts, suggesting the timing of alcohol use may be a particularly salient predictor. When participants used alcohol as recently as the prior week, they were more likely to endorse suicide ideation and attempts than when they used alcohol in the past month, or later (Tomek et al., 2015). Although research has been conducted among adults regarding the associations of alcohol and suicide ideation and attempts, adolescent research in this area is lacking (Borges et al., 2017). Additionally, no research, to our knowledge, has examined the daily level associations between alcohol and suicide ideation and attempts among adolescents, which are needed in order to identify the timing with which alcohol confers risk for suicide thoughts and behaviors.

1.2. Marijuana use and suicide among adolescents

Although prior studies have demonstrated that marijuana use can exacerbate mental health symptoms, such as depression (Degenhardt et al., 2003), limited research has explored the relationship between marijuana and suicide. A recent meta analysis revealed that chronic marijuana use is a risk factor for suicide (Borges et al., 2016). In addition, there is some evidence of a longitudinal relationship between marijuana and suicide ideation and behaviors but the relationship may depend on factors such as the age of onset (Pedersen, 2008). One longitudinal study of adolescents found that marijuana use in early adolescence was not associated with either suicide ideation or suicide attempts (Pedersen, 2008). However, among young adults, any prior year marijuana use increased the odds of a suicide attempt (Pedersen, 2008). Additionally, when young adults reported using 11+ times, the odds of a suicide attempt were even greater (Pedersen, 2008). It is important to note, however, that Pedersen (2008) included self-harm that was possibly non-suicidal in their conceptualization of suicide attempts, and thus, we cannot be certain that marijuana use increased the risk for attempts, over and above self-harm. However, prospective analyses have suggested that individuals with early initiation of marijuana use and individuals with heavy marijuana use are at an increased risk for suicide ideation and attempts (Borges et al., 2017). Lastly, recent research has indicated that daily marijuana users report greater suicide ideation when compared to less frequent marijuana users (Buckner et al., 2017).

There is a lack of research examing acute marijuana use as a risk factor for suicide ideation or attempts. In a recent meta analysis on this topic, the authors found only one study that possibly linked acute marijuana use with suicide ideation (Borges et al., 2016). In this study, Raja and Azzoni (2009) present a case of a patient who had used marijuana a few hours prior to coming to the emergency department for suicide ideation. Additionally, toxicology screens were more likely to be positive for marijuana than for other substances among individuals who died by suicide (Eksborg and Rajs, 2008). Given the limited findings regarding marijuana use and suicide, as well as the lack of concrete conceptualization of suicide variables when examining marijuana as a risk factor, additional research is warranted.

1.3. Demographic factors and suicide ideation and attempts

Several demographic factors; including gender, ethnicity, and sexual orientation, have been associated with an increased risk for suicide ideation and attempts. To be specific, females are more likely to report suicide ideation (aOR = 1.4) and attempts (aOR = 2.2) (Mortier et al., 2018). Approximately 22.1% of school-attending females have reported suicide ideation and 9.3% have reported suicide attempts compared to 11.9 and 5.1% male students respectively (Kann et al., 2018). Latinx adolescents report suicide attempts at higher rates than their non-Latinx peers (Gulbas et al., 2015; Kann et al., 2016) and Black students (9.8%) attempt at higher rates than White students (6.1%) (Kann et al., 2018). Similarly, research has demonstrated that sexual minorities are at increased risk for suicide ideation and attempts, and have an increased risk transitioning from suicide ideation to suicide plans and suicide attempts (Mortier et al., 2018). Specifically, lesbian, gay, and bisexual youth have the highest prevalence of suicide ideation (47.7%) and attempts (23.0%) compared to their heterosexual (suicide ideation: 13.3%; suicide attempts: 5.4%) and unsure (suicide ideation: 31.8%; suicide attempts: 14.3%) peers (Kann et al., 2018).

1.4. Purpose of study

Although prior longitudinal studies suggest a relationship between alcohol use and suicide ideation and attempts, research on the relationship between marijuana use and suicide ideation and attempts is sparse. Additional research is needed given that marijuana use, suicide ideation, and suicide attempts are increasing in prevalence among adolescents. In addition, past studies have been limited in a variety of ways. First, studies often combine suicide ideation and attempts into one construct, despite scholars advocating for examining them separately (Borges et al., 2016). Second, previous research has not assessed the effects of substance use on suicide ideation and attempts in the immediate months prior to inpatient psychiatric hospitalization, which represents a vulnerable and risky time period for suicide among adolescents and is critical to study in order to inform prevention efforts (Knesper, 2010). Finally, most studies utilize retrospective aggregate data from the year prior to an attempt, or data from a few hours preceding an attempt, rather than examining these relationships on a daily level over time. As such, this study tested the daily level relationships among adolescents' alcohol and marijuana use and suicide ideation and attempts by retrospectively assessing the presence of these variables in the three months prior to inpatient psychiatric hospitalization.

The purpose of this study was two-fold; first, to examine the within and between effects of alcohol and marijuana use on suicide ideation, and second, to examine the within and between effects of alcohol and marijuana use on suicide attempts. Our study, which used a high-risk sample of psychiatrically hospitalized suicidal adolescents who drink alcohol, was guided by four hypotheses. First, alcohol use on a given day would increase the odds of suicide ideation and suicide attempts on the same day. Second, alcohol use would increase the odds of suicide ideation and attempts over time. Third, considering the combined effect with alcohol use, marijuana use on a given day would increase the odds of suicide ideation and attempts on that same day. Finally, considering the combined effect with alcohol use, marijuana use would increase the odds of suicide ideation and attempts over time.

2.0. Methods

2.1. Participants

This study used data from a pilot trial that tested the feasibility and acceptability of a brief motivational enhancement intervention for alcohol use for adolescents who were hospitalized for a suicidal event and who reported past month alcohol use (McManama O'Brien et al., 2017). Participants were recruited from the inpatient psychiatric unit of an

Table 1
Descriptive statistics for time-invariant and time varying variables.

Time-invariant variables	*% (n)/M(SD)*	
Gender		
Male	20% (10)	
Female	80% (40)	
Sexual Orientation		
Sexual Minority	32% (16)	
Heterosexual	68% (34)	
Race		
White	68% (34)	
Non-White	32% (16)	
Ethnicity		
Hispanic/Latino	22% (11)	
Non Hispanic/Latino	78% (39)	
Age	15.8 (0.94)	
Time-Varying Variables	*Between%*	*Within%*
Suicide Attempts	70% (35)	3.49%
Suicide Ideation	100% (50)	34.50%
Alcohol Use	100% (50)	8.80%
Marijuana Use	82.00% (41)	20.14%
Hospitalization	82.00% (41)	5.15%

urban general hospital in the northeastern United States. To be eligible for the study, participants must have had a suicide plan or attempt precipitating the hospitalization, endorsed past month alcohol use, been between the ages of 13–17, and been able to speak and understand English. Adolescents who were experiencing active psychosis or who were in the custody of the state were excluded. The study was approved by the overseeing hospital's Institutional Review Board and all participants provided informed assent/consent.

Participants included a sample of 50 adolescents (80% female; 20% male; M_{age} = 15.8 SD = 0.95) who ranged in age from 14–17 years old. The majority of participants identified as White (68%), Non-Hispanic or Latino (78%), and heterosexual (68%). Table 1 provides demographic information for the sample.

2.2. Measures

All data were collected through face-to-face interviews during the adolescents' stay on the inpatient psychiatric unit. A modified version of the Timeline Followback Calendar (TLFB; Sobell and Sobell, 1992) was used to record the frequency of alcohol use (1 = drank that day, 0 = did not drink that day), marijuana use (1 = used marijuana that day, 0 = did not use marijuana that day), and suicide ideation (1 = suicide ideation on that day, 0 = no suicide ideation on that day) and attempts (1 = suicide attempt on that day, 0 = no attempt on that day) over the 90-day period prior to inpatient hospitalization. This data is retrospective and longitudinal. The TLFB calendar provides a retrospective report of alcohol use over the past three months by using the calendar as a trigger to remember specific incidences of substance use and suicide related thoughts and behaviors. Previous studies have shown that the TLFB has yielded high test-retest reliability (Sobell and Sobell, 1992). Age, gender (1 = male, 0 = female), race (1 = White, 0 = Non White), ethnicity (1 = Hispanic or Latino, 0 = Non Hispanic or Latino), sexual orientation (1 = heterosexual, 0 = sexual minority), and hospitalizations (1 = hospitalized on that day, 0 = not hospitalized on that day) were included as control variables. Age was grand mean centered.

2.3. Analytic approach

Data was managed and analyzed using STATA 15. Longitudinal analyses were conducted to examine the predictors of suicide ideation and suicide attempts in the 90 days prior to inpatient hospitalization. Panel data analysis was chosen over conventional logistic regression in order to take into account dependency within each participant (Rabe-Hesketh and Skrondal, 2012).

First, to predict suicide attempts from alcohol use and marijuana use, while controlling for age, race, ethnicity, sexual orientation, and hospitalization, a random effect model was performed. We modeled the coefficients using both the between and within information. The Hausman test indicated that the within and between effects were the same, and thus they were estimated together ($\chi^2 = 2.31$, $p = 0.51$).

Second, to predict suicide ideation from alcohol and marijuana use, while controlling for age, race, ethnicity, sexual orientation, and hospitalization, a mixed effect model (i.e., growth curve model) was performed. In this model, we allowed the coefficients themselves to vary across units. Results indicated that alcohol use had a random intercept ($z = 2.41$, $p < 0.05$), while all other time-varying variables had a fixed intercept.

3. Results

3.1. Univariate results for time-varying variables

3.1.1. Suicide ideation and attempts

All participants in this study endorsed suicide ideation on at least one day in the 90 days prior to inpatient hospitalization. Participants reported suicide ideation on 31.02 days of the 90 days (34.54%). For that same 90-day period, 70% of individuals had a suicide attempt on at least one day. On average, they attempted suicide on 1.8 days (2%) of the 90 days prior to inpatient hospitalization.

3.1.2. Alcohol and marijuana use

Because this study used a sample from an alcohol intervention study, all participants reported alcohol use on at least one day in the 90 days prior to inpatient hospitalization. Participants drank, on average, 8.1 days (9%) during that 90-day period prior to inpatient hospitalization. At the same time, 100% of the participants had at least one day where they did not drink, and did not drink for an average of 82 (91.20%) out of the 90 days. During that same 90-day period, the majority of participants (82%) used marijuana on at least one day and on average, they used 15.3 days (17% of the 90 days). In addition, 98% of the sample had at least one day with no marijuana use and did not use marijuana for about 76.5 days (85%) of the 90 days prior to hospitalization. These findings indicate that approximately 18% of the sample did not use marijuana at all during the entire 90 days prior to inpatient hospitalization. Descriptive statistics for time varying and time invariant study variables can be found in Table 1.

3.2. Unconditional models and intraclass correlations

Before running the longitudinal models, intraclass correlations (ICCs) were calculated for the unconditional models for each outcome to examine the proportion of variance accounted at the individual level. The ICCs for the unconditional models for suicide attempts and suicide ideation were 0.34 and 0.63, respectively. This indicates that 34%–63% of the variance in outcome measures were accounted for by the grouping structure of the data. For the suicide attempt model the proportion of variance at the second level indicated poor reliability; for the suicide ideation model, the ICC indicated a moderate to good reliability, confirming the need to account for the nested structure of our data. We decided to take into account the nested structure in both outcomes, as its omission would introduce bias.

3.3. Mixed effect for suicide ideation

The results of the model that tested the predictors of suicide ideation prior to inpatient hospitalization are presented in Table 3. In this model, there were 4497 observations nested within 50 participants. The model was statistically significant (Wald Chi^2 = 31.07, $p < 0.001$), suggesting that the odds of endorsing suicide ideation on a given day

Table 2
Random effect model of suicide attempts on alcohol and marijuana use.

Variable	Coefficient	Odds ratio
Alcohol Use	1.00 (0.45)	2.71*
Marijuana Use	0.66 (0.21)	1.94**
Hospitalization	4.54 (0.44)	93.79***
Age (mean)	0.01 (0.30)	1.00
Ethnicity (Hispanic/Latino)	0.93 (0.65)	2.52
Race (Non-White)	−0.97 (0.58)	0.38
Sexual Orientation (Sexual Minority)	1.27 (0.60)	3.56*
Gender (Female)	1.33 (0.75)	3.77
Goodness of Fit		
AIC	546.24	
BIC	610.35	
ICC	0.34	

Note: Standard errors in parenthesis; AIC = akaike information criterion; BIC = Bayesian information criterion; ICC = intraclass correlation coefficient.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

during the 90 days prior to inpatient hospitalization can be predicted from the independent variables. In addition, the independent variables increased the odds of endorsing suicide ideation over time. In this model, there was a random intercept for alcohol use, indicating that the effect of alcohol varies across individuals. Moreover, in this model, alcohol, age, ethnicity, race, and gender were not significant predictors. However, marijuana use, hospitalization, and sexual orientation were statistically significantly predictive of suicide ideation ($p < 0.05$). To be specific, when controlling for all other variables, the odds of endorsing suicide ideation on a given day increased by 48% (OR = 1.48, $p < 0.01$, CI = [1.14, 1.92]) when an individual used marijuana. Similarly, the use of marijuana increased the odds of suicide ideation over time. For youth who identified as a sexual minority, the odds of endorsing suicide ideation decreased by 89% (OR = 0.11, $p < 0.01$, CI = [0.03, 0.46]).

3.4. Random effect model for suicide attempts

The results of the model that tested the predictors of suicide attempts prior to inpatient hospitalization are presented in Table 2. In this model, there were 4497 observations nested within 50 participants. The model was statistically significant (Wald Chi^2 = 114.20, $p < 0.001$), suggesting that the odds of attempting suicide on a given day during the 90 days prior to inpatient hospitalization can be predicted from the independent variables, and the independent variables increased the odds of a suicide attempt over time. In this model, age, ethnicity, race, and gender were not significant predictors. However, alcohol use, marijuana use, hospitalization, and sexual orientation were significant predictors of suicide attempts ($p < 0.05$). To be specific, when controlling for all other variables, the odds of attempting suicide on a given day increased by 171% (OR = 2.71, $p < 0.05$, CI = [1.12, 6.59]) on a day when an individual used alcohol and by 94% (OR = 1.94, $p < 0.01$, CI = [1.27, 2.95]) on a day when they used marijuana. When participants used alcohol or marijuana, the odds of attempting suicide increased over time. Participants who identified as LGBQ were 2.56 times more likely to attempt suicide on any given day (OR = 3.56, $p < 0.05$, CI = [1.09, 11.61]).

Table 3
Mixed effect model of suicide ideation on alcohol and marijuana use.

Variable	Coefficient	Odds Ratio
Fixed effects		
Alcohol Use	0.19 (0.30)	1.21
Marijuana Use	0.39 (0.13)	1.48**
Hospitalization	0.62 (0.22)	1.86**
Age (mean)	−0.17 (0.36)	0.84
Ethnicity (Hispanic/Latino)	0.56 (0.84)	1.75
Race (Non-White)	−0.86 (0.76)	0.42
Sexual Orientation (Sexual Minority)	−2.22 (0.74)	0.11**
Gender (Female)	−0.63 (0.84)	0.53
Intercept	1.63 (1.07)	5.08
Random Effects		
Variance (Alcohol Use)	2.00 (0.05)**	
Variance (Intercept)	5.53 (1.31)***	
Goodness of Fit		
AIC	3545.90	
BIC	3617.42	
ICC	0.63	

Note: Standard errors in parenthesis.
*$p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

4. Discussion

Alcohol use, marijuana use, and suicide ideation and attempts represent critical independent, yet interrelated, public health problems among adolescents. Results from this study demonstrated that for suicidal adolescents who drink alcohol, using alcohol or marijuana in the three months preceding psychiatric hospitalization increased the odds of a suicide attempt on that same day and over time. Using retrospective longitudinal data, we also found that marijuana use, but not alcohol use, increased the odds that an adolescent would endorse suicide ideation that same day and over time. In addition, identifying as a sexual minority adolescent increased the odds of a suicide attempt, but decreased the odds of suicide ideation, in our study.

There are a variety of possible explanations for our findings. Consistent with previous research, our study found that alcohol use on a given day increased the odds that the adolescent would attempt suicide on that same day. Research has demonstrated that alcohol use increases central brain mechanisms related to behavioral activation (Bagge and Sher, 2008), which may explain why alcohol increased risk for a suicide attempt, but not suicide ideation. Similarly, alcohol use increases impulsivity while simultaneously decreasing the ability to problem-solve (Zhang and Wu, 2014). Although we did not empirically test mechanisms of change, it is possible that alcohol use activated risky behaviors, increased impulsivity, and decreased problem-solving abilities, putting adolescents at increased risk for a suicide attempt. Given our findings, future research is needed that directly tests mechanisms of suicidal behaviors with regard to impulsivity, behavioral activation, and problem-solving.

The results of our study add to the dearth of research on marijuana and suicide risk. Our results demonstrate that marijuana use not only confered risk for suicide attempts, but also for suicide ideation. Because this finding was not true for alcohol use, our findings suggest that substances may have differential effects on suicide ideation and behaviors, and should not be treated as having the same effect. It is possible that this finding may not have to do solely with marijuana itself, but instead be better explained as the use of marijuana as an additional substance combined with alcohol, particularly because our sample consisted of adolescents who reported drinking alcohol at least once in the past month. Prior research supports polysubstance use as conferring added risk, as one study found that each substance used increased the odds of sucide ideation among high school attending adolescents (Wong et al., 2013). Similarly, Borges et al. (2000) found that when individuals use one substance (compared to none), they are 2.6 times more likely to attempt suicide, and 1.6 times more likely to endorse suicide ideation, and when they use two substances, the odds of suicide ideation and attempts significantly increase (Borges et al., 2000).

Our findings should be considered in the context of the self-medication hypothesis, which posits that individuals use substances to cope with distress (Khantzian, 1997). The use of marijuana to cope with suicide ideation may be one mechanism which contributed to increased

risk for suicide attempts in our study. Adolescents may have used marijuana to cope with distressing feelings, and in turn, marijuana exacerbated these distressing feelings, rather than alleviating them as intended (Khantzian, 1997), leading to an increased risk for suicide attempt in our sample.

The differential findings related to the risk for suicide ideation and attempts among sexual minority participants in our study warrant further exploration. Understanding how alcohol confers risk for suicide ideation and attempts in this population is critical, as sexual minority and questioning adolescents are much more likely to drink alcohol than their heterosexual peers, with a comprehensive review suggesting sexual minority adolescents are about 2 times more likely to drink alcohol, with bisexual adolesents as much as 4 times more likely to drink alcohol (Marshal et al., 2009). In a study on marijuana use, sexual minority adolescents were 1.56 times more likely to report using marijuana within a 30-day period, and 2.58 times more likely to report lifetime marijuana use, compared to their heterosexual counterparts (Marshal et al., 2009). With respect to suicide risk, it is unclear why in this study, sexual minority participants were more likely to attempt suicide but less likely to endorse suicide ideation. This finding of sexual minority participants as less likely to endorse suicide ideation was surprising because previous research has found suicide ideation to be higher among sexual minority individuals (Ploderl et al., 2013). However, it is important to consider this finding in the specific context of our clinical sample, where identifying as a sexual minority may not be a risk factor relative to their cisgender peers, as it is for the general population. This finding should also be considered in the context of the social and political climate from which the sample was recruited. Specifically, one study found almost no sexual minority health disparities in suicide ideation among adolescents living in regions with the most protective school climates (Hatzenbuehler et al., 2014). Because our sample was drawn from a northeastern city situated within a fairly liberal region, it is possible that adolescents from our study have not encountered the same hostile school environments as students in less accepting regions.

Taken together, the findings of this study have important implications for future research, policy, and practice. With regards to future research, researchers should consider analyzing the dynamic nature of alcohol and other drug use. Rather than utilizing aggregate information on alcohol and other drug use (for example, how many days in the past month or year an adolescent used substances), researchers should consider more fine-grained analysis at the daily level. A single indicator for alcohol and other drug use will not capture the changes in an individuals' use over time, nor will it capture the specific time frames for which this use confers risk for suicide thoughts and behaviors. Having the ability to identify when and how alcohol and other drug use confers risk for suicide thoughts and behaviors will enable clinicians to develop appropriate and time responsive interventions.

With regards to policy, research has demonstrated that restrictive alcohol policies reduce underage alcohol use, and also indirectly reduce suicide among the general population (Xuan et al., 2016). Consequently, restrictive alcohol policies may be one potential mechanism through which underage alcohol use can be reduced, and ultimately, suicide ideation and attempts. Similarly, findings from this study suggest attention to the shifting marijuana policies is needed. At present, 23 states have legalized medical marijuana and 8 states have legalized recreational marijuana ("State Marijuana Laws in 2018 Map," 2018). Among youth, perceived harmfulness of marijuana use decreased following legalization of recreational marijuana and use itself tends to increase (Cerdá et al., 2017). This is particularly important as shifting marijuana policies may pose a profound effect towards both underage marijuana use, and ultimately risk for suicide ideation and attempts, among at-risk adolescents.

With regards to practice implications, it is imperative that clinicians are aware of the fast pace with which alcohol and marijuana use can increase the odds of a suicide attempt, and therefore must incorporate the assessment and management of substance use with all suicidal adolescents. For those adolescents who demonstrate chronic substance use and suicidality, there exist empirically supported treatments that target both problems in an integrated manner (e.g., I-CBT; Esposito-Smythers et al., 2011). Clinicians who work with suicidal adolescents should learn such protocols and implement them in practice. This study adds to our understanding of substance use as a risk factor by finding that alcohol by finding that alcohol and marijuana use on any given day increases the odds of attempting suicide on that same day. As such, therapeutic approaches and empirically supported interventions that highlight and address this relationship for adolescents are sorely needed.

Although the current study adds to the literature by examining the longitudinal and day-to-day associations between alcohol and marijuana use and suicide ideation and attempts, there are limitations that must be considered when interpreting findings. Limitations include retrospective self-report data with a small sample, as well as the fact that our sample was predominantly female, white, and heterosexual, which limits our ability to generalize findings to more diverse populations. Although data on mental health diagnostics were not available for this study, future research should consider examining the effects of mental health factors on the relationships between substance use and suicide ideation and attempts. In addition, findings from this study should be interpreted specifically for the population from which the sample was drawn - psychiatrically hospitalized suicidal adolescents who drink alcohol. Despite these limitations, this study has several strengths, including the use of longitudinal data with 90 time points at the daily level collected from a population at high risk for suicide. In sum, findings from this study contribute to the evidence of alcohol use as an acute risk factor for adolescent suicide attempts, and marijuana use as an acute risk factor for suicide ideation and attempts. Results underscore the importance of addressing alcohol and marijuana use in interventions with suicidal adolescents.

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Supplementary materials

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