

# Alcohol and Marijuana Use and Treatment Nonadherence Among Medically Vulnerable Youth

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## abstract

**BACKGROUND AND OBJECTIVE:** Adolescents face peak risks for onset and intensification of alcohol and marijuana use. However, we know little about these behaviors and their associations with knowledge or treatment adherence among chronically ill youth, a medically vulnerable group.

**METHODS:** Cross-sectional assessment of consented youth ages 9 to 18 years receiving care for asthma/cystic fibrosis, type 1 diabetes, arthritis, or inflammatory bowel disease (IBD) by using a self-administered online tool. Prevalence and correlates of risk behaviors and associations with knowledge and treatment adherence were estimated using descriptive statistics and logistic regression, controlling for demographics, mental health, and the multiclinic sampling frame.

**RESULTS:** Of 403 consented youth (75.8% response), 51.6% were girls, 75.1% were white, and average age was 15.6 years. Of high school youth, 36.5% and 12.7% reported past-year alcohol use and binge drinking, respectively; 20% reported past-year marijuana use. Among high school youth, 53.1% and 37.2% answered correctly that alcohol can interfere with their medications and laboratory tests; youth answering incorrectly were 8.53 and 4.46 times more likely to drink and binge drink, respectively ( $P$  values  $< .001$ ). Thirty-two percent and 8.3% of high school youth reported regularly forgetting or skipping their medications in the past 30 days; compared with past-year nondrinking youth, drinkers were 1.79 and 1.61 times as likely to report regularly missing or skipping medications ( $P$  values  $< .05$ ).

**CONCLUSIONS:** Alcohol and marijuana use are common among youth with chronic medical conditions. Alcohol use is associated with treatment nonadherence. Education and preventive interventions are warranted to ameliorate risk.



**WHAT'S KNOWN ON THIS SUBJECT:** Increasing percentages of youth are living with chronic medical conditions. Although adolescents face peak risks for onset and intensification of alcohol and marijuana use, we know little about these behaviors and their associations with treatment adherence among chronically ill youth.

**WHAT THIS STUDY ADDS:** This study quantifies alcohol and marijuana use behaviors among a heterogeneous sample of chronically ill youth in aggregate and by condition, and measures associations between alcohol use/binge drinking and knowledge about alcohol interactions with medications/laboratory tests and also treatment nonadherence.

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Dr Weitzman conceptualized and designed the study, designed data collection measures and protocols, supervised data collection, directed data analyses, and drafted the initial manuscript; Ms Ziemnik and Ms Huang carried out data analyses, and reviewed and revised the manuscript; Dr Levy co-designed the study, data collection measures and protocols, supervised data collection, and critically reviewed the manuscript; and all authors approved the final manuscript as submitted.

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Advances in medical care and earlier onset of several chronic diseases are resulting in a growing population of youth with chronic medical conditions (YCMC): asthma, cystic fibrosis, diabetes, and others. Globally, at least 12% of adolescents have a chronic condition,<sup>1</sup> and an estimated 1 in 4 US youth does.<sup>2</sup> These medically vulnerable youth participate in healthy social and educational activities as well as risk-taking behaviors, including alcohol and other substance use, that can uniquely imperil their health.<sup>3</sup>

Alcohol is the substance most commonly used by adolescents.<sup>4</sup> Its use is associated with the top 4 leading causes of morbidity and mortality among teens.<sup>5</sup> For YCMC, alcohol use may play a substantial unrecognized role in exacerbating morbidity and increasing health care costs. Although chronic diseases are heterogeneous, YCMC who use alcohol face the potential for negative alcohol interactions (AI) with medications<sup>6</sup> and laboratory tests, treatment adherence, self-care, and underlying disease status. Moreover, alcohol use can expose YCMC to behaviors and lifestyle factors associated with drinking that may acutely worsen their health, sleep deprivation,<sup>7</sup> dietary program deviation,<sup>8</sup> secondhand smoke,<sup>9</sup> and unplanned/unprotected sex<sup>10</sup> with attendant risks from sexually transmitted disease and pregnancy (of severe consequence to youth on immune-suppressing or teratogenic medications).

Many youth who drink alcohol smoke marijuana.<sup>4</sup> For YCMC, marijuana use carries risks for disease exacerbation from poor diet associated with heavy use,<sup>11,12</sup> airway inflammation,<sup>13</sup> and treatment/medication nonadherence from being impaired or sleep deprived.<sup>7,14–17</sup> Emerging evidence suggests antiinflammatory effects from cannabinoids, the active ingredients in marijuana<sup>18,19</sup>; however, no studies have established

their therapeutic value for youth, and the American Academy of Pediatrics opposes all use of marijuana for children and adolescents, including for “medical use.”<sup>20</sup>

Despite the potential for alcohol and marijuana use to negatively affect health and treatment outcomes of YCMC, there are substantial gaps in knowledge about the prevalence and patterning of these behaviors among this group, and associations with knowledge and outcomes such as treatment adherence. To address this gap and inform preventive interventions at the intersection of chronic disease management and substance use prevention, we investigated alcohol and marijuana use among youth with a chronic medical condition.

## METHODS

We quantified onset, frequency, and intensity of alcohol and marijuana use among youth receiving care for a chronic medical condition by using a structured assessment during a routine subspecialty care visit. Participants self-administered the questionnaire on a tablet computer configured with a polarizing screen for privacy and an optional audio recording of the assessment questions and response options. Participant responses were entered into a browser-based survey application and transmitted with secure socket layer encryption to a secure centralized server. No data were saved locally on tablets. Youth were assented with a waiver of parental consent under the approval of the Boston Children’s Hospital Institutional Review Board. During the assent process, we informed participants that their answers would be kept confidential unless a possible risk for acute harm was detected in their responses to questions preprogrammed to indicate a safety concern. We obtained a certificate of confidentiality for this study.

## Site

Participants were recruited from outpatient subspecialty clinics affiliated with a large pediatric teaching hospital in the Northeast United States.

## Sample

From each of 4 main clinics/conditions, we recruited a convenience sample of 100 English-speaking patients ages 9 to 18 years with type 1 diabetes, juvenile idiopathic arthritis, moderate persistent asthma or cystic fibrosis, or IBD (ulcerative colitis or Crohn disease). To be eligible, patients had to have been diagnosed with a chronic medical condition for at least 1 year. Patients who were medically or emotionally unstable on the day of their appointment were ineligible. We oversampled youth in middle and late adolescence to ensure sufficient sample size in age groups anticipated to include onset of alcohol and marijuana use based on healthy population patterns.<sup>4</sup> The total target sample was apportioned equally across conditions to comprise the following: 5% ( $n = 20$ ) youth ages 9 to 11, 10% ( $n = 40$ ) youth ages 12 to 13, 25% ( $n = 100$ ) youth ages 14 to 15, and 60% ( $n = 240$ ) youth ages 16 to 18. As the overall goal of our research was to validate the National Institute on Alcohol Abuse and Alcoholism Youth Alcohol Screening tool, which is recommended for children age 9 and older, we included a small number of young children despite the low rates of substance use in this age group.

## Assessment

The assessment covered alcohol use knowledge, behaviors, and health care interactions, as well as questions about marijuana use. Its length was 57 to 281 questions, contingent on responses to programmed skip logic.

## Subject Demographic Characteristics

Respondents reported age in years, current grade, sex, race, ethnicity, and

highest education attained by a parent as a proxy for socioeconomic status (SES).

### *Alcohol and Marijuana Use*

Questions covered quantity and frequency of own alcohol use and friends' use,<sup>21</sup> binge drinking based on age and gender (3 or more drinks for girls aged 9–17 and boys aged 9–13, 4 or more drinks for girls aged 18, 5 or more drinks for boys aged 14–18),<sup>21,22</sup> frequency of marijuana use,<sup>23</sup> problems related to alcohol use,<sup>24,25</sup> behavioral measures indicative of *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* disordered use,<sup>26</sup> and self-report of alcohol and marijuana use age of onset.<sup>23</sup>

### *Mental Health Status*

Mental health was assessed with a validated 5-question scale from the Mental Health Inventory of the Short Form-36.<sup>27</sup> Questions included the following: How much of the time have you been a very nervous person, felt calm and peaceful, felt downhearted and blue, been a happy person, felt so down in the dumps that nothing could cheer you up. Responses to the 6-point Likert-scaled items were transformed to a 100-point scale for analysis, consistent with published reports.<sup>28</sup> Higher values indicated better mental health and values <40 were considered clinically relevant.

### *Knowledge of Medication and Laboratory Test Interactions*

Novel measures about knowledge of AI with medications and laboratory tests used to treat and monitor a condition, respectively, were developed with expert review from pediatric immunologists, pulmonologists, endocrinologists, gastroenterologists, and rheumatologists. Questions were piloted with youth and revised for clarity and simplicity. They included the following: Can alcohol interfere with or get in the way of any of the medications you take? And, Can

alcohol interfere with or get in the way of the laboratory tests that are used to monitor your [condition]? Respondents could answer “yes,” “no,” or “I don’t know.” To assess whether answers were correct with respect to the medications youth were taking, we compiled a list of current prescription and over-the-counter medications in use by the sample and coded the medications for published contraindications.<sup>29,30</sup> The list was checked by a pediatrician to ensure validity for the target age groups. “Yes” was coded as “correct” if a participant was taking any alcohol-contraindicated medication.

### *Medication Adherence*

Self-report of nonintentional and intentional medication nonadherence was measured using the following questions adapted from a validated scale<sup>31</sup>: In the past 30 days, how often have you missed a dose of your medicine (didn’t take it when you were supposed to) because you forgot to take it? And: In the past 30 days, how often have you skipped a dose of your medicine (didn’t take it when you were supposed to) because you were tired of having to take medicine? Participants could answer by using responses to a 5-point Likert scale encompassing never, rarely, sometimes, often, and all the time.

### *Pretesting and Administration*

The assessment was pretested iteratively with youth from each disease area (total  $n = 16$ ), to capture patient-centered language and concerns, and ascertain face validity of questions.

### *Data Analyses*

Data were analyzed in SAS<sup>32</sup> (SAS Institute, Inc, Cary, NC) by using descriptive statistics and multivariable logistic regression controlling for demographics and mental health status; all aggregate analyses controlled for the multicenter sampling frame by using generalized estimating equations. Analyses

focused on prevalence of lifetime and past-year alcohol and marijuana use, and binge drinking among youth reporting past 90-day alcohol consumption.<sup>21,22</sup> We tested for differences in the proportion of youth reporting alcohol and marijuana use across conditions in analyses that controlled for gender, race/ethnicity, and SES. Associations among alcohol use and knowledge of possible AIs were assessed among high school youth in analyses that excluded youth with asthma, given the lack of a direct pharmacological interaction between alcohol and asthma medications/laboratories. Associations between reports of treatment nonadherence and alcohol use/binge drinking were assessed for high school youth.

## **RESULTS**

### **Sample Characteristics**

In total, 403 youth consented to participate of 532 invited (response rate 75.8%). Of youth who declined to participate, 48% reported they had too little time, 30% reported being uninterested in research, 20% reported being unwilling to participate in this study, and 2% reported feeling unwell. Approximately half (51.6%) of the study sample comprised girls, most (75.1%) were white, and average age was 15.6 years (range 9 to 18). Across the sample, the average value for the mental health scale was 76 of 100 (SD 8.21, range 44–84), indicating good overall mental health. Sample characteristics differed across conditions for gender and race/ethnicity (Table 1).

### **Alcohol Use**

Past-year alcohol use was reported by nearly one-third (30.8%) of the entire sample and more than one-third (36.5%) of high school youth (Table 2). Older age was associated with alcohol use ( $P < .001$ ); drinking patterns did not differ by gender, race/ethnicity, condition, or mental health status. The average and

**TABLE 1** Social and Demographic Characteristics of Participants in Aggregate and By Medical Condition

	Total	Asthma and Cystic Fibrosis	Type 1 Diabetes	Inflammatory Bowel Disease	Juvenile Arthritis	<i>P</i> <sup>a</sup>
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	
Total	403	101 (25.1)	100 (24.8)	100 (24.8)	102 (25.3)	
Age, y, median (SD)	16 (2.1)	16 (2.1)	16 (2.1)	16 (2.1)	16 (2.16)	.85 <sup>b</sup>
Girls	208 (51.6)	47 (46.5)	43 (43.0)	51 (51.0)	67 (65.7)	.007
Race						
White	296 (75.1)	62 (61.4)	70 (72.9)	87 (88.8)	77 (77.8)	.0001
Non-white	98 (24.9)	39 (38.6)	26 (27.1)	11 (11.2)	22 (22.2)	
Grade						
3–5	10 (2.5)	4 (4.0)	2 (2.0)	1 (1.0)	3 (2.9)	.84
6–8	61 (15.1)	16 (15.8)	15 (15.0)	13 (13.0)	17 (16.7)	
9+	332 (82.4)	81 (80.2)	83 (83.0)	86 (86.0)	82 (80.4)	
Mental Health Score, median (SD)	76 (8.2)	76 (9.1)	76 (7.5)	76 (8.3)	76 (7.8)	.55 <sup>b</sup>
Parent is a college graduate	280 (71.4)	66 (65.4)	67 (71.3)	73 (74.5)	74 (74.8)	.42

Data are presented as number (percentage) of subjects unless otherwise indicated.

<sup>a</sup> The  $\chi^2$  test for difference across conditions unless otherwise specified.

<sup>b</sup> Analysis of variance.

median age of first drinking was 15 years and did not differ by condition. On average, girls initiated alcohol use at older ages than boys ( $P = .004$ ).

Binge drinking was reported by 10.4% of the total sample, by 12.7% of high school youth, and 37.7% of high school youth who reported past-year alcohol use. Binge drinking was more common among white ( $P < .01$ ) and older participants ( $P < .001$ ), although levels did not differ by gender or parent education. Among high school youth, binge drinking was associated with better mental health ( $P < .01$ ). There were no differences in binge-drinking prevalence levels across medical conditions after controlling for gender, race/ethnicity, and mental health.

### Marijuana Use

Approximately one-sixth of the entire sample (17.2%) and one-fifth (20.6%) of high school youth reported using marijuana in the past year (Table 2). The average (and median) age of first marijuana use was 15.1 (15.5) years and did not differ by condition. Marijuana use was associated with older age, male sex, and lower SES ( $P < .01$  for all). Unlike alcohol, marijuana use was negatively associated with mental health ( $P < .01$ ). Almost all youth who reported past-year marijuana use also reported past-year alcohol use. Youth with IBD had higher rates of marijuana use than those with asthma ( $P < .01$ ) or arthritis ( $P = .05$ ). Levels of dual substance use

(ie, use of both alcohol and marijuana in the past year) did not differ across conditions in analyses that adjusted for demographics and mental health.

### Knowledge

Knowledge about whether alcohol use can interfere with medications and with laboratory tests used to treat chronic conditions was low. Among high school youth with diabetes, IBD, arthritis, or cystic fibrosis: 53.1% and 37.2% answered correctly that alcohol can interfere with medications and laboratory tests, respectively (27% answered both correctly); 8.8% and 8.1% answered incorrectly, and 38.2% and 54.8% answered “I don’t know.” Knowledge about alcohol interactions

**TABLE 2** Substance Use Prevalence Among High School Youth With Chronic Medical Conditions, in Aggregate and By Medical Condition

	Total	Asthma and Cystic Fibrosis	Type 1 Diabetes	Inflammatory Bowel Disease	Juvenile Arthritis
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
No past year substance use	197 (60.1)	52 (65.0)	52 (64.2)	45 (52.9)	48 (58.54)
Past year alcohol use	121 (36.5)	26 (32.1)	29 (34.9)	34 (39.5)	32 (39.02)
Binge drinking <sup>a</sup>	40 (37.7)	4 (17.4)	12 (48.0)	15 (46.9)	9 (34.62)
Ever use of marijuana	83 (25.4)	17 (21.3)	25 (30.9)	28 (33.3)*	13 (15.85)
Past year marijuana use	67 (20.6)	11 (13.8)**	19 (23.8)	25 (29.8)	12 (14.63)**
Past 4 wk marijuana use	28 (9.5)	2 (2.8)	13 (17.1)***	10 (13.9)***	3 (3.95)
Any past year substance use (alcohol or marijuana)	131 (39.9)	28 (35.0)	29 (35.8)	40 (47.1)	34 (41.46)
Past year use of both alcohol and marijuana	57 (17.4)	9 (11.3)	19 (23.5)	19 (22.4)	10 (12.20)

Estimated for clinical samples adjusted for compositional differences in age, gender, race/ethnicity, mental health, and parent education.

<sup>a</sup> Among youth who report past-year alcohol use.

\* $P < .05$ , reference group is Juvenile Arthritis.

\*\* $P < .05$ , reference group is Inflammatory Bowel Disease.

\*\*\* $P < .05$ , reference group is Asthma and Cystic Fibrosis.

with medications or laboratory tests did not differ across conditions.

### Associations Among Knowledge and Behaviors

Some 40.3% and 33.0% of high school youth who correctly answered questions about the potential for AIs with medications or laboratory tests, respectively, reported past year alcohol use. Youth who incorrectly answered the medication interaction question were 8.53 and 4.46 times as likely to drink and binge drink, respectively, as youth who answered correctly, in multivariate multilevel analyses (both *P* values < .001). Similarly, high school youth who incorrectly answered the laboratory test interaction question were 6.08 and 9.08 times as likely to drink and binge drink, respectively, as youth who answered correctly, in multivariate multilevel analyses (both *P* values < .001) (Table 3). Results did not differ when we removed from the analyses 8 youth who were taking medication holidays.

### Medication Nonadherence

Approximately one-third (32%) and almost one-tenth (8.3%) of 332 high school youth, respectively, reported forgetting to take or skipping their prescription medications in the past 30 days (Table 4). Reports of unintentional (forgetting) and intentional (skipping) nonadherence were not associated with demographics, nor did these patterns

differ across conditions, although youth with lower mental health scores were more likely to report intentional nonadherence (*P* < 0.001). High school youth who reported drinking in the past year were 1.79 times as likely to report they forgot to take their medications and 1.61 times as likely to report skipping their medications “always/often/sometimes” over the past 30 days than youth who did not report drinking in the past year (both *P* values < .05).

### DISCUSSION

More than one-third and one-fifth of high school participants with a chronic medical condition reported alcohol and marijuana use, respectively. Past-year prevalence levels were similar to those observed among population-representative cohorts, although we found no differences in drinking prevalence by gender, in contrast to population-based studies in which boys have higher risk.<sup>4</sup> This may reflect the voluntary nature of our sample, although the high study participation rate suggests at most a small bias from a healthy volunteer effect.<sup>33</sup> Alternatively, it may reflect some aspect of the chronic disease context that equilibrates risk across demographic groups. In our sample, binge drinking was positively associated with mental health status and may reflect greater social integration, as found in studies of

healthy youth.<sup>34</sup> Conversely, marijuana use was negatively associated with mental health, possibly reflecting use of marijuana to ameliorate symptoms and/or marijuana’s role in worsening mental health.<sup>35,36</sup>

We found no evidence of variation in alcohol use risk across medical conditions, but some evidence of condition-varying risk for marijuana use, which was least prevalent among youth with asthma and cystic fibrosis, as might be expected given the exacerbating effects of smoking on respiratory function.<sup>37,38</sup> Marijuana use also was relatively low among youth with arthritis. Confirming and understanding condition-varying risks for marijuana use is important to understanding outcomes and merits additional investigation; marijuana use may ameliorate symptoms for some conditions, confounding treatment effects.<sup>18,19</sup> Secular changes in the perceived harmfulness of marijuana<sup>4</sup> and shifts toward legally enabling dispensing of marijuana to adults for medical purposes may drive changes in marijuana use among chronically ill children and teens.<sup>39</sup>

Among YCMC, knowledge was poor about the potential for alcohol use to negatively interact with prescription medications or laboratory tests. Youth who incorrectly answered these questions were at high risk for alcohol use and binge drinking. Alcohol interactions are primarily

**TABLE 3** Drinking Risks Among High School Youth in Relation to Knowledge About Alcohol Interactions With Medications and Laboratory Tests

	Total	Past-year Drinking		Binge Drinking	
	<i>n</i> (%)	<i>n</i> (%)	OR (95% CI)	<i>n</i> (%)	OR (95% CI)
Can alcohol interfere with or get in the way of any of the medications you take?					
No	23 (8.8)	19 (82.6)	8.53 (2.96, 24.61)*	11 (52.38)	4.46 (2.28, 8.75)*
Don't know	100 (38.2)	25 (25.0)	0.78 (0.54, 1.13)	5 (5.32)	0.35 (0.05, 2.32)
Yes	139 (53.1)	54 (38.9)	1.00	19 (14.18)	1.00
Can alcohol interfere with or get in the way of the laboratory tests that are used to monitor your disease?					
No	21 (8.1)	16 (76.2)	6.08 (2.46, 15.03)*	10 (50.00)	9.08 (5.26, 15.69)*
Don't know	143 (54.8)	53 (37.1)	1.14 (0.61, 2.12)	20 (14.49)	1.82 (0.49, 6.70)
Yes	97 (37.2)	30 (30.9)	1.00	6 (6.67)	1.00

Estimated for clinical samples adjusted for compositional differences in age, gender, race/ethnicity, mental health, and parental education. CI, confidence interval; OR, odds ratio. \**P* < .001.

**TABLE 4** Patterns and Risks for Forgetting or Skipping Medications Among High School Youth by Drinking Status

	Total	Past-Year Drinking		Binge Drinking	
	n (%)	n (%)	OR (95% CI)	n (%)	OR (95% CI)
In the past 30 days, how often have you missed a dose of your medicine (did not take it when you were supposed to) because you forgot to take it?					
Sometimes, Often, Always	102 (32.0)	43 (42.2)	1.79 (1.00,3.22)*	12 (12.12)	1.53 (1.30,1.81)**
Never or Rarely	217 (68.0)	71 (32.7)	1.00	24 (11.82)	1.00
In the past 30 days, how often have you skipped a dose of your medicine (did not take it when you were supposed to) because you were tired of having to take medicine?					
Sometimes, Often, Always	26 (8.3)	13 (50.0)	1.61 (1.08,2.41)*	4 (15.38)	1.89 (0.67, 5.34)
Never or Rarely	288 (91.7)	98 (34.0)	1.00	30 (11.03)	1.00

Estimated for clinical samples adjusted for compositional differences in age, gender, race/ethnicity, mental health, and parental education. CI, confidence interval; OR, odds ratio.

\* $P < .05$ .

\*\* $P < .001$ .

considered a concern for older adults; however, the high prevalence of binge drinking among adolescents raises concern for adverse effects in youthful cohorts. Misunderstanding about the potential for alcohol to adversely interact with care factors may strongly influence drinking risk, yet knowledge alone appears insufficient to completely protect against drinking. Many youth drink who know about alcohol interactions. Hence, universal alcohol education for youth with chronic medical conditions may be an important prevention activity. To address the full picture of risk indicated here, it must be accompanied by research to ascertain and address the motivations for alcohol use and binge drinking among medically vulnerable youth.

In the sample overall and across medical conditions, many youth reported regularly forgetting to take their medications, whereas a smaller percentage reported regularly intentionally skipping medications. Nonadherence was associated with alcohol use, and intentional nonadherence also was independently associated with lower mental health status. Nonadherence may reflect the developmental context of adolescence: poor self-regulation, overestimation of one's capabilities, feelings of invulnerability, and health-risking behaviors all are common,<sup>40</sup> just as youth are transitioning toward autonomy in self-management from

complete or shared parental control. The cross-sectional study design precludes determination of whether and to what extent alcohol use plays a causal role in medication nonadherence. Nonadherent youth may be more likely to drink alcohol due to an underlying personality factor associated with each behavior, or to the separate confounding effect of "burnout" or loss of motivation from the prolonged stress of managing a chronic disease. Alcohol use may represent an attempt to relieve such chronic stress. To promote sustained health-protecting practices among this group, greater understanding of the psychological and behavioral underpinnings of nonadherence is needed, including the role that substance use may play in signifying or amplifying risk.

Our findings raise significant concerns about the potential for substance use to undermine the health status of medically vulnerable youth, including through AI with medications/laboratory tests and treatment nonadherence. The intersection of alcohol use and chronic disease may constitute an enormous financial burden for patients, families, and society. The estimated annual costs from excessive alcohol use exceeded \$223.5 billion in 2006, considering costs from losses to productivity, health care, and crime.<sup>40</sup> At the same time, 75% of the \$2 trillion in our US annual health care budget is spent on

medical care of people with chronic illnesses,<sup>41</sup> of which \$300 billion annually is attributable to treatment nonadherence.<sup>42</sup> To the extent that alcohol use constitutes a threat to an underlying chronic condition or to a patient's adherence to treatment, early identification and response are among our most important, available, and underused interventions. This is especially so for youth where costs associated with chronic illness, alcohol use problems, and the negative interaction of the 2 compound over a lifetime.

Findings describe a medically heterogeneous opt-in sample of youth from a large urban health care setting. Although a very high percentage of youth agreed to participate, research with a multi-institutional sample is needed to establish generalizability of the findings. Survey data are vulnerable to recall and reporting bias. When possible, we used survey items drawn from validated tools. Novel items were reviewed by domain experts and piloted to ensure face validity and acceptability. All associations are cross-sectional. Longitudinal work is needed to inform temporal associations among knowledge, behaviors, and adherence. Aggregate and cross-condition analyses were undertaken by using multivariate statistics that controlled for the multiclinic sampling design, where appropriate. Nevertheless, sample size limitations

precluded analyses of relatively rare behaviors within conditions.

youth are warranted to ameliorate risk.

data collection and study coordination.

## CONCLUSIONS

Alcohol and marijuana use are prevalent among youth with chronic medical conditions and drinking is associated with treatment nonadherence. Education and screening of medically vulnerable

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## ABBREVIATIONS

AI: alcohol interactions  
IBD: inflammatory bowel disease  
SES: socioeconomic status  
YCMC: youth with chronic medical conditions

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