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Adolescents with better mental health have less problem alcohol use six months later

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Abstract

Purpose: Adolescents who report having mental health problems, including depression and anxiety, are at greater risk of alcohol use. We examined the longitudinal association between mental health and alcohol use six months later in a diverse adolescent sample attending a primary care appointment. The primary care setting provides a unique opportunity to reach this younger age group and address risk factors, including mental health problems and substance use.

Methods: Adolescents aged 12–18 ($n = 668$) recruited from waiting rooms at four primary care clinics in Los Angeles, California and Pittsburgh, Pennsylvania completed a baseline web-based survey (April 2013 to November 2015) and another survey six months later. Bivariate analysis and multi-variable regression assessed associations between baseline mental health and 6-month alcohol use outcomes (any use, heavy use, and maximum quantity).

Results: Adolescents were stratified by mental health scores using the Mental Health Inventory-5 (MHI-5) cut off at baseline. In unadjusted analyses of alcohol outcomes at six months, adolescents with more mental health problems reported higher alcohol use across all three measures ($p < .01$ for heavy use; $p < .05$ for any use and maximum quantity used). Adolescents' reports of better mental health at baseline were associated with fewer heavy drinking episodes ($p < .05$) and lower

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Contributors

LM: Study design, data analysis, data interpretation, and manuscript preparation.

RS: Data analysis, data interpretation, and manuscript preparation.

BS: Study conceptualization/design, data interpretation, and manuscript preparation.

LP: Statistical analysis, data interpretation, and manuscript preparation.

WS: Study conceptualization/design; data interpretation, and manuscript preparation.

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Conflict of interest

The authors declare that they have no competing interests or conflicts.

Trials registration

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maximum number of drinks ($p < .05$) at six months, after adjusting for baseline alcohol use, intervention group, site, and demographic characteristics.

Conclusions: Addressing mental health in primary care may be important for decreasing alcohol problems in adolescents. Strategies for facilitating screening and intervention with adolescents at-risk of alcohol use are warranted.

Keywords

Adolescents; Mental health; Alcohol use; Primary care

1. Introduction

Adolescents who report having mental health problems, including depression (Asarnow et al., 2014) and anxiety (Zehe, Colder, Read, Wiczorek, & Lengua, 2013) are at greater risk for problematic alcohol use. A U.S. nationally representative sample of 10,123 adolescents aged 13–18 from the National Comorbidity Survey-Adolescent Supplement (NCS-A) found high rates of alcohol use in adolescents with any prior lifetime mental health disorder (10.3%), any mood disorder (13.9%), and any anxiety disorder (17.3%) (Conway, Swendsen, Husky, He, & Merikangas, 2016); however, few studies have examined these associations longitudinally among a racially and ethnically diverse sample of adolescents.

Medical visits provide an optimal but underutilized opportunity to screen adolescents and address risk factors, including mental health symptoms and substance use (D'Amico et al., 2016). This short communication focuses on whether having more mental health symptoms was an indicator of risk for future alcohol use in a large diverse sample of adolescents attending a primary care (PC) appointment.

2. Methods

2.1. Participants and procedures

This study involved four PC clinics (one in Los Angeles, California; three in Pittsburgh, Pennsylvania). Every adolescent age 12 through 18 (inclusive) that came for an appointment during the 2.5-year study period (4/13–11/15) was asked to be in the study by survey research group staff. We obtained parental consent and assent (if under 18) or consent if 18. Youth were screened for at-risk alcohol use using the National Institute of Alcohol and Alcohol Abuse (NIAAA) screening guide (NIAAA, 2011). The screening guide consists of two questions: one about self-consumption and the other about friend consumption of alcohol. These questions are asked in a different order depending on age, with those age 12–14 asked first about friend drinking. After screening, adolescents completed a baseline web-survey from April 2013 to November 2015 and received \$25. We obtained a certificate of confidentiality; the Institutional Review Board and clinics approved procedures. Of 3309 adolescents approached; 73% ($n = 2417$) were eligible. Reasons for ineligibility included not being in the required age range, not speaking English, not being at the clinic for a scheduled appointment, and having a disability. The refusal rate was 18.5% ($n = 614$) resulting in 1803 adolescents consenting to be contacted. Of the 1803 adolescents, 230 did not complete the baseline survey within the field period or had unreliable contact information. The final

enrolled sample included 1573 adolescents. The NIAAA screener identified 294 patients as at-risk who were randomized to either an intervention ($n = 153$) or usual care ($n = 141$). Follow-up (by email or text) was attempted for all at-risk adolescents at six months after baseline. The 1279 adolescents identified as low-risk were not assigned to any intervention; follow-up was attempted at six months using a Web survey for a random subsample (41% of low-risk adolescents; $n = 518$). Of the 812 adolescents for whom a 6-month follow-up was attempted, 668 completed the survey (82% retention rate overall; 239 (81%) for at-risk adolescents and 428 (83%) for low-risk adolescents) and received \$50. More details about the randomized controlled trial can be found in (authors redacted) (D'Amico et al., 2016) (D'Amico, Parast, Shadel, Meredith, & Seelam, 2018). This paper focuses on the 668 at-risk and low risk adolescents who completed both the baseline and 6-month survey.

2.2. Measures

We examined three well-established alcohol outcome measures (Ellickson, McCaffrey, Ghosh-Dastidar, & Longshore, 2003; Johnston, M, Bachman, & Schulenberg, 2011). For *any alcohol use* and *heavy alcohol use*, respectively, we asked: "During the past [time frame], how many times did you try or use [at least one full drink of alcohol] [5 or more drinks]?" Time frames were past year at baseline, and past 3 months at 6-month follow up. The 6-point response scale (0 = "Never" to 5="More than 20 times") was rescaled to a pseudo-continuous variable ranging from 0 to 20 using the mid-point of any range as the new value (e.g. 3–10 times was recoded as 6.5 times). To assess *maximum quantity of alcohol* in the past 30 days, respondents were asked "What is the largest number of drinks that you've had on any day in the past 30 days?" at each time point. Respondents could enter a number from 1 to 15.

Our independent variable was mental health using the well-validated 5-item Mental Health Inventory (MHI-5) (Berwick et al., 1991). Respondents indicated frequency for five feelings (e.g., feeling nervous, downhearted and blue) during the past month on a 1–6 scale (all of the time to none of the time). Relevant items were reversed so that a higher total score (transformed to range from 0 to 100; $\alpha = 0.72$) indicated better mental health. We also created a dichotomous measure using a cut-point of 60 on that scale (Kelly, Dunstan, Lloyd, & Fone, 2008), where a score above 60 indicates better mental health.

Covariates included baseline alcohol use, age, gender, race/ethnicity, mother's education. We also controlled for randomization, derived by combining the adolescents' alcohol risk group (based on responses to screener substance use items) with the intervention indicator. If adolescents were in the at-risk group, they could have been assigned to usual care (control group) or intervention. Combining risk with intervention resulted in a 3-level indicator controlled for in all multivariate models: low risk; at-risk, enhanced usual care group; and at-risk, CHAT intervention group.

2.3. Statistical analysis

We used *t*-tests to compare alcohol use measures for individuals above the dichotomous cut-off score of 60 or above on the MHI-5 compared to individuals with MHI-5 scores lower than 60). We used ordinary least squares regression analysis to examine associations

between mental health (non-dichotomous version) and 6-month alcohol use outcomes controlling for baseline alcohol use (i.e., the baseline version of the alcohol use outcome variable used in each model), and after adjusting for covariates. In multivariable analyses, we transformed the MHI-5 scale to range from 0 to 10 to ease interpretation of regression coefficients. All models included a fixed effect for site to account for clustering within sites. We conducted multiple imputations for item-level missing data and ran regressions within each of 40 imputed datasets, pooling results across datasets (Schafer & Graham, 2002).

3. Results

Characteristics of this longitudinal sample ($n = 668$) were similar to the full enrolled sample ($n = 1573$). In addition, there were no differences between the 668 adolescents in this analysis who completed the follow-up survey compared with the 144 non-completers, with the exception that those who did not complete the 6-month survey were more likely to be in Pittsburgh. On average, adolescents were 15.6 years of age, and 57.6% of the sample was female. The sample was also similarly racially and ethnically diverse with about half Hispanic (56%), nearly a quarter Black (23.2%), and with some adolescents identifying as multiracial or of another race (6.6%). The average MHI-5 score at baseline was 67.4, above the cut-off of 60 (Table 1), with a range of about 42 points. Unadjusted alcohol outcomes at 6-months stratified by the dichotomous MHI-5 cut-off score show that those with poorer mental health reported higher use across all measures (Fig. 1, $p < .01$ for heavy use and $p < .05$ for both any use and maximum quantity).

Multivariable regression results (Table 1) show the negative association between baseline (non-dichotomous) MHI-5 and 6-month alcohol use held for heavy alcohol use and maximum quantity ($p < .05$ for each) after adjusting for baseline use and covariates. For heavy use, a 50 point increase on the MHI-5 scale (equivalent to moving from the individual with the worst mental health score in this sample to the individual with the best mental health score in this sample) was associated with nearly one less time (0.80) of heavy alcohol use (e.g. a decrease of 0.16×5) in the last 3 months and over half a drink less (0.55) with respect to maximum number of drinks consumed in a day in the past 30 days (e.g., a decrease of 0.11×5).

4. Discussion

We examined the longitudinal association between mental health and alcohol use in a racially and ethnically diverse adolescent PC sample. Poorer baseline mental health was not associated with frequency of past month drinking six months later, but was associated with frequency of heavy drinking episodes and maximum number of drinks in the past month. Thus, poorer mental health could be a trigger for increased alcohol use over time. Longitudinal findings are consistent with cross sectional national studies of adolescents (Asarnow et al., 2014; Zehe et al., 2013), and provide novel information about the association between mental health symptoms and risky alcohol use in a sample of highly diverse adolescents.

However, we note some limitations of the study. We assessed presence of symptoms, and did not have information regarding whether adolescents met diagnostic criteria, or if results would differ with a clinical population. In addition, as with many clinical studies, adolescents who were ineligible or refused to participate in the study could not be included in these analyses; thus, if there were differences in study participants vs. non-participants, results may not be completely representative. However, our representativeness is strengthened by that fact that our sample of adolescents came from two distinct cities (Los Angeles and Pittsburgh), and our six month follow-up rate for this analysis was high, at 82%. High follow-up rates strengthen data quality, but not necessarily sample representativeness. Nevertheless, because a third of the eligible patient sample refused participation, we cannot rule-out the potential that our sample is biased. While it is not unusual to recruit less than 100%, it is possible that those adolescents that participated were more or less likely to accurately report problem use. However, use rates in our sample were similar to national norms. In addition, whereas the MHI-5 has been used extensively with other longitudinal studies to predict outcomes in adolescents ranging from age 11–18 years old (D’Amico, Tucker, et al., 2016; Dunbar et al., 2018; Tucker, Troxel, Ewing, & D’Amico, 2016), we are not aware of any extensive validation studies among adolescents to support the validity of the MHI-5 scale (or any specific cut-off). Among adults, a cut-off score of 60 has been shown to have high specificity (0.94) and minimizes misclassification (Error Rate = 17.6) (Kelly et al., 2008). In this paper, we chose to use that cut-off despite the absence of validation in adolescents to illustrate the pattern of alcohol use for those with higher vs. lower scores. Future work is needed to validate the MHI-5 in adolescents generally and to determine the most valid cut-point for use with adolescents.

Previous work with the current sample indicated that although screening rates for alcohol use have been shown to be low for adolescents, those at highest risk for alcohol use were significantly more likely to be screened and referred to a mental health intervention (Meredith et al., 2018). This suggests that screening for alcohol use may identify those also needing help with mental health problems given high rates of comorbidity of alcohol problems with mental health problems common among adolescents, such as depression and anxiety conditions (Kushner, Krueger, Frye, & Peterson, 2008).

A strength of this study is that longitudinal data allowed us to assess effects of baseline mental health symptoms on alcohol use outcomes six months later, and we controlled for baseline alcohol use. However, even though we analyzed data longitudinally using a repeated measures design, we cannot rule out that level of alcohol use measured prior to the baseline assessment is what led to poorer mental health. Regardless, findings suggest that screening for mental health symptoms could identify those at risk of developing alcohol problems. One study found that adolescents with comorbid mental and substance use disorders reported more substance use problems after treatment compared with adolescents without a comorbid mental health disorder (Grella, Hser, Joshi, & Rounds-Bryant, 2001). This indicates that additional work is needed to disentangle causality of mental health problems and substance use among adolescents.

Overall, findings underscore the importance of following a positive mental health problem screen by discussing alcohol and other substance use risk as adolescents may use substances

to cope with mental health symptoms (Armstrong & Costello, 2002; Kilpatrick et al., 2000 #14). Results highlight the need to continue to remove PC barriers to screening and intervention with at-risk adolescents. Given the co-occurrence of both mental health problems and substance use risk, PC providers should consider addressing both types of risk simultaneously with their adolescent patients rather than focusing on only a single type of risk. Preventing future use of alcohol or catching these teens early on in their trajectory of alcohol use could significantly decrease the likelihood of problems later (D'Amico et al., 2018).

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HIGHLIGHTS

- Adolescents who report having mental health problems are at greater risk of alcohol-related problems.
- Medical visits provide an optimal but underutilized opportunity to screen adolescents for future risk factors.
- Adolescents' reporting better mental health had fewer heavy drinking episodes and lower maximum number of drinks at six months, after adjusting for other factors.
- Addressing mental health in primary care may be important for decreasing alcohol problems in adolescents.

Fig. 1.
Unadjusted 6-Month Alcohol Use Outcomes by Baseline Mental Health (MHI-5) Groups.

Table 1

Sample Characteristics and Unstandardized Regression Coefficients for AOD Outcomes at Six Months ($n = 668$).

Independent variables ^a	Alcohol outcome variables (Estimate (95% CI))			Alcohol max quantity (# drinks)		
	n (%) or mean (SD)	Past 3-month alcohol use (# times)	Past 3-month heavy alcohol use (# times)	Past 3-month heavy alcohol use (# times)	Alcohol max quantity (# drinks)	Alcohol max quantity (# drinks)
Intercept	-	-2.78 (-6.42, 0.87)	-2.04 (-4.73, 0.66)	-2.04 (-4.73, 0.66)	-1.36 (-3.59, 0.87)	-1.36 (-3.59, 0.87)
Baseline Use ^b	-	0.37 (0.30, 0.44)***	0.26 (0.20, 0.33)***	0.26 (0.20, 0.33)***	0.42 (0.34, 0.50)***	0.42 (0.34, 0.50)***
MHI-5 ^c	67.43 (20.19)	-0.10 (-0.27, 0.07)	-0.16(-0.30, -0.03)*	-0.16(-0.30, -0.03)*	-0.11(-0.22, -0.01)*	-0.11(-0.22, -0.01)*
Site: Pittsburgh	266 (39.82)	0.82 (-0.26, 1.90)	1.06 (0.21, 1.92)*	1.06 (0.21, 1.92)*	0.31 (-0.39, 1.00)	0.31 (-0.39, 1.00)
Site: Los Angeles	402 (60.18)	Ref	Ref	Ref	Ref	Ref
Black	155 (23.20)	-0.23 (-1.34, 0.88)	-0.09 (-0.95, 0.77)	-0.09 (-0.95, 0.77)	-0.18 (-0.88, 0.52)	-0.18 (-0.88, 0.52)
Hispanic	374 (55.99)	0.31 (-0.95, 1.56)	0.92 (-0.06, 1.90)	0.92 (-0.06, 1.90)	0.65 (-0.15, 1.45)	0.65 (-0.15, 1.45)
Multi/Other race	44 (6.59)	0.55 (-1.04, 2.15)	-0.02 (-1.23, 1.19)	-0.02 (-1.23, 1.19)	0.21 (-0.80, 1.22)	0.21 (-0.80, 1.22)
White	95 (14.22)	Ref	Ref	Ref	Ref	Ref
Age, mean (SD)	15.61 (1.86)	0.26 (0.05, 0.46)*	0.16 (0.02, 0.31)*	0.16 (0.02, 0.31)*	0.19 (0.07, 0.32)**	0.19 (0.07, 0.32)**
Female	382 (57.62)	0.13 (-0.55, 0.81)	0.29 (-0.22, 0.80)	0.29 (-0.22, 0.80)	-0.22 (-0.65, 0.21)	-0.22 (-0.65, 0.21)
Male	281 (42.38)	Ref	Ref	Ref	Ref	Ref
Mother's education: College	98 (14.85)	0.22 (-0.85, 1.29)	0.38 (-0.46, 1.21)	0.38 (-0.46, 1.21)	-0.29 (-0.95, 0.37)	-0.29 (-0.95, 0.37)
Mother's education: Some college	66 (10.00)	-0.43 (-1.65, 0.79)	0.46 (-0.47, 1.39)	0.46 (-0.47, 1.39)	-0.33 (-1.10, 0.44)	-0.33 (-1.10, 0.44)
Mother's education: High school (HS)	176 (26.67)	-0.28 (-1.16, 0.61)	-0.28 (-0.97, 0.41)	-0.28 (-0.97, 0.41)	-0.51 (-1.08, 0.06)	-0.51 (-1.08, 0.06)
Mother's education: Don't Know	115 (17.42)	-0.46 (-1.45, 0.53)	-0.18 (-0.93, 0.58)	-0.18 (-0.93, 0.58)	-0.51 (-1.14, 0.13)	-0.51 (-1.14, 0.13)
Mother's education: Less than HS school	205 (31.06)	Ref	Ref	Ref	Ref	Ref
R ²	-	0.35	0.24	0.24	0.52	0.52

* $p < .05$.

** $p < .01$.

*** $p < .001$.

^a Models included indicators to control for the effect of the sub-study intervention and alcohol use risk.

^b Baseline use is the same alcohol outcome six months before.

^c For the regressions, MHI-5 was transformed by dividing the 0–100 scale values (represented in the first column) by 10 to ease interpretation (range now 0–10) – next three columns; higher scores on the scale indicate better mental health.