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Original article

Alcohol Mixed With Energy Drink Use Among U.S. 12th-Grade Students: Prevalence, Correlates, and Associations With Unsafe Driving

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A B S T R A C T

Purpose: The consumption of alcohol mixed with energy drinks (AmED) is a risky drinking behavior, most commonly studied using college samples. We know little about rates of AmED use and its associations with other risk behaviors, including unsafe driving, among high school students. This study examined the prevalence and correlates of AmED use among high school seniors in the United States.
Methods: Nationally representative analytic samples included 6,498 12th-grade students who completed Monitoring the Future surveys in 2012 and 2013. Focal measures included AmED use, sociodemographic characteristics, academic and social factors, other substance use, and unsafe driving (i.e., tickets/warnings and accidents) after alcohol consumption.
Results: Approximately one in four students (24.8%) reported AmED use during the past 12 months. Rates of AmED use were highest among males and white students. Using multivariable logistic regression models controlling for sociodemographic characteristics, results indicate that students who cut class, spent more evenings out for fun and recreation, and reported binge drinking, marijuana use, and illicit drug use had a greater likelihood of AmED use. AmED use was also associated with greater odds of alcohol-related unsafe driving, even after controlling for sociodemographic, academic, and social factors and other substance use.
Conclusions: AmED use among 12th-grade students is common and associated with certain sociodemographic, academic, social, and substance use factors. AmED use is also related to alcohol-related unsafe driving, which is a serious public health concern.
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IMPLICATIONS AND CONTRIBUTION

Research on alcohol mixed with energy drink use has focused predominantly on college students. The present study, using nationally representative samples of high school seniors, shows that this potentially dangerous drinking behavior occurs earlier during high school and is associated with other risky behaviors, including alcohol-related unsafe driving.

The use of alcohol mixed with energy drinks (AmED) has emerged as a high-risk drinking behavior, especially among youth. Although the U.S. Food and Drug Administration banned the sale of premixed alcoholic energy drinks in 2010 after deeming caffeine an "unsafe food additive" for alcoholic beverages [1], AmED use is relatively common. Most studies examining AmED consumption have predominately used college samples, finding prevalence rates ranging from 20%–25% [2–5]. In one of the few studies using a high school student sample, Azagba et al. [6] found that more than one third of Canadian high school seniors reported AmED use within the past year. In

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another study using a panel sample of youth drinkers, 7.4% of 16- to 18-year-olds reported AmED use within the past 30 days [7]. High school–aged youth appear to be engaging in AmED use; yet, nationally representative prevalence rates and correlates among youth in the United States remain unknown. This is troublesome, considering that adolescents are especially vulnerable to risky drinking behaviors [8,9].

A serious danger of AmED use is that the stimulant effects of caffeine may be perceived as offsetting the depressant effects of alcohol, resulting in individuals feeling less intoxicated than they actually are [10–12]. Researchers have described this as "wide awake drunkenness" [13]. Thus, energy drinks may be used with the intent to diminish the depressant effects of alcohol. For example, college students' motivations for AmED use include being able to drink more, getting drunk faster, and feeling less tired when drinking [12]. Not only does the discrepancy between perceived and actual intoxication contribute to drinking past the point of intoxication, but also it is associated with increased risk-taking behavior [2,7,11,14]. College students classified as moderate drinkers with a high proportion of drinking occasions involving AmED use reported more physical consequences, including hangovers, blackouts, and vomiting compared with moderate drinkers with low AmED use [15]. Likewise, in a study that investigated consequences of AmED use through daily surveys of college students, students experienced more negative consequences and reported drinking greater amounts of alcohol on days when they consumed alcohol and energy drinks, compared with days when they consumed only alcohol [14].

AmED use is also associated with impaired driving, although this research is again limited to college students and adult samples [3,5,16,17]. Consuming AmED may contribute to driving after drinking because of the subjective perception that caffeine offsets the effects of alcohol that impair coordination and attention. College students who engaged in more frequent AmED use have been found to report significantly greater odds of driving after drinking, even after controlling for age, gender, binge drinking, and risk-taking propensity [3]. In a study testing subjective versus objective measures of alcohol intoxication, young adults reported feeling that they had less impaired motor coordination when they consumed AmED compared with when they consumed only alcohol [11]. Despite subjects' perceptions of reduced effects of intoxication, AmED use did not improve objective measures of motor coordination or visual reaction time. Additionally, breath alcohol concentration remained unaffected by AmED use. In fact, in a study that tested driving performance using a driving simulator task, AmED use was associated with a greater number of speed fluctuations, lateral movements, and increased crashes compared with consuming alcohol without the addition of energy drinks [17]. To our knowledge, no studies to date have investigated the association between AmED use and unsafe driving among high school students. Research is needed to test this association for three key reasons. First, high school students are likely less experienced drivers. Second, the risk of motor vehicle crashes in the United States is highest among adolescents aged 16–19 years compared with any other age group [18]. Third, substance use is a known risk factor for unsafe driving [19–21].

Using nationally representative survey data on U.S. high school seniors, the present study aimed to (1) examine the prevalence of AmED use in relation to sociodemographic characteristics; (2) investigate associations between AmED use and academic and social factors and other substance use; and (3) test the relation between AmED use and alcohol-related unsafe driving (i.e., tickets/warnings after drinking alcohol and accidents after drinking alcohol). Few studies have examined sociodemographic characteristics in relation to AmED use, especially among high school students, and findings tend to be mixed. AmED use may be most prevalent among males [4,5,22], although some studies show no gender differences [6,23]. White youth are often most likely to report AmED use [2,5,22,23], but other studies have shown that black youth have higher consumption rates [6,7]. Youth of higher socioeconomic status are more likely to use AmED [24], but again these findings are inconsistent [4,7].

Based on this limited evidence, for our first aim, we hypothesized that males, white students, and students with parents having higher educational attainment would be most likely to report AmED use. For our second aim, based on findings demonstrating a link between substance use and academic and social risk factors [25–28], we hypothesized that lower grade point average, public school attendance, 4-year college plans, cutting class, and spending more evenings out for fun and recreation would be associated with greater likelihood of AmED use. Furthermore, in accordance with existing research showing a relation between AmED use and other types of substance use [6,23,29], we hypothesized that AmED users would be more likely to have engaged in other types of substance use, including binge drinking, marijuana use, and illicit drug use, compared with non-users. For our third aim, we hypothesized that AmED use would be associated with greater likelihood of tickets/warnings after drinking alcohol and motor vehicle accidents after drinking alcohol. Although no existing research has examined AmED use associated with unsafe driving among high school students, the strong link between AmED consumption and unsafe driving in young adult samples [3,5,16,17] and the more limited driving experience of high school students offers plausible information to guide our hypothesis.

Methods

Sample

The present study included data from 12th-grade students who participated in the Monitoring the Future (MTF) study [30] in 2012 and 2013. The MTF samples used here are nationally representative of the U.S. 12th graders. Since 1975, MTF has conducted annual surveys of high school seniors through self-report questionnaires completed at school. The focus of the MTF questionnaires is to assess the attitudes, beliefs, and behaviors of youth, pertaining particularly to substance use. MTF uses a three-stage randomized sampling procedure using geographic areas, schools in those areas, and specific classes within each school. Sampling weights correct for differential probabilities of selection, and all analyses in the present study accounted for the MTF survey's complex, multistage sampling design. All procedures are reviewed and approved on an annual basis by the University of Michigan's institutional review board for compliance with federal guidelines for the treatment of human subjects.

A question regarding AmED use was added to MTF surveys in 2012. Thus, data analyzed in the present study included two consecutive cohorts of 12th-grade students from 2012 to 2013. Two (of six) within-classroom randomly administered questionnaire forms included questions pertaining to AmED use. In

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