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Social and situational party characteristics associated with high-intensity alcohol use among youth and young adults

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Abstract

Background: Rates of high-intensity drinking, which is alcohol consumption that exceeds standard heavy drinking levels, have increased in recent years and peak in young adulthood. To identify modifiable environmental targets for prevention of high-intensity drinking, we identified characteristics of parties attended by youth and young adults that were associated with high-intensity drinking and the consequences of this excessive form of drinking.

Methods: Data are from 15–20 year old participants in an online survey (n=2442; 55.4% female, 74.8% non-White) who resided in 24 communities across seven states that were a part of a community randomized intervention trial to reduce the incidence and consequences of underage drinking parties. We used multinomial logistic regression to predict level of drinking by six party characteristics (size, location, age and gender composition, supervision, others' drinking behavior), and to predict six consequences (hangover, not remember event, passed out, punished by parents, broke something/got in fight, sex against will) from level of drinking. We tested study hypotheses in two models, one that used a single binge drinking threshold (below binge vs. at or above binge level) and one that additionally used a high-intensity drinking level (below binge, 1–2 times binge, 2+ times binge level).

Results: We found that larger party size and a mostly male composition were unique predictors of high-intensity drinking when compared to those who consumed 1–2 times the binge drinking level. Odds of passing out, not remembering the drinking event, breaking/damaging property, or getting in a fight were more than double for high-intensity drinkers compared to standard binge level drinkers.

Conclusions: Results from this study indicate there are unique precursors and consequences of high-intensity alcohol consumption among youth and young adults. These environmental factors

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associated with high-risk drinking contexts can be used to develop prevention strategies to mitigate the harms associated with excessive alcohol consumption.

Keywords

youth and young adults; high-intensity alcohol use; party characteristics; drinking consequences

Introduction

Alcohol remains the most commonly used substance among youth and young adults in the United States (Miech et al., 2016). When they do drink, youth are more likely than adults to drink heavily (Siqueira et al., 2015). To date, the majority of research on heavy alcohol consumption has examined ‘binge drinking’ or ‘heavy episodic drinking’, generally defined based on the National Institute on Alcohol Abuse and Alcoholism levels of four or more drinks for females and five or more drinks for males in a two hour period, which typically elevates blood alcohol levels to the common legal driving limit of 0.08 g/dl (NIAAA, 2015). This binge drinking threshold has been widely used as a marker of risky alcohol consumption among youth and young adults (e.g., Wechsler & Nelson, 2001) to identify those at risk for severe consequences, including alcohol abuse and dependence. However, the mean number of drinks consumed during a drinking episode among young adults is 9.5, or more than twice that of the standard binge drinking threshold (Naimi et al., 2010). This has led substance abuse researchers to call for additional research on high-intensity alcohol consumption, or drinking behavior that exceeds the binge drinking threshold (Patrick, 2016).

High-intensity alcohol use among youth and young adults has increased in recent years (Patrick et al., 2013). Rates of high-intensity drinking escalate across adolescence and peak in young adulthood (Patrick, 2016). Alcohol consumption at a high-intensity level of two or three times the binge drinking threshold has been shown to increase blood alcohol levels rapidly, resulting in significant, and at times life-threatening, impairment (NIAAA, 2015b). Specifically, consumption of large quantities of alcohol poses risk for acute physical effects, such as alcohol-induced blackouts and alcohol poisoning (Terry-McElrath & Patrick, 2016), as well as heightened risk for deleterious social consequences, including physical and sexual assault (Hingson et al., 2009). Early research on high-intensity drinking among young adults indicates that higher consumption cutoffs are associated with substantially increased risk for experiencing negative consequences (Hingson & White, 2013; White & Hingson, 2014). Thus, understanding risk factors for high-intensity alcohol consumption among youth and young adults is a necessary step for prevention scientists to effectively reduce the burden associated with this exceptionally risky form of drinking.

One such important risk factor for alcohol use is the context in which drinking takes place. Each drinking event occurs within a setting of specific circumstances, including social factors, such as the attributes of others in attendance; situational factors, such as alcohol availability and adult supervision; and the location of the event itself (Friesthler et al., 2014). Risk for underage alcohol use and consequences varies across these factors, and drinking contexts are associated with the risk of experiencing alcohol-related problems independent of an individual’s level of alcohol consumption (Lipperman-Kreda et al., 2015; Mair et al.,

2015). For example, parties are the most commonly reported context for alcohol use among high school seniors (McCabe et al, 2014), and larger parties are associated with increased risk for drinking (Lipperman-Kreda et al, 2018; Egan et al, 2018; Wagoner et al, 2012). Factors within these contexts may translate into increased risk for alcohol consumption and negative consequences by increasing access to alcohol (Bersamin et al, 2016), direct modeling of alcohol use behaviors (Clapp & Schilling, 2001), and reinforcing social norms and increasing social pressure to consume alcohol (e.g. Elek et al, 2006). No study to date, however, has investigated the characteristics of drinking contexts that may increase the likelihood of high-intensity alcohol consumption among underage drinkers. Investigation of unique environmental circumstances that precipitate excessive alcohol consumption among youth and young adults is needed to elucidate potential intervention targets for prevention efforts.

The current study examines social, situational, and location-based characteristics of parties where drinking took place attended by 15–20 year olds in the U.S. We utilized data from a multi-year community randomized intervention trial to reduce the incidence and consequences of underage drinking parties to identify party characteristics unique to high-intensity alcohol consumption compared to drinking at or below the standard binge drinking threshold. We also investigated the extent to which high-intensity drinking was uniquely associated with multiple alcohol consequences.

Materials and Methods

Study Sample and Survey Methods

Overview.—Data from this study are drawn from the Millennial Youth and Young Adult Survey (MYSurvey), which was administered to 15–20 year olds located in 24 communities in 7 states that were participating in a community-level intervention to reduce underage alcohol consumption, *The Study to Prevent Teen Drinking Parties* (see Wolfson et al, 2017 for details). The MYSurvey was a repeated cross-sectional survey which was conducted annually between 2013–2016 (n=4 cross-sections).

Community recruitment.—Twenty-four cities across seven states (California, Colorado, Georgia, Iowa, Indiana, New Mexico, and New York) were recruited to participate in the intervention trial. Eligibility requirements for communities included having population size between 25,000 to 300,000 residents, a local law enforcement authority, and an active substance abuse prevention coalition. Cities could not have a social host ordinance already in place or be located in a state with a state-level social host law at the time of recruitment. Randomization was stratified by state and community size, and cities were assigned to the intervention or control (delayed intervention) group.

Data collection.—The MYSurvey was used to collect data on the primary outcomes of the trial. It was conducted at four points of the study: 1) baseline (2013; pre-intervention), 2) mid-intervention (2014), 3) late intervention (2015), and 4) post-intervention (2016). An address-based sampling approach was used to identify and invite participants by mail (Dillman, 2007). At each point of data collection, households that were likely to have at least one 15–20 year old resident (identified via an age-targeted list developed by Marketing

Systems Group) were invited to participate (ranging from 17,892 to 19,196 invitations). Following participant consent and assent for those under 18 years old, participants completed the online survey, which took approximately 20 minutes to complete, and received an electronic Amazon gift card (\$5 in Year 1 to \$15 in Year 4) upon survey submission. Specific response rates are not possible when using address-based sampling, as it is not known whether a non-respondent was ineligible or if the individual was eligible but did not respond (Smith, 2009). Conservative estimates for response rates across data collection years range from 12.1% in Year 1 to 17.8% in Year 4. Survey procedures were approved by the Wake Forest School of Medicine's Institutional Review Board and a Certificate of Confidentiality was obtained from NIAAA to ensure further participant protections.

Analytic sample.—We used data collected across all four waves of data collection. An algorithm was used to eliminate multiple responses from the same person. Specifically, if two participants from two different waves had the same household address, were of the same gender, and their ages aligned with the time elapsed between data collection waves, then the earlier record for the participant was eliminated and only the most recent data collected was maintained for analyses. These procedures resulted in 3918 participant records. Given that we were interested in the context of drinking events, we restricted the sample to those who provided data on the last party they attended with alcohol (n=2442).

Measures

Alcohol consumption.—Participants were asked how many drinks they consumed at the last party they attended. A drink was defined as a 12oz beer, 8 ounces of malt liquor, a 5-ounce glass of wine, or 1.5 ounces of liquor. Participants responded with an integer value between 0 and 20. Using this value, drinking level was defined according to gender-specific definitions of binge drinking (NIAAA, 2015) as under binge threshold (0; 0–3 drinks for females, 0–4 drinks for males), 1–2 times binge threshold (1; 4–7 drinks for females, 5–9 drinks for males), and high intensity drinking of 2+ binge levels (2; 8+ drinks for females, 10+ drinks for males).

Alcohol consequences.—Participants were asked if they experienced any of the following consequences while at the last party they attended, or once it was over, “passed out due to your drinking,” “unable to remember what happened while drinking,” “had a headache or hangover,” “punished by parents or guardians,” “broke or damaged something due to your drinking,” “were involved in a fight”, and “someone tried to have sex with you or actually had sex with you against your will”. Questions regarding this full set of consequences was only collected in 2015 and 2016. Endorsement of consequences was coded as “yes” or “no”.

Party characteristics.—Six characteristics of the last party the participant attended were assessed (Egan et al, 2018). 1) *Location of the party*: One item asked ‘For the last party you attended where alcohol was being served, where did it mostly take place?’. *Location* was coded as “my home” (“at my home (apartment or dorm)”), “other’s home” (“in another person’s home”), or “other” (all other response categories such as “at a park or beach” and

“in a vehicle”); 2) *Party size* was assessed with a single open-ended item, “How many people, other than you, were at the party?”. The item was treated as a continuous variable and the natural log of the numerical response was used due to the skewed distribution of the variable; 3) The *gender composition* of the party was determined by asking participants, “Who was at the party?”. Three categories were recoded based on five response options, “Majority female” (“all female” or “mostly female”), “majority male” (“all male” or “mostly male”), and “mixed gender” (“about half female, half male”); 4) *Age composition* was assessed by asking participants “How many of the people at the party were over 21?”. The five response options were recoded into two categories of “mostly under 21” (“some”, “a few”, or “none”) and “mostly over 21” (“many” or “all”); 5) Participants responded to what extent their or someone else’s parent or guardian *supervised the party*. Parental supervision was coded as “yes” with a response of “all of the time” or “most of the time” and “no” if participants responded with “some of the time”, “none of the time”, or “don’t know” or if they indicated that neither parent supervised the party; 6) *Others’ drinking behavior* was assessed with a single item asking participants if “they saw other people getting drunk” for which they responded “yes” or “no”.

Individual characteristics and covariates.—Participants self-reported their age, sex, ethnicity, and race (recoded as White or Non-White due to small numbers in other groups). Mother’s completed education was used as a proxy for family socioeconomic status and coded as “less than a college degree” or “completed college degree”. Community-level intervention treatment status, year of survey collection, and whether the community passed a social host ordinance during the study period were also included as covariates with the individual-level demographic variables in all models.

Data Analysis

Descriptive statistics were calculated to describe the demographic characteristics of the sample and distribution of party characteristics for the entire sample and for each level of drinking. A series of multinomial logistic regressions were then conducted to test study hypotheses. First, we predicted level of drinking from party characteristics, controlling for individual characteristics and study covariates (intervention status, whether a community had a local social host ordinance, and data collection year). Next, we predicted alcohol consequences from level of drinking, controlling for the same covariates as well as party characteristics. In both multinomial regressions we utilized two models to elucidate the contribution of high-intensity drinking, one that used only the typical binge threshold (Model 1: below binge, 1+ binge), and one that included all three levels of drinking (Model 2: below binge, 1–2 times binge, 2+ binge). We conducted sensitivity analyses of all models separately by gender and age. All modeling adjusted for within-community clustering by treating community as a random effect using PROC GLIMMIX with a logit link function in SAS version 9.4. Adjusted and unadjusted odds ratios and 95% confidence intervals are presented.

Results

Table 1 reports characteristics of the sample and of the last party with alcohol attended by participants overall and by level of alcohol consumption. In the overall sample, there were slightly more females (55.4%) than males (44.6%), the majority of the sample was White (74.8%), 14% were Hispanic, and 68.2% of participants' mothers had earned a college degree. While 63% of 18–20 year old respondents reported attending a four year college, 90% of all respondents resided with their parents at the time of the survey. The majority of parties were held at someone else's home (72.2%), included both males and females (77.0%), and were not supervised by a parent (71.2%). The parties were fairly evenly distributed with respect to age (47% mostly under 21, 53% mostly over 21) and whether participants saw a lot of people getting drunk (48.6% yes, 51.4% no). Experiencing a hangover (18.1%) and not remembering what happened (8.4%) at the party were the most commonly endorsed consequences.

Table 2 presents results of the multinomial logistic regression analyses predicting level of drinking based on party characteristics, controlling for individual characteristics and study covariates. Two party characteristics were associated with a high-intensity drinking level compared to those who drink at the standard 1–2 times the binge level (Model 2): larger parties (AOR: 1.4, CI: 1.1, 1.9) and majority male gender composition (compared to mixed gender), AOR: 1.9, CI: 1.04, 3.5). There were four party characteristics that were shared by both binge and high-intensity drinking levels. Majority female gender composition was associated with increased risk for a binge drinking episode compared to drinking below binge levels in Model 1 (compared to mixed gender, AOR: 1.6, CI: 1.1, 2.3), but only for the high-intensity alcohol consumers compared to below binge levels in Model 2 (AOR: 2.4, CI: 1.3, 4.3). A party attended by people mostly over the age of 21 was protective in Model 1 (AOR: 0.7, CI: 0.6, 0.9), and for those who consume 1–2 times the binge level compared to those below the binge threshold in Model 2 (AOR: 0.8, CI: 0.6, 0.98). Parental supervision was protective of binge drinking in Model 1 (AOR: 0.4, CI: 0.3, 0.6), with similar results in Model 2 comparing 1–2 times the binge threshold (AOR: 0.4, CI: 0.3, 0.6) and high-intensity levels (AOR: 0.4, CI: 0.2, 0.9) to those drinking below the binge threshold. Seeing others drunk at the party increased odds of alcohol consumption in Model 1 (AOR: 6.1, CI: 4.6, 8.1), and in Model 2 when comparing 1–2 times the binge threshold (AOR: 5.7, CI: 4.2, 7.7) and high-intensity levels (AOR: 8.2, CI: 4.5, 15.0) to those drinking below the binge threshold. Lastly, location was a significant predictor of alcohol use when comparing drinking in another location as compared to one's own home in Model 1 (AOR: 0.6, CI: 0.3, 0.9).

In sensitivity analyses for the models predicting drinking level by party characteristics, larger party size (AOR: 1.4, CI: 1.02, 2.0) and majority female composition (AOR: 3.1, CI: 1.2, 7.8) were risk-inducing for HID as compared to drinking below binge threshold for males, but not females. Majority female composition (AOR: 2.3, CI: 1.2, 4.4) was also risk-inducing for HID compared to 1–2 times the binge threshold, but only for males. Increased party size (AOR: 1.4, CI: 1.02, 1.9), majority male composition (AOR: 2.1, CI: 1.1, 4.1), and majority female composition (AOR: 2.4, CI: 1.1, 5.1) were risk-inducing for HID compared to below binge thresholds for 18–20 year olds but not their younger counterparts. Majority

female composition (AOR: 2.1, CI: 1.1, 4.1) heightened risk for HID compared to 1–2 times binge threshold for 15–17 year olds only, and a crowd that was mostly over 21 was protective (AOR: 0.7, CI: 0.6, 0.98) only for those who were 18–20 years of age (see Supplementary Tables 1 and 2 for details).

Table 3 presents results of the multivariate multinomial logistic regression analyses predicting consequences from level of drinking, controlling for party and individual characteristics as well as study covariates. The odds of experiencing any alcohol-related consequences was higher in Model 1 (AOR: 7.7, CI: 5.3, 11.1) and when examining Model 2 drinking at 1–2 times the binge threshold (AOR: 6.0, CI: 4.3, 8.3) and high-intensity levels (AOR: 9.9, CI: 5.5, 17.6) to those who consume alcohol at less than the binge threshold. Across Model 2 results, all consequences except getting punished by parents were more likely to occur for those who consumed alcohol at 1–2 times the binge threshold and for those who consumed at a high-intensity level compared to those who consumed less than the binge threshold. High-intensity alcohol consumption was a unique risk factor for three consequences when compared to those who drank at standard binge drinking levels: risk for passing out (AOR: 2.7, CI: 1.3, 5.8), not remembering what happened while drinking (AOR: 2.4, CI: 1.3, 4.3), and breaking something or getting into a fight (AOR: 2.8, CI: 1.3, 5.8) were more than double for those who drank at a high-intensity level as compared to those who consumed 1–2 times the binge level of drinks.

In sensitivity analyses for models predicting consequences by level of drinking, the pattern of effects was the same for females and males with the exception that risk for passing out for HID as compared to below binge threshold was only significant for females (AOR: 6.1, CI: 1.7, 21.9). The same result emerged for those ages 18–20 (AOR: 2.9, CI: 1.2, 7.2) as compared to younger participants. Risk for sex against one's will for those who consumed 1–2 times the binge threshold compared to below binge threshold (AOR: 15.9, CI: 2.8, 88.6), HID compared to below binge threshold (AOR: 5.2, CI: 1.04, 25.4), and HID compared to 1–2 times binge threshold (AOR: 7.0, CI: 1.8, 27.1) was significant only for those ages 18–20 and not their younger counterparts, though these results should be interpreted with caution given the low counts of this consequence (See Supplementary Table 3 for details).

Discussion

The study sought to determine characteristics of parties with alcohol attended by 15–20 year olds that contribute to high-intensity drinking in this age group. In addition, the study examined whether alcohol-related consequences were uniquely associated with drinking beyond the binge threshold. We found that party size and majority male party attendance were factors that increased risk for high-intensity alcohol consumption, even when compared to standard binge drinking thresholds. Identification of these risk-inducing settings can inform preventive interventions to reduce alcohol consumption among underage drinkers. This is particularly important given that this study identified multiple consequences that were uniquely associated with high-intensity alcohol consumption, including passing out, not remembering events, and aggressive interpersonal behaviors.

The context in which drinking takes place for youth and young adults is a critical factor in whether and how much alcohol an individual consumes. We identified two party characteristics, larger size and majority male composition, that predicted high-intensity alcohol use, even when compared to those who drank at 1–2 times the binge drinking level. Large crowds at a party may increase access to alcohol, and one's own perception of alcohol availability is a predictor of heavy drinking (Jones-Webb et al., 1997). A greater number of individuals in a social setting also provides increased opportunity to model drinking behaviors (Bandura, 1977). Thus, witnessing large numbers of people consuming alcohol, particularly large quantities of alcohol, may in turn result in an individual mimicking others' risky drinking behavior. This is especially important when a majority of the attendees are males rather than majority females or an equal mix of genders. Although we found that individuals were significantly more likely to report binge drinking at parties when the majority of attendees were females, this association was not statistically significant when we examined HID compared to binge drinking in the full sample. Rather, individuals attending parties with majority males were more likely to report HID compared to binge drinking, which has practical significance since young males engage in binge drinking and getting drunk at higher rates than females (Chen et al., 2004; Wilsnack et al., 2000). Males are also more likely to participate in drinking games and competitions (Borsari et al., 2008), which can rapidly increase intoxication levels. However, in sensitivity analyses predicting level of drinking by party characteristics by gender and age, majority female composition was risk inducing for high-intensity alcohol consumption even when compared to those who consume at 1–2 times the binge drinking threshold for males and those ages 15–17. It may be that some males drink more around females to make an impression or decrease anxiety or inhibitions associated with interactions with someone of the opposite gender. This contrasts with previous research showing that males consume fewer drinks per hour when around mostly females (Thrul et al., 2016), though this may be due to the difference in alcohol outcome assessed. For older youth, parties composed of mostly one gender or the other, rather than an equal mix of genders was risk-inducing for HID as compared to those who didn't consume alcohol at a binge level. Thus, addressing parties that are largely a single gender is an important contextual element to include in preventive interventions. Addressing large social gatherings, in particular those predominantly attended by males, point to specific targets for prevention to reduce the harms of high-intensity drinking among youth and young adults. Social host ordinances (SHOs) may be one such approach to intervening on this problem. SHOs hold property owners or the individual with control over the household accountable for underage drinking that occurs on the property (Wagoner et al., 2012; Paschall et al., 2014), thus addressing social, situational, and location-based event factors in a single policy.

In addition, we identified several party characteristics that served as risk or protective factors for both binge and high-intensity drinking that are important elements of the drinking context to be addressed in preventive interventions. Our results indicate that when a responsible adult is present throughout a social gathering, the risk of alcohol consumption among underage drinkers is lower, a finding that held across models when comparing heavy drinkers to those who consume less than binge levels. While this result confirms research indicating a protective effect of adult supervision for girls (Bersamin et al., 2016), it

contradicts other research demonstrating little or no effects of adult supervision on youth alcohol use (e.g. Lipperman-Kreda et al., 2017). Mere presence of an adult may not be sufficient to deter alcohol consumption, particularly if that adult is not aware that alcohol is present. The protective effects of supervision are only possible when a responsible adult is present and active in the activities of the youth. Family-based interventions should therefore specify to parents the need to actively monitor youth who are in their home. A party attended by mostly individuals over the age of 21 reduced the odds of binge drinking, which may be due to the fact that those of legal drinking age have greater access to alcohol and thus do not feel pressured to consume high levels simply because alcohol is present. As expected based on previous research (Clapp et al., 2007), parties in which many people were drunk elevated risk for binge drinking across models. In such settings, youth often mimic the behaviors of those around them, internalizing social norms that drinking is accepted by their peers who are present at the party. Additionally, perceptions of others experiencing positive effects of drinking, such as having fun, being relaxed, or talking with a romantic interest, may heighten an individual's own positive expectancies for drinking and getting drunk, thereby increasing the likelihood of binge levels of alcohol consumption. To address these alcohol cognitions, prevention strategies could utilize brief alcohol interventions that incorporate feedback on peer norms and alcohol expectancies (Tanner-Smith & Lipsey, 2015). Lastly, drinking often occurs in a home setting among adolescents (Jackson et al., 2016; Vidourek et al., 2018), which is confirmed by this study, as the majority of participants reported drinking in private homes across different levels of alcohol consumption. This reinforces the need to communicate the risks for alcohol use in the home to parents, and to provide strategies to mitigate this risk, such as locking up alcohol, remaining actively engaged when youth and their friends are in their home, and proactively inquiring about the home setting of their child's friends.

The relationship between high alcohol intake and alcohol-related consequences among youth and young adults is well established (Perkins, 2002; Windle & Windle, 2005). Examining the consequences of high-intensity alcohol use is especially important given the acute intoxication that occurs with this type of excessive consumption. We found that the odds of experiencing three alcohol-related consequences--passing out, not remembering what happened during the drinking event, and damaging property or getting in a fight--were more than double for those that consumed alcohol at two or more times the binge drinking threshold compared to those who drank at 1–2 times the binge drinking level, which itself is a risky level of drinking. These findings corroborate other research findings indicating unique consequences of drinking beyond the binge threshold with adolescent (Evans-Polce et al, 2017; McCabe et al, 2017), young adult (Hingson & White, 2013), and general adult populations (Hingson et al., 2017). Having no memory of the drinking event is indicative of alcohol-induced blackouts, or periods of amnesia that occur in which the individual engages in behaviors, potentially serious acts such as unintended sexual activity, but the brain is unable to create memories for the event. This is particularly alarming among young adults given their incomplete knowledge of blackouts (Miller et al 2018) and high rates of sexual assault in which alcohol is involved in this age group (Abbey, 2002). Collectively, this work demonstrates an increased level of risk for individuals and their communities associated with high-intensity alcohol consumption that warrants strategic attention to reduce such harms.

This study adds to growing evidence of the need to measure and include in analyses a high-intensity level of alcohol consumption to capture drinkers that exceed standard binge drinking thresholds. Doing so differentiates drinkers who are most at risk for severe consequences due to acute intoxication levels. We tested study hypotheses using two models, one that utilized gender-specific cutoffs for males and females to denote a binge or heavy drinking episode (4+ females, 5+ males), and another that also included a high-intensity drinking level (two or more times the gender-specific binge threshold). We found unique precursors and consequences of drinking at a high-intensity level when compared to those who drink at standard binge levels. Thus, the etiology of high-intensity drinking is unique even when compared to those who consume alcohol at levels that are widely accepted as risky. Our findings with youth and young adults align with similar research that suggests not all binge drinkers consume alcohol in the same pattern, endure drunkenness in the same manner, or experience similar consequences (Read et al 2008; Hingson & Zha, 2018). These results are supported by event-level assessment of alcohol use that found 4+/5+ binge drinking thresholds are accurate to predict some alcohol consequences, but were too low to predict severe acute consequences, such as blackouts and risky sex (Labhart et al, 2018). Consequently, use of a single level of risky drinking masks important information about higher, more dangerous consumption levels that should be a focus of public health prevention efforts.

Strengths, limitations, and future directions

A strength of this study is its use of a large dataset, with detailed data on party characteristics, attendance, and consequences, including participants residing in multiple areas across the U.S. While the sample is based on 24 communities in seven states, the results may not be generalizable to all 15–20 year olds in the US. It may be that youth and young adults who reside in areas that differ from the included communities (e.g., very large urban or small rural areas) may experience parties with other defining characteristics. For example, greater density of alcohol outlets, which in turn increases availability of alcohol, in urban metropolitan areas is associated with higher quantities of alcohol consumption among adolescents (Huckle et al., 2008). Delineating the social context of alcohol use in these communities with particularly high and low population densities is an important avenue for further research. This study was also strengthened by an extensive assessment of party characteristics; however, there may be other factors of the drinking context that are relevant to alcohol use, such as the relationship of the underage individual to others at the party. Previous research has indicated the deep selection and socialization processes that occur within adolescent peer networks that are associated with substance use (Ennett & Bauman, 1994; Burk et al., 2012). Thus, integrating social network components that capture interpersonal connections within a shared location are relevant to the study of youth and young adult drinking contexts. In addition, participants self-reported their alcohol consumption at a later date, which may have resulted in recall bias. Use of methods such as ecological momentary assessment that capture data in real time and in the natural setting (Shiffman, 2009) limit biases associated with retrospective recall. Studies that utilize these real-time methods (e.g. Lipperman-Kreda et al., 2018) are effective in capturing alcohol use as it occurs as well as the immediate social context of that drinking episode. It should also be noted that high-intensity drinking occurred in only 5% of the sample; thus, outliers in this

group may have had a disproportionate effect on our results. Finally, more nuanced measures of severe consequences associated with high-intensity drinking, such as distinguishing complete and fragmentary blackouts (Miller et al., 2018), would provide further insight into the etiology of high-intensity alcohol consumption.

Conclusions

This study indicates that there are unique precursors and consequences associated with high-intensity alcohol use among youth and young adults. Specifically, social settings with large numbers of people and majority male composition are associated with excessive alcohol consumption. Furthermore, the odds of experiencing alcohol consequences, such as not remembering the drinking event and aggressive behavior, are more than double for those who consume alcohol at a high-intensity level when compared to standard binge drinking levels. Collectively, these results indicate the need to further our understanding of the etiology of excessive alcohol consumption by youth and young adults and to develop and widely disseminate preventive interventions that reduce the burden and harms of high-intensity drinking.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1:

Sample and party characteristics (n=2442 attended a party with alcohol across all years)

	All (n=2442) n (%)	Below binge threshold (n=1885) n (%)	1–2 times binge threshold (n=431) n (%)	2+ binge threshold (n=126) n (%)
Individual characteristics				
Male	1057 (44.6%)	805 (44.2%)	182 (42.8%)	70 (56.9%)
Female	1312 (55.4%)	1016 (55.8%)	243 (57.2%)	53 (43.1%)
Non-White	606 (25.2%)	502 (27.1%)	74 (17.3%)	30 (24.0%)
White	1801 (74.8%)	1352 (72.9%)	354 (82.7%)	95 (76.0%)
Hispanic	332 (14.0%)	282 (15.4%)	39 (9.1%)	11 (9.0%)
Non-Hispanic	2041 (86.0%)	1543 (84.6%)	387 (90.9%)	111 (91.0%)
College degree	1609 (68.2%)	1215 (66.9%)	310 (73.6%)	84 (68.9%)
Less than college	750 (31.8%)	601 (33.1%)	111 (26.4%)	38 (31.2%)
Age: 15–17	963 (39.4%)	827 (43.9%)	99 (23.0%)	37 (29.4%)
Age: 18–20	1479 (60.6%)	1058 (56.1%)	332 (77.0%)	89 (70.6%)
Party Characteristics				
Location				
Other's home	1759 (72.2%)	1319 (70.2%)	343 (79.6%)	97 (77.6%)
My home	228 (9.4%)	184 (9.8%)	32 (7.4%)	12 (9.6%)
Other place	449 (18.4%)	377 (20.1%)	56 (13.0%)	16 (12.8%)
Gender composition				
Majority females	279 (11.4%)	208 (11.1%)	50 (11.6%)	21 (16.7%)
Majority males	283 (11.6%)	201 (10.7%)	61 (14.2%)	21 (16.7%)
Mixed sex 50/50	1876 (77.0%)	1472 (78.3%)	320 (74.3%)	84 (66.7%)
Age distribution				
Mostly under 21	1143 (47.0%)	807 (43.0%)	257 (59.6%)	79 (62.7%)
Mostly over 21	1291 (53.0%)	1070 (57.0%)	174 (40.4%)	47 (37.3%)
Parent supervision				
Yes	699 (28.8%)	647 (34.6%)	41 (9.6%)	11 (8.7%)
No	1727 (71.2%)	1224 (65.4%)	388 (90.4%)	115 (91.3%)
Saw a lot of people get drunk				
Yes	1181 (48.6%)	719 (38.4%)	355 (82.4%)	107 (84.9%)
No	1248 (51.4%)	1153 (61.6%)	76 (17.6%)	19 (15.1%)
Size, <i>Mean (SD)</i>	39.1 (72.0)	39.5 (72.7)	33.9 (57.0)	49.6 (101.5)
Consequences				
Passed out				
Yes	64 (3.4%)	20 (1.4%)	24 (7.1%)	20 (20.8%)
No	1829 (96.6%)	1440 (98.6%)	313 (92.9%)	76 (79.2%)
Not remember				
Yes	158 (8.4%)	47 (3.2%)	73 (21.6%)	38 (40.0%)
No	1725 (91.6%)	1403 (96.8%)	265 (78.4%)	57 (60.0%)
Hangover				

		All (n=2442)	Below binge threshold (n=1885)	1–2 times binge threshold (n=431)	2+ binge threshold (n=126)
		n (%)	n (%)	n (%)	n (%)
	Yes	291 (18.1%)	105 (8.4%)	142 (49.7%)	44 (55.0%)
	No	1319 (81.9%)	1139 (91.6%)	144 (50.4%)	36 (45.0%)
Punished by parents					
	Yes	61 (3.8%)	40 (3.2%)	16 (5.6%)	5 (6.3%)
	No	1542 (96.2%)	1199 (96.8%)	268 (94.4%)	75 (93.8%)
Broke/damaged/fight					
	Yes	57 (3.0%)	22 (1.5%)	19 (5.6%)	16 (16.7%)
	No	1825 (97.0%)	1427 (98.5%)	318 (94.4%)	80 (83.3%)
Sex against will					
	Yes	30 (1.6%)	9 (0.6%)	12 (3.6%)	9 (9.4%)
	No	1860 (98.4%)	1447 (99.4%)	326 (96.5%)	87 (90.6%)

Table 2:

Multinomial logistic regression predicting level of alcohol use by party characteristics (n=2442 attended a party with alcohol across all years)

	Level of drinking: Odds Ratio (95% CI)			
	Model 1 1+ times binge threshold vs. below binge threshold	1–2 times binge threshold vs. below binge threshold	Model 2 2+ times binge threshold vs. below binge threshold	2+ times binge threshold vs. 1–2 times binge threshold
Party Characteristics				
Size	0.9 (0.8, 1.1)	0.9 (0.7, 0.995)	1.2 (0.97, 1.6)	1.4 (1.1, 1.9)
Other's Home (vs. My Home)	0.8 (0.5, 1.3)	0.8 (0.5, 1.3)	0.8 (0.4, 1.6)	0.9 (0.4, 2.0)
Other Place (vs. My Home)	0.6 (0.3, 0.9)	0.6 (0.3, 1.04)	0.5 (0.2, 1.2)	0.8 (0.3, 2.1)
Majority Females (vs. 50/50)	1.6 (1.1, 2.3)	1.4 (0.9, 2.0)	2.4 (1.3, 4.3)	1.7 (0.9, 3.3)
Majority Males (vs. 50/50)	1.1 (0.8, 1.5)	0.9 (0.6, 1.4)	1.7 (0.99, 3.0)	1.9 (1.04, 3.5)
Age Distribution: Mostly Over 21 (vs. Mostly Under 21)	0.7 (0.6, 0.9)	0.8 (0.6, 0.98)	0.7 (0.4, 1.02)	0.9 (0.5, 1.4)
Parent supervision most or all of the time: Yes (vs. No)	0.4 (0.3, 0.6)	0.4 (0.3, 0.6)	0.4 (0.2, 0.9)	1.1 (0.5, 2.5)
Saw a lot of people getting drunk: Yes (vs. No)	6.1 (4.6, 8.1)	5.7 (4.2, 7.7)	8.2 (4.5, 15.0)	1.5 (0.8, 2.8)
Individual Characteristics				
Gender: Female (vs. Male)	0.9 (0.7, 1.1)	1.0 (0.8, 1.3)	0.5 (0.4, 0.8)	0.6 (0.4, 0.9)
Age: 15–17 (vs. 18–20)	0.5 (0.4, 0.7)	0.5 (0.4, 0.7)	0.7 (0.4, 1.1)	1.4 (0.8, 2.2)
Race: Non-White (vs. White)	0.9 (0.6, 1.2)	0.8 (0.6, 1.1)	1.0 (0.6, 1.7)	1.4 (0.8, 2.4)
Ethnicity: Hispanic (vs. Non-Hispanic)	0.7 (0.4, 0.97)	0.7 (0.4, 1.1)	0.5 (0.2, 1.1)	0.7 (0.3, 1.7)
Mother's education: College Degree (vs. Less than College Degree)	1.1 (0.8, 1.4)	1.1 (0.9, 1.5)	0.9 (0.6, 1.4)	0.8 (0.5, 1.2)
Covariates				
Status: Intervention (vs. Control)	1.0 (0.7, 1.4)	1.0 (0.7, 1.5)	1.0 (0.6, 1.6)	1.0 (0.6, 1.6)
SHO ever passed: Yes (vs. No)	1.1 (0.8, 1.5)	1.0 (0.7, 1.5)	1.1 (0.7, 1.7)	1.0 (0.6, 1.6)
Year: 2014 (vs. 2013)	0.9 (0.6, 1.4)	0.9 (0.6, 1.4)	0.9 (0.4, 1.7)	0.9 (0.4, 1.9)
Year: 2015 (vs. 2013)	0.9 (0.6, 1.3)	0.9 (0.6, 1.3)	0.9 (0.5, 1.5)	0.9 (0.5, 1.7)
Year: 2016 (vs. 2013)	0.7 (0.5, 0.999)	0.8 (0.6, 1.1)	0.6 (0.3, 1.04)	0.8 (0.4, 1.4)

Table 3:

Multinomial logistic regression predicting alcohol consequences by level of alcohol use (n=760 attended a party with alcohol in 2015 and 2016)

	Any consequence	Passed out	Not remember	Hangover	Punished by parents	Broke/damaged/fight	Sex against will
Drinking level							
Model 1: 1+ vs. below binge threshold	7.7 (5.3, 11.1)	7.2 (3.6, 14.4)	7.2 (4.5, 11.6)	7.1 (4.9, 10.2)	1.6 (0.8, 3.1)	6.7 (3.0, 14.9)	5.7 (2.0, 16.7)
Model 2: 1-2 vs. below binge threshold	6.0 (4.3, 8.3)	4.4 (2.1, 9.0)	4.7 (2.9, 7.5)	6.6 (4.6, 9.3)	1.4 (0.7, 2.8)	4.0 (1.7, 9.3)	3.5 (1.2, 10.5)
Model 2: 2+ vs. below binge threshold	9.9 (5.5, 17.6)	11.9 (5.1, 27.8)	11.2 (5.9, 21.0)	7.6 (4.4, 13.3)	1.7 (0.6, 4.9)	11.2 (4.2, 30.0)	9.4 (2.5, 36.0)
Model 2: 2+ vs. 1-2	1.7 (0.9, 3.0)	2.7 (1.3, 5.8)	2.4 (1.3, 4.3)	1.2 (0.7, 2.0)	1.2 (0.4, 3.7)	2.8 (1.1, 6.8)	2.7 (0.8, 9.1)
Party Characteristics							
Size	1.0 (0.9, 1.2)	1.1 (0.8, 1.6)	1.3 (1.01, 1.7)	1.1 (0.9, 1.3)	1.0 (0.7, 1.4)	1.2 (0.9, 1.8)	0.8 (0.4, 1.4)
Other's Home (vs. My Home)	0.6 (0.4, 1.1)	0.7 (0.3, 1.7)	0.5 (0.2, 0.9)	0.6 (0.3, 0.98)	1.2 (0.4, 3.4)	0.5 (0.2, 1.3)	0.8 (0.2, 3.3)
Other Place (vs. My Home)	0.6 (0.3, 1.2)	0.9 (0.3, 2.9)	0.6 (0.3, 1.4)	0.6 (0.3, 1.1)	0.8 (0.2, 2.9)	1.1 (0.3, 3.6)	0.3 (0.03, 3.3)
Majority Females (vs. 50/50)	2.0 (1.2, 3.1)	4.4 (2.1, 9.2)	2.1 (1.2, 3.9)	1.6 (0.9, 2.6)	1.9 (0.9, 4.3)	5.6 (2.5, 12.2)	2.3 (0.7, 7.5)
Majority Males (vs. 50/50)	0.8 (0.5, 1.2)	0.6 (0.2, 1.8)	0.7 (0.3, 1.4)	0.6 (0.4, 1.1)	1.9 (0.9, 4.3)	1.7 (0.6, 4.3)	0.3 (0.03, 2.3)
Mostly Over 21 (vs. Mostly Under 21)	1.0 (0.7, 1.4)	1.5 (0.8, 2.9)	0.7 (0.5, 1.1)	1.1 (0.8, 1.5)	0.8 (0.5, 1.6)	1.2 (0.6, 2.4)	1.5 (0.6, 4.1)
Parent supervision: Yes (vs. No)	0.3 (0.2, 0.5)	0.4 (0.1, 1.01)	0.2 (0.1, 0.6)	0.2 (0.1, 0.4)	0.6 (0.3, 1.3)	0.1 (0.01, 0.4)	0.3 (0.03, 2.3)
Saw a lot of people get drunk: Yes (vs. No)	2.6 (1.8, 3.6)	2.8 (1.2, 6.3)	3.1 (1.7, 5.6)	2.5 (1.7, 3.7)	1.9 (0.97, 3.7)	0.8 (0.4, 1.9)	10.8 (1.3, 88.5)
Individual Characteristics							
Gender: Female (vs. Male)	0.8 (0.6, 1.1)	0.5 (0.3, 0.9)	0.9 (0.6, 1.4)	0.9 (0.6, 1.2)	1.2 (0.6, 2.1)	0.6 (0.3, 1.1)	2.0 (0.7, 5.3)
Age: 15-17 (vs. 18-20)	0.9 (0.7, 1.3)	0.6 (0.3, 1.2)	1.0 (0.6, 1.5)	0.9 (0.6, 1.3)	3.2 (1.7, 5.7)	1.2 (0.6, 2.5)	1.3 (0.5, 3.6)
Race: Non-White (vs. White)	1.2 (0.8, 1.7)	1.1 (0.5, 2.2)	0.8 (0.4, 1.3)	1.1 (0.7, 1.6)	1.1 (0.6, 2.3)	1.4 (0.6, 3.3)	0.5 (0.1, 2.2)
Ethnicity: Hispanic (vs. Non-Hispanic)	1.6 (0.999, 2.5)	2.9 (1.3, 6.4)	1.4 (0.7, 2.7)	1.3 (0.8, 2.2)	1.2 (0.5, 2.9)	3.1 (1.3, 7.8)	0.8 (0.1, 6.5)
Mother's Education: College Degree (vs. Less than College Degree)	1.0 (0.7, 1.4)	0.7 (0.4, 1.3)	0.6 (0.4, 0.99)	1.0 (0.7, 1.4)	0.9 (0.5, 1.7)	1.2 (0.5, 2.5)	0.5 (0.2, 1.4)
Covariates							
Status: Intervention (vs. Control)	1.4 (0.97, 1.9)	0.8 (0.4, 1.7)	1.1 (0.6, 1.8)	1.2 (0.8, 1.8)	1.7 (0.9, 3.2)	1.9 (0.8, 4.4)	6.9 (1.9, 25.2)
SHO ever passed: Yes (vs. No)	0.7 (0.5, 1.01)	1.0 (0.5, 2.2)	1.1 (0.7, 1.8)	0.8 (0.5, 1.1)	0.5 (0.3, 0.98)	1.0 (0.4, 2.3)	0.5 (0.2, 1.3)
Year: 2016 (vs. 2015)	0.8 (0.6, 1.1)	0.8 (0.4, 1.4)	0.9 (0.6, 1.4)	0.8 (0.6, 1.1)	0.8 (0.5, 1.5)	0.6 (0.3, 1.1)	1.1 (0.4, 2.8)