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High-Intensity Drinking Among Young Adults in the United States: Prevalence, Frequency, and Developmental Change

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Abstract

BACKGROUND—The present study is the first to examine the developmental course of high-intensity drinking (i.e., consuming 10+ drinks in a row) across late adolescence and the transition to adulthood.

METHODS—National longitudinal data (N=3,718) from Monitoring the Future were used to examine trajectories of 10+ high-intensity drinking from age 18 through 25/26 overall and across sociodemographic subgroups; results were compared with similar analysis of 5+ binge drinking trajectories.

RESULTS—Results document that 10+ drinkers consume not just a greater quantity of alcohol on a given drinking occasion, but also engage in 5+ drinking more frequently than drinkers who do not report having 10 or more drinks. Developmental patterns for 10+ and 5+ drinking were similar, with peak frequencies reported at age 21/22. Greater peaks in both 10+ and 5+ drinking were documented among men and among college attenders, compared to women and non-attenders, respectively. However, there was a steeper decline in 10+ drinking after age 21/22, indicating that risk for consumption of 10 or more drinks in a row is more clearly focused on the early twenties. Patterns of developmental change in both behaviors were driven largely by college students: no significant age-related change in 10+ drinking was observed among men and women who did not go to college, and no significant age-related change in 5+ drinking was observed among female non-attenders.

CONCLUSIONS—Findings underscore the importance of recognizing high-intensity drinkers as a unique high-risk group, and that college attendance is associated with particularly strong peaks in the developmental course of high-intensity drinking.

Keywords

high-intensity; extreme binge drinking; college attendance; trajectories; development; binge drinking

In the research literature, high-quantity alcohol use is usually examined with the highest category being binge drinking, typically defined as 5 or more drinks in a row on a given occasion (Johnston et al., 2015; Wechsler and Nelson, 2001). Such 5+ drinking is potentially risky and has clear links with alcohol-related and other health-related consequences (Chassin

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et al., 2002; Courtney and Polich, 2009; Wechsler et al., 1994). However, the standard 5+ measure also has limitations (Jackson et al., 2008; Alexander and Bowen, 2004). Factors such as body weight, alcohol tolerance, and food intake/hydration prior to drinking may result in an individual having a relatively low (and potentially legal) BAC following 5+ drinking. Thus, the single 5+ threshold does not always differentiate those most at risk for consequences resulting from intoxication levels surpassing the legal limit.

Considering inclusion of both a 5+ and a higher threshold is particularly important because young people often far exceed 5+ drinks. Evidence shows that high school students (Patrick et al., 2013), college students (White et al., 2006), and young adults more generally (Hingson and White, 2013) consume many more drinks on some occasions. In fact, during binge drinking episodes, young adults aged 18 to 24 in the U.S. have an average of over 9 drinks (Naimi et al., 2010). Thus, we need additional measures of high-quantity alcohol use to capture the heterogeneity in binge drinking and to advance our understanding of the etiology of risky drinking, particularly during late adolescence and the transition to adulthood.

Recent calls for research include a focus on the epidemiology and etiology of high-intensity drinking—defined here as consuming 10 or more drinks in a row—to better understand the acute and long-term risks of very high alcohol use levels (Hingson and White, 2013; Patrick, 2016). One important next step is to examine the developmental course of high-intensity drinking across late adolescence and the transition to adulthood based on longitudinal data (Patrick, 2016). Examining the typical course of 10+ drinking—how it escalates, peaks, and subsides among young people overall and among sociodemographic subgroups—will provide essential information for prevention and intervention efforts to target when and with whom to intervene in order to prevent associated consequences. In particular, important unanswered questions involve similarities and differences between 10+ and 5+ drinking in terms of developmental course and subgroups at greatest risk for such drinking.

There is considerable research on trajectories of 5+ drinking across adolescence and into adulthood; binge drinking prevalence tends to increase across adolescence, peak in the early 20s, and then decline across the mid-to-late 20s (Chassin et al., 2002; Johnston et al., 2015; Maggs and Schulenberg, 2004; Patrick and Schulenberg, 2011; Schulenberg and Patrick, 2012). Thus, 5+ drinking, like other risk behaviors, tends to show a developmentally embedded pattern of peaking during the transition to adulthood, drawing attention to how binge drinking relates to the tasks and transitions of adolescence and early adulthood (Brown et al., 2008; Schulenberg and Maggs, 2002). Engaging in 5+ drinking is quite common though not normative during the transition to adulthood, with over one-third of those aged 19–24 having at least one episode in a given two week period (Johnston et al., 2015). Some young adults may use binge drinking to facilitate social connectedness (a primary developmental task), and understanding this developmental embeddedness is important for informing prevention and intervention efforts (Crosnoe, 2011; Schulenberg and Maggs, 2002; Chassin et al., 1989). Whether the course of higher-intensity drinking during the transition to adulthood fits a similar developmental pattern is not known. Similarities between the course of 5+ drinking and 10+ drinking would suggest potentially

similar underlying causes and functions; differences in the developmental pattern would suggest potential uniqueness in the predictors and correlates of high-intensity drinking.

A range of sociodemographic and educational covariates has been shown to be associated with the overall developmental trajectory of binge drinking across late adolescence and into adulthood, including gender, race/ethnicity, socioeconomic status, comorbid substance use, high school academic success, and college attendance. The extent and degree to which these covariates are associated with the average trajectory of higher-intensity drinking during the same developmental period is unknown. Men, compared to women, and whites, compared to non-whites, have shown significantly faster rates of change over time in "heavy drinking" (a measure combining binge drinking with the frequency of getting drunk) (Chen and Jacobson, 2013); they also show higher prevalence rates of gender-specific binge drinking (5+ for males vs. 4+ for females; Costanzo et al., 2007) and of having 6+ drinks per occasion throughout the second decade of life (Muthén and Muthén, 2000). Higher parental education (an indication of family-of-origin socioeconomic status) has been found to be associated with lower heavy drinking at ages 13–21, but higher rates of linear and quadratic change over the next decade (Chen and Jacobson, 2013) and higher rates of binge drinking (Patrick et al., 2012) during young adulthood. Binge drinking frequency is highly comorbid with tobacco and marijuana use across age (Jackson et al., 2008; Schulenberg et al., 1996a), with evidence that early use of other substances is associated with later development of high-risk alcohol use (Nelson et al., 2015). Higher high school grades have been shown to predict lower adolescent binge drinking (Patrick and Schulenberg, 2010) but to be generally unrelated to the post-high school trajectory of binge drinking (Schulenberg et al., 1996b). The transition into being a full-time college student is associated strongly with increased risk of binge drinking. Involvement in binge drinking is typically lower among college-bound than other high school students, but then escalates more quickly post-high school for college students than non-college age-mates (Brown et al., 2008; Schulenberg and Patrick, 2012). In an examination of binge drinking from adolescence through young adulthood as a function of college attendance, Timberlake et al. (2007) found that high school binge drinking was more common for those who did not go on to attend college, but by age 19 and throughout young adulthood, binge drinking among those who attended college surpassed that of those who did not attend college.

The Current Study

The current study is the first to examine the longitudinal course of high-intensity drinking across late adolescence and the transition to adulthood. Three research aims are examined: (1) how 10+ drinkers differ in their level of involvement with 5+ drinking, compared to those who do not report 10+ drinking; (2) to what degree the average trajectory of 10+ drinking frequency parallels the average trajectory of 5+ drinking frequency from ages 18 through 25/26; and (3) to what extent sociodemographic and educational characteristics account for similarities and differences between 10+ and 5+ drinking trajectories, with a particular focus on gender and college attendance.

METHODS

Study Population

Analyses used data from the Monitoring the Future (MTF) study; detailed methodology is provided elsewhere (Bachman et al., 2015; Johnston et al., 2015). Briefly, a nationally representative sample of approximately 15,000 12th graders (modal age 18) from about 130 schools is surveyed annually. A subsample of about 2,450 seniors is randomly selected from each annual sample for longitudinal follow-up using mailed questionnaires; substance users are oversampled (analyses include weights accounting this oversample). Respondents are randomly divided with half surveyed one year after graduation (modal age 19) and then every two years after that to age 29, and half surveyed two years after graduation (modal age 20) and then every two years after that to age 30. Given the current study's focus on early young adulthood, responses at age 18, 19/20, 21/22, 23/24, and 25/26 are included in these analyses. Follow-up questionnaires are mailed in the spring with a modest monetary incentive. The University of Michigan Behavioral Sciences Institutional Review Board approved the study.

The analyses utilize items asked from 2005 onwards on one MTF questionnaire form (out of six randomly distributed questionnaire forms used for data collection). Thus, the current sample was limited to cohorts who were in the 12th grade from 1997 to 2013 and had the opportunity to respond to follow-up surveys during 2005–2014 (see Supplemental Table 1). The average age-18 response rate for these cohorts was 82.5% (most all non-response at age 18 being due to school absenteeism rather than refusal). A total of 5,973 individuals who responded to the relevant questionnaire at age 18 were selected for longitudinal follow-up and thus form the sample eligible for participation in the current paper. Of those, 3,718 (62.2%) responded to at least one of the four relevant follow-up surveys from 2005 to 2014 and provided data on either 5+ or 10+ drinking outcomes; data on both outcomes were available for 3,698 (61.9%).

Measures

High-intensity and binge drinking—The two alcohol outcomes used in these analyses were based on questions posed at age 18 and each follow-up survey, as follows: *During the last two weeks, how many times have you had…. five or more drinks in a row?* [5+ binge drinking]; *10 or more drinks in a row?* [10+ high-intensity drinking]. Response categories included none, once, twice, 3–5 times, 6–9 times, and 10 or more times (coded 0–5 for analysis). In accordance with earlier work on the topic (e.g., Patrick, 2016; Patrick et al., 2013; White et al., 2006), we operationalize high-intensity drinking as drinking twice the binge threshold, or 10+ drinks.

Covariates—Gender, race/ethnicity, parental education, high school grades, and high school substance use were reported at age 18. Gender was coded as male or female. Self-identified race/ethnicity was coded as White, Black, Hispanic, or Other. Black, Hispanic, and Other race respondents reported very low prevalence for high-intensity drinking; hence all analyses used a dichotomy of White versus non-White. A dichotomy for parental education (used as a proxy for socioeconomic status; Patrick et al., 2012) indicated whether

respondents reported that at least one parent had graduated from college. Average high school grades were asked using a 9-point scale ranging from A to D; data were coded into a dichotomy of (0) C+ or lower versus (1) B- or above. High school substance use measures were dichotomous and indicated any use of (a) cigarettes within the past 30 days, (b) marijuana within the past 12 months, and (c) illicit drugs other than marijuana in the past 12 months. College attendance was reported at age 19/20 and indicated if the respondent reported being a full-time student at a 4-year college (vs. other).

Analysis

Analyses were conducted with Mplus 7.3 (Muthén and Muthén, 1998–2015) using full-information maximum likelihood estimation. Missing data on covariates were addressed by including covariates in the model via modeling variances (Muthén and Muthén, 2010a; 2010b). For Aim 1 (examining 5+ drinking among 10+ drinkers), unconditional means were estimated to examine overlap between 5+ and 10+ drinking prevalence and frequency. Linear, quadratic, and piecewise growth curve models were explored for both Aim 2 (comparisons of 10+ and 5+ drinking trajectories) and Aim 3 (examining trajectories by subgroups); results indicated piecewise latent growth curve models provided the best fit for both 10+ and 5+ drinking. In addition to the intercept, two distinct time periods (ages 18 through 21/22; ages 21/22 through 25/26) were identified and modeled with separate latent slopes. Associations with sociodemographic and educational covariates were examined using time-invariant covariate and grouping models. In time-invariant covariate models, direct paths from age 18 covariates were added to both Intercept and Slopes; direct paths were added only to Slopes for college attendance (see Supplemental Figure 1). Based on the results of time-invariant models, two- and four-group models further investigated associations between gender and college status with developmental change in both 10+ and 5+ drinking frequency. Comparisons of models where estimates were constrained to be equal across groups versus estimated freely were made using the Satorra-Bentler scaled chi-square difference test (Satorra and Bentler, 2001). All models used maximum likelihood estimation with robust standard errors and were weighted using attrition weights.

RESULTS

Supplemental Table 2 provides descriptive statistics for outcomes and covariates. The prevalence of 10+ drinking rose from 8.9% at age 18 to 13.8% at age 21/22, and then decreased to 12.1% by age 25/26. In comparison, the prevalence of 5+ drinking rose from 19.1% at age 18 to 32.9% at age 21/22 and remained steady through age 25/26.

Aim 1: Overlap between 10+ and 5+ drinking

To examine the overlap between 10+ and 5+ drinking, the sample was limited to cases with data on both behaviors (n=3,698). The percentage of 5+ drinkers who also reported 10+ drinking was highest at age 18, when 45.4% of 5+ drinkers also reported 10+ drinking (in the total sample, 19.4% reported 5+ and 8.8% reported 10+). The proportion of 5+ drinkers who also reported 10+ drinking diminished steadily to age 25/26, when 36.4% of those reporting 5+ drinking also reported 10+ drinking (31.9% reported 5+; 11.6% reported 10+). The percentage of those reporting having 5+ drinks but not 10+ drinks (i.e., a maximum of

5–9 drinks) rose from 10.3% at age 18 to 19.3% at age 21/22, and then remained essentially steady through age 25/26 (20.6%).

Mean 5+ drinking frequency was estimated at each age among (a) those reporting 5+ but not 10+ drinking, and (b) those reporting 5+ and 10+ drinking. Results (Figure 1) show that if no 10+ drinking was reported, respondents who reported 5+ (i.e., had a max of 5–9 drinks) typically did so between once or twice in the past two weeks (ranging from 1.50 to 1.58; 1="once" and 2="twice"). However, 10+ drinkers typically reported 5+ drinking nearly 3–5 times in the past two weeks (ranging from 2.60 to 2.80; 2="twice" and 3="3–5 times"). Thus, 10+ drinkers engaged in 5+ drinking almost twice as frequently as those who did not drink beyond the 10+ threshold. The average frequency of 10+ drinking (among those who reported any) was 1.86 across all ages (ranging from 1.71 to 1.98, not graphed), or slightly less than two times in the past two weeks.

Aim 2: Comparisons of trajectories of 10+ and 5+ drinking frequency

Unconditional growth model estimates of both 10+ and 5+ drinking frequency for all respondents are reported in Table 1 (together with fit statistics) and estimated means are graphed in Figure 2, Panel A. While some individuals reported 10+ drinking on 10 or more occasions in the past 2 weeks at each age (value of 5 on 0–5 scale), estimated mean frequency of 10+ drinks across the total sample remained below once in the past 2 weeks (value of 1 on 0–5 scale) at all ages, rising from 0.175 (age 18) to 0.267 (age 21/22) and then decreasing to 0.200 (age 25/26). Estimates of mean 5+ drinking frequency also remained below once in the past two weeks, but were higher than estimated 10+ drinking frequency (rising from 0.391 at age 18 to 0.683 at age 21/22, and then decreasing to 0.627 by age 25/26). The rates of increase for 10+ and 5+ drinking from age 18 through 21/22 (Slope 1) were both significant (0.046 and 0.146, respectively). The rates of decrease from age 21/22 through 25/26 (Slope 2) for both 10+ drinking and 5+ drinking were similar (−0.033 vs. −0.028), but only 10+ drinking achieved significance.

For both 10+ and 5+ drinking, significant and negative correlations between Intercept and Slope 1 indicated that individuals with lower initial frequency increased more quickly through age 21/22. The lack of significant associations between Intercept and Slope 2 indicated that the rate of change in both 10+ and 5+ drinking from age 21/22 through 25/26 was unrelated to age 18 use frequency. For both drinking behaviors, significant negative correlations between Slopes 1 and 2 indicated that individuals reporting the strongest rates of increase from age 18 through 21/22 were also those who reported the strongest decreases from age 21/22 through 25/26.

Aim 3: Subgroup differences in trajectories of 10+ and 5+ drinking

Multivariable time-invariant covariate models (see Table 1 for estimates and fit statistics) indicated consistent patterns of association between covariates (other than high school grades) and Intercepts (age 18 use frequency) for both 10+ and 5+ drinking. Similar associations were observed between covariates and rates of change in both behaviors across the transition to adulthood. The rates of increase in frequency for Slope 1 (from age 18 through 21/22) were significantly higher for males (vs. females) and those who reported

attending a 4-year college full-time at age 19/20 (vs. non-attenders). Conversely, the Slope 1 rates of change for both behaviors were significantly *lower* for those who reported past 12-month illicit drug use other than marijuana as high school seniors (vs. non-users). Significant Slope 1 associations between race/ethnicity and high school cigarette use that were observed for 5+ drinking were not observed for 10+ drinking. For both 10+ and 5+ drinking, only college attendance at age 19/20 was significantly and negatively associated with rates of change in use frequency for Slope 2 (from age 21/22 through 25/26).

Two- and four-group models were run to further investigate gender and college attendance associations with 10+ and 5+ drinking. Results are reported in Table 2 and Figure 2 (Panels B and C, two-group models). The two-group model for gender confirmed that, at age 18, men reported higher frequency of 10+ and 5+ drinking than women did. Both men and women showed significant increases in 10+ and 5+ drinking from age 18 through 21/22, although the Slope 1 rate of increase was higher for men. Both men and women had significant decreases in 10+ and 5+ drinking frequency across Slope 2, but the rates of decrease observed did not differ between genders.

The two-group model for college status showed that, at age 18, mean frequencies of 10+ and 5+ drinking were higher for non-attenders than college attenders. No significant developmental change in 10+ drinking frequency was observed across either Slope 1 or Slope 2 for non-attenders. In contrast, the mean frequency of 5+ drinking significantly increased among non-attenders from age 18 through 21/22 (Slope 1) and then remained statistically stable from age 21/22 through 25/26. Among college attenders, 10+ and 5+ drinking both significantly increased from age 18 through 21/22, and then significantly decreased so that, by age 25/26, they returned to 5+ and 10+ frequency rates similar to or below those of non-attenders.

To investigate the associations across gender and college attendance simultaneously, a four-group model was used. Results clarified that developmental change in 10+ drinking was driven by college status; both Slope 1 and Slope 2 estimates could be constrained to be equal for men and women within college attendance. For 5+ drinking, the increase from age 18 through 21/22 was highest for college-attending men, followed by college-attending women, and, finally, non-attending men. Non-attending women showed no significant age-related change in 5+ drinking. No significant change in 5+ drinking frequency from age 21/22 through 25/26 was observed for either men or women non-attenders. Among college attenders, the significant decrease in 5+ drinking frequency from age 22/22 through 25/26 could be constrained to be equal for men and women.

DISCUSSION

High-intensity drinkers (i.e., individuals who report consuming 10 or more drinks in a row) drink alcohol in not only greater quantity but also greater frequency than binge drinkers (i.e., those who report consuming 5 or more drinks in a row). This replicates earlier work with college students showing that frequent binge drinkers were more likely to drink to higher quantities (White et al., 2006). High-intensity drinkers report having 10+ drinks almost twice in the past two weeks and having 5+ drinks about 3–5 times (among those who do not

report 10+ drinking, the average frequency of having 5–9 drinks is between once and twice). Given that 5+ drinking has clear links with alcohol-related and other health-related consequences (Chassin et al., 2002; Courtney and Polich, 2009; Wechsler et al., 1994; Schulenberg et al., in press), high-intensity drinkers appear to be a particularly high-risk population for intoxication-related consequences both to themselves and to others who may be affected by their actions. This extends previous work that has documented rates of high-intensity drinking among high school students (Patrick et al., 2013), college students (Patrick et al., 2016; White et al., 2006), and young adults (Patrick and Terry-McElrath, in review; Terry-McElrath and Patrick, 2016).

The observed developmental pattern in high-intensity drinking across the transition to adulthood was similar to that documented for binge drinking, but indicated that risk for consumption of 10+ drinks in a row more clearly concentrated in the early twenties. Peak frequencies of both 10+ and 5+ drinking were reported at age 21/22. High-intensity drinking frequency significantly declined after age 21/22, while binge drinking frequency did not show a statistically significant decline. Previous research has shown a significant decrease in 5+ drinking prevalence after age 21/22 (Johnston et al., 2015; Patrick and Schulenberg, 2011).

Greater peaks in high-intensity and binge drinking were documented among men than women. Developmental change in both behaviors was driven largely by college attendance. For 10+ drinking, there was no significant age-related change in frequency among men and women who did not go to college. Significant age-related change in 5+ drinking was not observed among non-college women, and showed only a modest peak at age 21/22 for non-college men. Frequencies of both 10+ and 5+ drinking among college attenders decreased by the mid-20s to approximately match non-attenders. College is a period of acute, time-limited risk for very heavy alcohol use, including both 5+ and 10+ drinking, for those who attend (Hingson et al., 2009; Perkins, 2002; Wechsler et al., 1994).

Strengths of the study include the national, multi-wave, multi-cohort longitudinal data that allow examination of average trajectories and subgroup analyses across eight years when risk of heavy drinking tends to reach its lifetime peak. However, the findings should be considered within the limitations of this study, which include the use of a school-based 12th grade sample (excluding high school drop-outs), and self-report alcohol use measures with two-year gaps between assessments. While the participation rates reported in the Methods section were typical for recent mail data collection efforts (Dillman et al., 2014), there was noted attrition. Analyses (not shown) indicated that study participation at age 19/20 (but not later ages) was significantly lower in multivariable models for individuals with higher age 18 alcohol involvement, thus possibly resulting in underestimation of alcohol use prevalence and frequency in the absence of attrition weighting. The use of attrition weights in the current analyses adjusts for such underestimation. Such limitations notwithstanding, this is the first study to chart the normative developmental course of high-intensity drinking, using national longitudinal data spanning late adolescence and the transition to adulthood. Future research should investigate whether there are multiple trajectories of high-intensity drinking that mirror the multiple trajectories that have been documented for binge drinking (Jackson et al., 2008; Maggs and Schulenberg, 2004; Nelson et al., 2015; Schulenberg et al., 1996a).

Additional consideration of psychosocial predictors and time-varying covariates is warranted, to examine potential differences between risk and protective factors for higher-intensity drinking compared to 5+ drinking. Finally, it will be important to evaluate the consequences of the developmental course of high-intensity drinking and binge drinking, including whether the behaviors differentially predict alcohol use disorders and other health outcomes in midlife.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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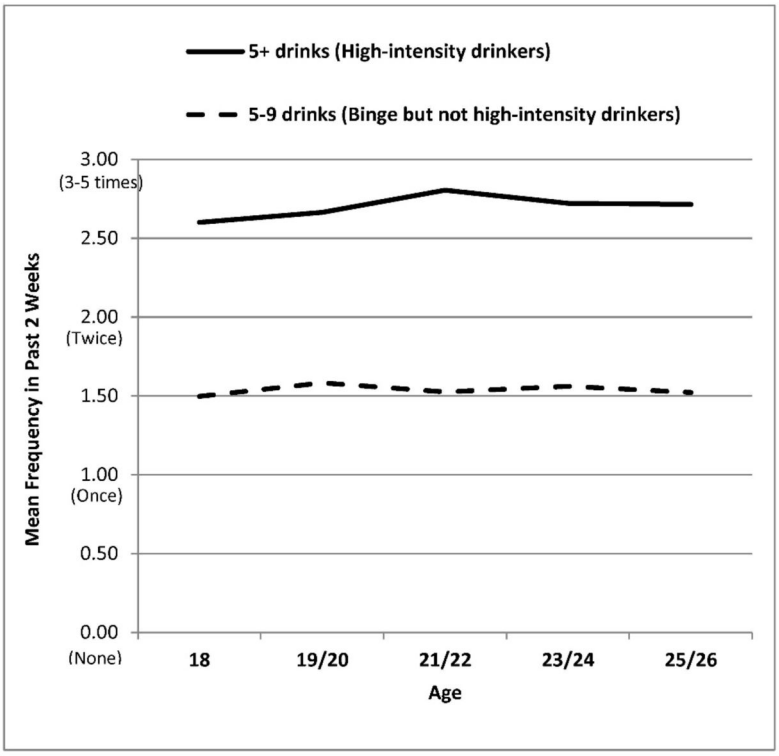

Figure 1. Comparing Frequency of Past 2-Week 5+ Binge Drinking among U.S. Young Adults Based on 10+ High-Intensity Drinking Participation

Note: Frequency range of (0) none, (1) once, (2) twice, (3) 3–5 times, (4) 6–9 times, (5) 10 or more times. 5+ drinks (High-intensity drinkers) = mean frequency of 5+ drinks if respondent reported any 10+ drinking. 5–9 drinks (Binge but not high-intensity drinkers) = mean frequency of 5+ drinks if respondent reported 5+ but not 10+ drinking.

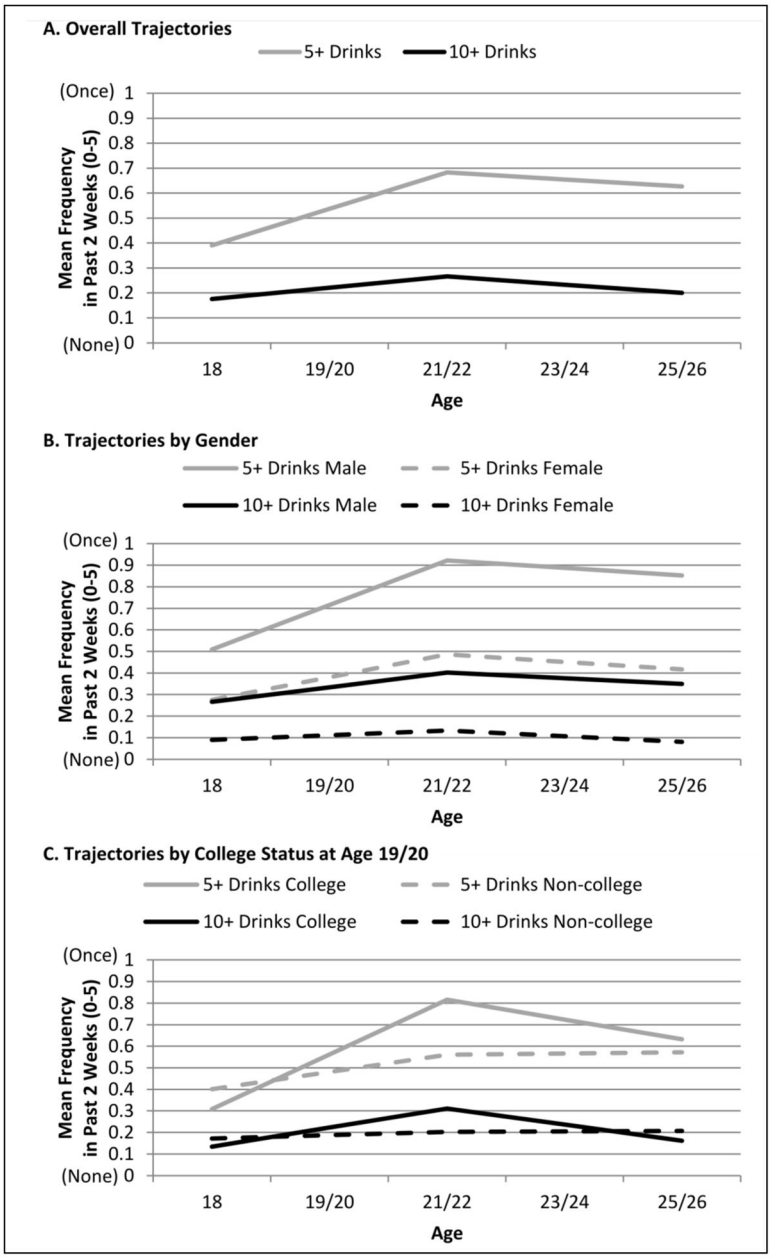

Figure 2. Estimated Trajectories of Past 2-Week 10+ High-Intensity and 5+ Binge Drinking Frequency among U.S. Young Adults

Notes: Model fit statistics reported in Table 1 for overall trajectories and in Table 2 for trajectories by gender and college status.

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Table 1

Piecewise Trajectories of Past 2-Week 10+ High-Intensity and 5+ Binge Drinking among U.S. Young Adults: Unconditional Growth Models and Time-Invariant Covariates

Unconditional growth models	**Mean estimates (unstandardized)**					
	I (Age 18)		**S1 (Age 18–21/22)**		**S2 (Age 21/22–25/26)**	
	Est	**p**	**Est**	**p**	**Est**	**p**
10+ High-intensity drinking	0.175	<.001	0.046	<.001	−0.033	0.001
5+ Binge drinking	0.391	<.001	0.146	<.001	−0.028	0.066
	Correlations (standardized)					
	I, S1		**I, S2**		**S1, S2**	
	r	**p**	***r***	**p**	***r***	**p**
10+ High-intensity drinking	−0.377	<.001	0.101	0.473	−0.824	<.001
5+ Binge drinking	−0.269	0.008	−0.022	0.866	−0.406	0.002
Time-invariant covariate models[a]	**Coefficients (standardized)**					
	I		**S1**		**S2**	
	B	**p**	**β**	**p**	**β**	**p**
10+ High-intensity drinking						
Male	0.177	<.001	0.109	0.001	−0.110	0.125
White race/ethnicity	0.067	0.025	0.042	0.201	−0.072	0.257
At least one parent with college degree	0.010	0.760	−0.033	0.352	0.094	0.156
Average high school grades B- or higher	0.027	0.488	0.022	0.611	−0.196	0.094
Past 30-day cigarette use (age 18)	0.246	<.001	−0.065	0.238	0.005	0.950
Past 12-month marijuana use (age 18)	0.175	<.001	−0.006	0.901	−0.081	0.316
Past 12-month other illicit drug use (age 18)	0.224	<.001	−0.095	0.046	−0.060	0.446
College attendance (age 19/20)	--	--	0.108	<.001	−0.206	0.037
5+ Binge drinking						
Male	0.152	<.001	0.108	0.002	0.085	0.106
White race/ethnicity	0.069	0.016	0.080	0.024	−0.042	0.416
At least one parent with college degree	0.020	0.513	−0.017	0.653	0.031	0.553

Unconditional growth models	Mean estimates (unstandardized)					
	I (Age 18)		S1 (Age 18–21/22)		S2 (Age 21/22–25/26)	
	Est	p	Est	p	Est	p
Average high school grades B- or higher	0.076	0.039	−0.008	0.860	−0.120	0.104
Past 30-day cigarette use (age 18)	0.310	<.001	−0.120	0.031	0.058	0.420
Past 12-month marijuana use (age 18)	0.340	<.001	−0.023	0.632	−0.090	0.198
Past 12-month other illicit drug use (age 18)	0.228	<.001	−0.114	0.019	0.034	0.600
College attendance (age 19/20)	--	--	0.179	<.001	−0.139	0.025
	X^2	(df)	p	CFI	TLI	RMSEA
Model fit statistics						
10+ High-intensity drinking						
Unconditional model	4.132	(5)	0.531	1.000	1.006	<.001
Multivariable model	26.899	(22)	0.215	0.995	0.988	0.008
5+ Binge drinking						
Unconditional model	3.555	(6)	0.737	1.000	1.006	<.001
Multivariable model	33.296	(23)	0.076	0.994	0.986	0.011

Notes: Ns(unweighted) for 10+ high-intensity drinking = 3,716; for 5+ binge drinking = 3,700. I = Intercept; S1 = Slope 1; S2 = Slope 2.

[a]All covariates entered simultaneously in time-invariant covariate models.

Table 2

Piecewise Trajectories of Past 2-Week 10+ High-Intensity and 5+ Binge Drinking among U.S. Young Adults: Unconditional Growth Models Grouped by Gender and College Attendance

		Mean estimates (unstandardized):					
		I (Age 18)		S1 (Age 18–21/22)		S2 (Age 21/22–25/26)	
	N	Est	p	Est	p	Est	p
10+ High-intensity drinking							
Two-group model: gender[a]							
Females	2,153	0.089	<.001	0.022	0.014	−0.026	0.001
Males	1,563	0.266	<.001	0.068	<.001	−0.026	0.001
Two-group model: college attendance [b]							
Non-attending[c]	1,593	0.171	<.001	0.016	0.254	0.002	0.871
Attending	1,434	0.134	<.001	0.088	<.001	−0.075	<.001
Four-group model: gender and college attendance[d]							
Not attending - Females	910	0.083	<.001	0.010	0.389	0.007	0.578
Not attending - Males	683	0.279	<.001	0.010	0.389	0.007	0.578
Attending - Females	896	0.042	<.001	0.069	<.001	−0.058	<.001
Attending - Males	538	0.283	<.001	0.069	<.001	−0.058	<.001
5+ Binge drinking							
Two-group model: gender[e]							
Females	2,146	0.275	<.001	0.105	<.001	−0.035	0.015
Males	1,554	0.509	<.001	0.207	<.001	−0.035	0.015
Two-group model: college attendance[f]							
Non-attending	1,589	0.401	<.001	0.080	<.001	0.006	0.802
Attending	1,427	0.308	<.001	0.254	<.001	−0.092	<.001
Four-group model: gender and college attendance[g]							
Not attending - Females	907	0.296	<.001	0.040	0.084	<.001	0.987
Not attending - Males	682	0.497	<.001	0.142	<.001	<.001	0.987
Attending - Females	893	0.202	<.001	0.213	<.001	−0.091	<.001
Attending - Males	534	0.443	<.001	0.323	<.001	−0.091	<.001

Notes: I = Intercept; S1 = Slope 1; S2 = Slope 2. Decisions to free or constrain estimates to be equal across groups based on results of Satorra-Bentler scaled chi-square difference tests. For 10+ and 5+ gender grouping models, Slope 2 mean and variance were constrained to be equal across gender. For 10+ and 5+ college status grouping models, Slope 2 variance was constrained to be equal across college status. For the four-group gender and college status models, Slope 1 and Slope 2 means were constrained to be equal across gender within college status groups for 10+; Slope 2 mean was constrained to be equal across gender within college status groups for 5+.

[a] χ^2(df)=8.454(12); RMSEA=<.001; CFI=1.000; TLI=1.026.

[b] χ^2(df)=12.063(10); RMSEA=0.012; CFI=0.992; TLI=0.984.

[c] Attending = Full-time student at 4-year college at age 19/20.

[d] χ^2(df)=32.264(30); RMSEA=0.010; CFI=0.991; TLI=0.988.

[e] χ^2(df)=20.926(14); RMSEA=0.016; CFI=0.989; TLI=0.985.

[f] χ^2(df)=26.255(11); RMSEA=0.030; CFI=0.977; TLI=0.959.

[g] χ^2(df)=44.440(28); RMSEA=0.028; CFI=0.975; TLI=0.964.