

Initiation of and Escalation to High-Intensity Drinking in Young Adults

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IMPORTANCE High-intensity drinking (HID) (≥ 10 drinks in a row) is associated with acute negative outcomes. Identifying factors associated with HID initiation in adolescence and how it is associated with young adulthood outcomes can inform screening and prevention.

OBJECTIVE To identify when individuals initiate HID and speed of escalation from first drink and first binge to first HID; characteristics associated with initiation and escalation; and whether these characteristics are associated with weekly alcohol consumption, HID frequency, and symptoms of alcohol use disorder at age 20 years.

DESIGN, SETTING, AND PARTICIPANTS This cohort study analyzed web-based survey data from respondents in the US who reported alcohol use in the past 30 days recruited from the 2018 12th grade Monitoring the Future study and surveyed again from February 14 through April 17, 2020, at modal age 20 years in the Young Adult Daily Life Study. Only respondents who reported HID by modal age 20 years were included in the analyses.

EXPOSURES Retrospective alcohol use initiation and self-reported alcohol use measures.

MAIN OUTCOMES AND MEASURES Key retrospective measures included year of initiation for alcohol, first binge (≥ 5 drinks), and HID (≥ 10 drinks). Measures at age 20 years included weekly alcohol consumption, HID frequency, and Alcohol Use Disorders Identification Test (AUDIT) scores. Covariates included biologic sex, race and ethnicity, parental college education, family history of alcohol problems, and college status. Descriptive statistics and multivariable regression models were used, and all analyses were weighted.

RESULTS Of the 451 participants with data eligible for analysis, 62.0% were male (38.0% female). On average, alcohol, binge, and HID were initiated during high school. Mean time of escalation from first drink to first HID was 1.9 (95% CI, 1.8-2.1) years and between first binge and first HID, 0.7 (95% CI, 0.6-0.8) years. Initiating HID by grade 11 (vs later) was associated with higher average weekly alcohol consumption (adjusted incidence rate ratio [aIRR], 1.40; 95% CI, 1.10-1.79), HID frequency (aIRR, 2.01; 95% CI, 1.25-3.22), and AUDIT score (adjusted odds ratio, 1.17; 95% CI, 1.02-1.34) at age 20 years. Escalation from first binge to first HID in the same year (vs ≥ 1 year) was associated with higher HID frequency at age 20 years (aIRR, 1.66; 95% CI, 1.06-2.61).

CONCLUSIONS AND RELEVANCE These findings suggest that understanding ages and patterns of HID initiation and escalation associated with particular risk may facilitate screening for adolescents and young adults.

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High-intensity drinking (HID), defined as consuming 10 or more drinks in a row,¹ is a particularly risky drinking behavior that is accompanied by multiple health risks, including negative acute (eg, passing out, unsafe driving, or unintentional injuries²⁻⁷) and longer-term consequences (eg, alcohol use disorder⁸). While risk for such negative consequences is high for binge drinking, it is significantly greater for HID.^{7,9} Across the most recent 5 years (2017-2021), 1 in 10 young adults reported HID in the past 2 weeks.¹⁰ Given the nontrivial percentage of individuals engaging in HID, understanding HID escalation and initiation has high public health importance.

There is considerable variability in the developmental timing of alcohol use behaviors. For example, in 2021, one-fifth of US adolescents reported initiating alcohol use by eighth grade and more than one-half by 12th grade.¹¹ Earlier alcohol initiation is associated with family history of alcohol problems and being male, non-Hispanic White, and Hispanic.^{12,13} While some studies found that higher household socioeconomic status is associated with earlier initiation, other studies found no associations.¹⁴ Earlier initiation is associated with subsequent binge drinking, alcohol-related unintentional injury, and alcohol use disorder.¹⁵⁻²¹ While HID prevalence is greatest in individuals in their early 20s^{10,22-25} and particularly high among college students (vs noncollege young adults²³), little is known about typical HID initiation. Furthermore, the speed of escalation from first drink or first binge to HID is unknown.

Among young adults who report HID, the patterns of HID initiation and speed of escalation may vary and be different from those observed for binge drinking. Such variance matters, as earlier initiation and faster escalation to intoxication and binge drinking are recognized risk factors for negative outcomes, including greater alcohol consumption and greater binge drinking frequency.^{20,21,26} Although binge drinking and HID share some risk factors, other factors differentiate HID behaviors,²⁷ such as drinking contexts^{5,28} and motives.^{7,28} Important differences regarding initiation and escalation also may exist, but research on developmental patterns, including typical age of HID initiation and characteristics and consequences of earlier initiation, has not been available. Such research could help to inform intervention efforts by identifying the potential impact of delaying HID initiation and identifying subgroups that might be prioritized.

The current study used data collected in 2020 from US young adults at a modal age 20 years (2 years after 12th grade) who reported alcohol use as 12th grade students. Three research questions were assessed:

1. When was HID typically initiated, and how quickly did individuals escalate from first drink and first binge to HID?
2. Did HID initiation and escalation vary by sex, race and ethnicity, parental education (an indicator of household socioeconomic status), family history of alcohol problems, or college status?
3. Were HID initiation and escalation associated with mean weekly consumption, frequency of HID, or symptoms of alcohol use disorder at age 20 years, and did college status moderate the associations?

Key Points

Question When is high-intensity drinking (HID) (≥ 10 drinks in a row) initiated, who initiates earlier, and are earlier HID initiation and speed of escalation to HID associated with young adult alcohol use in the US?

Findings In this cohort study of 451 individuals, HID was initiated, on average, in late high school, and adolescents escalated from first drink to HID in 2 years. Family history of alcohol problems was associated with earlier HID initiation, and earlier HID initiation was associated with greater alcohol consumption, more frequent HID, and symptoms of alcohol use disorder at age 20 years.

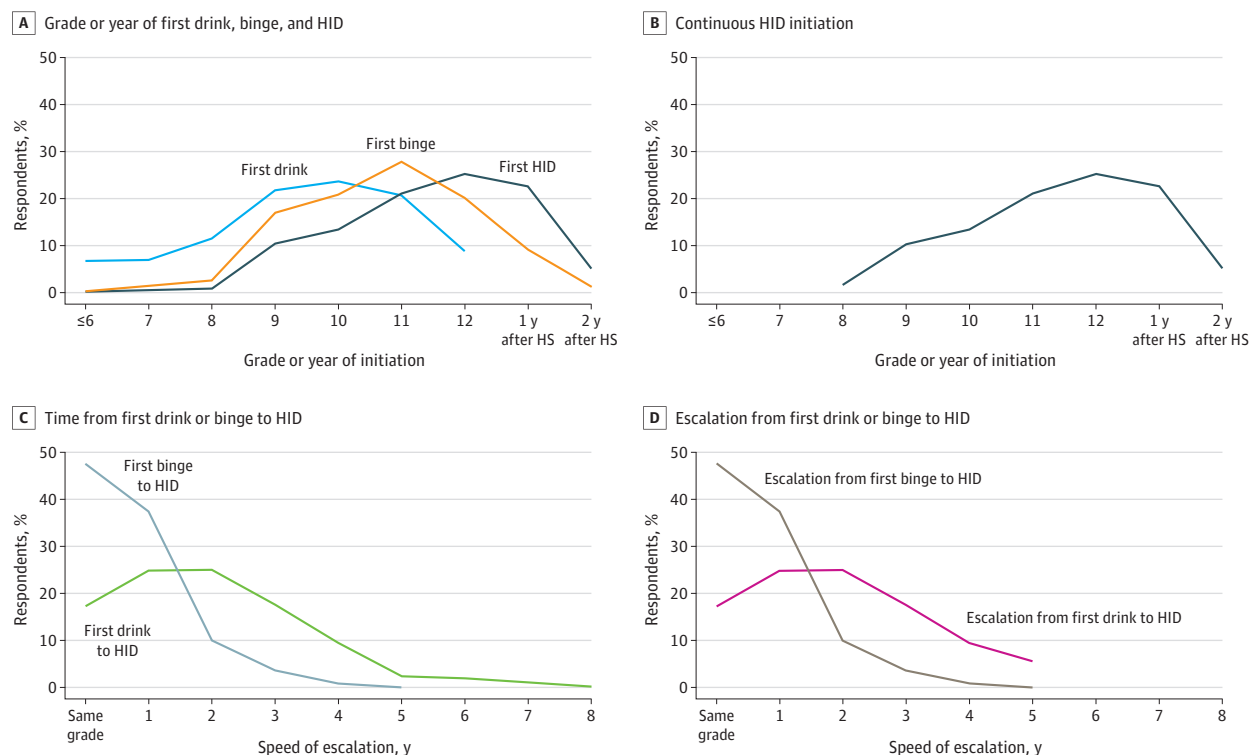
Meaning Early initiation of and quick escalation to HID may be markers for later negative outcomes among young adults and can inform screening and prevention.

Methods

Sample

This cohort study used data collected through the online Young Adult Daily Life (YADL) study in 2020.⁷ Participants were selected from 14 502 US nationally representative 12th grade students participating in the Monitoring the Future study in spring 2018.²⁹ Eligibility requirements included reporting past 30-day alcohol use in the 12th grade survey. Of the 4240 students who reported past 30-day drinking, 828 were excluded due to random selection into the Monitoring the Future longitudinal study^{10,30}; another 1208 were excluded due to missing contact information, leaving 2204 individuals eligible for YADL. In year 1 of YADL (2019), 13 of 2204 (0.6%) participants refused further participation, leaving 2191 eligible for year 2 participation. Age of first HID was asked in year 2 only (modal age 20 years). Data were collected from 857 of 2191 (39.1%) respondents from February 14 through April 17, 2020 (eTable 1 in [Supplement 1](#)). The study was approved by a University of Michigan institutional review board, and respondents provided informed consent by clicking "Yes, I agree to participate" on the consent screen. Nonresponse adjustments are described in the Statistical Analysis section. The study followed the American Association for Public Opinion Research (AAPOR) reporting guideline.

The current research questions pertained only to respondents who reported initiating HID. Of all 857 respondents, 370 (43.2%) reported not initiating HID and were ineligible for analysis. An additional 20 (2.3%) had missing data on 1 or more initiation measures (first drink, first binge, or first HID), and 16 (1.9%) provided conflicting initiation data, leaving a total of 451 eligible for analysis. Of these, 15 (3.3%) were missing data on 1 or more covariates (as described in the Statistical Analysis section). Compared with excluded respondents, those retained for analysis were more likely to be male, non-Hispanic White, and full-time 4-year college students; no differences were observed by parental education or family history of alcohol problems.

Figure. Reported Grade or Year of Initiation of Alcohol Use Behaviors and Escalation to High-Intensity Drinking (HID)

Unweighted N = 451. Because all respondents reported past 30-day alcohol use in 12th grade, the categories of 1 and 2 years after high school (HS) were not relevant for initiation of first drink.

Measures

At modal age 20 years, respondents were asked about initiation and escalation, current alcohol behaviors, family history of alcohol problems, and college status. The remaining covariates were self-reported at modal age 18 years when respondents completed the 12th grade survey.

Initiation and Escalation

To assess grade or year of initiation, respondents were asked, “When (if ever) did you first do each of the following things? (a) Try an alcohol beverage—more than just a few sips? (b) Drink 5 or more drinks in a row? (c) Drink 10 or more drinks in a row?” Response options included never, grade 6 or below, grade 7, grade 8, grade 9 (freshman), grade 10 (sophomore), grade 11 (junior), grade 12 (senior), first year after high school (June 2018 to May 2019), and second year after high school (June 2019 to May 2020). Few respondents reported initiating HID before grade 9 (Figure, A), so continuous HID initiation was coded as 8 (grade ≤8) to 14 (2 years after high school) (Figure, B). Based on the observed distribution, a dichotomous measure indicating HID initiation in 11th grade or before (1) vs 12th grade or later (0) was also coded. Two escalation measures were assessed: first drink to HID (range, 0-8; calculated as grade or year of first HID – first drink) and first binge to HID (range, 0-5; calculated as first HID – first binge). Few respondents reported 5 or more years between first drink and HID (Figure, C); thus, first drink to HID escalation and first binge to HID escalation

were both coded 0 to 5 (Figure, D). Dichotomous measures indicated same year (1) vs 1 or more years (0).

Alcohol Measures at Age 20 Years

Alcohol use measures at age 20 years included average weekly consumption, current HID frequency, and Alcohol Use Disorders Identification Test (AUDIT) scores. Average weekly consumption was calculated from the Daily Drinking Questionnaire-Revised (adapted from the original Daily Drinking Questionnaire³¹) as the sum of the typical number of drinks consumed each day in an average week in the past 30 days. Current HID frequency was assessed by asking, “Think back over the last 2 weeks. How many times (if any) have you had 10 or more drinks in a row?” Response options were coded as 0 (none), 1 (once), 2 (twice), 4 (3-5 times), 8 (6-9 times), or 10 (≥10 times). The self-report, 10-item AUDIT was used to assess symptoms of alcohol use disorder.³² AUDIT scores were modeled as continuous and dichotomized as 16 or more vs 0 to 15.³²

Covariates

Family history of alcohol problems was based on the question, “Have any of your biological relatives had what you would call a significant drinking problem—one that did or should have led to treatment?” If respondents indicated yes to mother, father, brother(s), or sister(s), then they were coded yes (vs no). College status indicated currently attending a 4-year college

or university full time (vs not). Sex response options included female or male. Separate items measured ethnicity (Hispanic or Latino) and race (American Indian or Alaska Native; Arab, Middle Eastern, or North African; Asian or South Asian; Black or African American; Native Hawaiian or Other Pacific Islander; White; or other). Due to limited sample sizes, race and ethnicity were coded for analysis as Hispanic, non-Hispanic White, or non-Hispanic other (including American Indian or Alaska Native; Arab, Middle Eastern or North African; Asian or South Asian; Black or African American; Native Hawaiian or Other Pacific Islander; other; and multiracial). Parental education indicated whether at least 1 parent had a college degree (vs not).

Statistical Analysis

For descriptive analyses, we used SAS, version 9.4 (survey procedures with a domain statement) (SAS Institute Inc); for regression models, we used Mplus, version 7.4 (maximum likelihood with robust SEs estimator; type = complex with subpopulation statement) (Muthén and Muthén). All analyses were weighted to adjust for sampling and nonresponse (based on extensive information available from 12th grade measures, including sex, race and ethnicity, region, number of parents in the household, parental education, religious commitment, high school grades, truancy, college plans, and substance use). In regression models, missing covariate data were addressed by using full information maximum likelihood. Discussion focused on associations with statistical significance of $P < .05$.

For the first research question, descriptive statistics for initiation of first drink and binge and escalation to HID were obtained. For the second research question, bivariate and multivariable associations between covariates and continuous initiation and escalation were estimated using linear regression (initiation) and negative binomial regression (escalation). For the third research question, models assessing associations between initiation and alcohol use outcomes at age 20 years included the dichotomous HID initiation measure; models examining escalation associations used the dichotomous escalation indicators. Mean weekly consumption, HID frequency, and continuous AUDIT score outcomes were modeled using negative binomial regression; logistic regression was used for the dichotomous AUDIT score of 16 or higher. Multivariable models controlled for sex, race and ethnicity, parental education, family history of alcohol problems, and college status. Moderation by college status was examined by rerunning research question 3 models with an interaction term between the relevant initiation or escalation measure and college status.

Results

As shown in Table 1, weighted characteristics for the 451 participants with data eligible for analysis were 38.0% female and 62.0% male; 21.4% identified as Hispanic, 66.6% as non-Hispanic White, and 11.9% as non-Hispanic other. Mean weekly alcohol consumption was 9.2 drinks (SE, 0.6 drinks); mean HID

frequency was 0.5 occasions (SE, 0.1 occasions). The mean AUDIT score was 7.6 (SE, 0.3; median, 6.0; IQR, 3.8-9.9); 7.5% reported an AUDIT score of 16 or higher.

HID Initiation and Escalation Descriptive Statistics

Among this sample of young adults who reported past 30-day drinking in 12th grade and initiated HID by age 20 years, initiation of all 3 levels of alcohol use primarily occurred during grades 9 to 12 (Table 1 and Figure). Mean grade or year of initiation was 9.7 (SE, 0.1) for first drink, 10.7 (SE, 0.1) for first binge, and 11.5 (SE, 0.1) for first HID. Median grade or year of initiation was 9.1 (IQR, 8.0-10.2) for first drink; 10.3 (IQR, 9.2-11.3) for first binge, and 11.1 (IQR, 10.0-12.1) for first HID. Less than one-half (46.7%) of respondents initiated HID before 12th grade, with the remaining 53.3% initiating by the second year after high school.

Regarding speed of escalation, the mean number of years between first drink and first HID was 1.9 (SE, 0.1 years; median, 1.3 years; IQR, 0.3-2.5 years); the mean number of years between first binge and first HID was 0.7 (SE, 0.1 years; median, 0.1 years; IQR, 0.0-0.7 years) (Table 1 and Figure). Almost one-fifth (17.2%) of respondents initiated first drink and HID in the same year; almost one-half (47.6%) initiated binge and HID in the same year.

Covariate Associations With HID Initiation and Escalation

Table 2 presents multivariable associations between covariates and HID initiation and escalation. Family history of alcohol problems was associated with earlier (lower grade or year) HID initiation (multivariable estimate [MEst], -0.459 ; 95% CI, -0.837 to -0.081) (eFigure 1 in Supplement 1). Being a current college student was associated with later (higher grade or year) HID initiation (MEst, 0.440 ; 95% CI, 0.073 - 0.807) (eFigure 1 in Supplement 1). Sex, race and ethnicity, and parental education were not associated with HID initiation. No associations were observed between covariates and first drink to HID escalation. Males had a shorter expected rate of escalation from first binge to HID than females (adjusted incidence rate ratio [aIRR], 0.72 ; 95% CI, 0.57 - 0.91) (eFigure 2 in Supplement 1). No other covariates were associated with escalation to HID.

HID Initiation and Escalation Associations With Drinking Outcomes at Age 20 Years

Table 3 presents HID initiation and escalation associations with average weekly consumption and HID frequency (covariate associations shown in eTable 2 in Supplement 1). Initiating HID by 11th grade (vs later) was associated with a greater rate of average weekly drinks reported at age 20 years (bivariate model: IRR, 1.28 [95% CI, 1.01 - 1.61]; multivariable model: aIRR, 1.40 [95% CI, 1.10 - 1.79]). Initiating HID by 11th grade (vs later) was associated with an increase in the expected rate of past 2-week HID occasions at age 20 years (bivariate model: IRR, 1.83 [95% CI, 1.13 - 2.97]; multivariable model: aIRR, 2.01 [95% CI, 1.25 - 3.22]). Escalation from first drink to HID was not associated with average weekly consumption or HID frequency at age 20 years. Escalation from first binge to HID in the same year (vs later) was not associated with average weekly consumption but was associated with an increase in the expected rate of past

2-week HID occasions in the multivariable model (aIRR, 1.66; 95% CI, 1.06-2.61). No evidence of moderation by college status was observed for HID initiation or escalation from binge to HID. In the model assessing associations between escalation from first drink to HID and HID frequency, the escalation-by-college status interaction term was significant (aIRR, 4.41; 95% CI, 1.01-19.20). Additional models (not shown) revealed that escalation from first drink to HID in the same year (vs later) was not associated with HID frequency at age 20 years among noncollege respondents. Among college respondents, same-year escalation was associated with greater HID frequency (aIRR, 2.04; 95% CI, 1.10-3.43) at age 20 years.

Associations between HID initiation and escalation and AUDIT outcomes are presented in **Table 4** (covariate associations are shown in eTable 3 in [Supplement 1](#)). No initiation or escalation measures were associated with AUDIT scores of 16 or higher. Initiating HID by 11th grade (vs later) was not bivariously associated with the continuous AUDIT score, but in the multivariable model, initiating HID by 11th grade was associated with a greater expected AUDIT score at age 20 (adjusted odds ratio, 1.17; 95% CI, 1.02-1.34). No evidence of moderation by college status was observed.

Discussion

This cohort study extends previous research on the developmental timing of alcohol use to include initiation of and escalation to HID. Among this sample of young adults who reported alcohol use while in 12th grade, more than one-half (53.3%) reported initiating HID by their second year after high school. Very few respondents reported HID initiation prior to high school; HID was typically initiated around 11th grade. Even after controlling for family history of alcohol problems and other covariates, initiating HID by grade 11 (vs later) was associated with greater average weekly alcohol consumption, more frequent HID, and more alcohol use disorder symptoms at age 20 years. Delaying HID initiation may reduce the likelihood of acute and long-term negative alcohol use consequences in adulthood.

Although associations between alcohol initiation age and later negative alcohol outcomes have been challenged due, in part, to inconsistencies in operationalization,³³ the utility of determining age of initiation for well-defined high-risk behaviors, such as HID, lies in the possibility of early intervention to delay initiation, thereby reducing long-term consequences. In this study, almost one-half of respondents who initiated HID did so before the end of high school, almost one-fifth escalated from first drink to HID in the same grade or year, and almost one-half escalated from binge to HID within the same grade or year. These findings point to the relatively small window available to engage adolescents and young adults in HID prevention once they begin drinking. Delaying HID may be feasible by implementing prevention and intervention programs in secondary schools or colleges that target individuals who have used alcohol but not yet initiated binge drinking or HID. Consideration of this possibility is consistent with the idea of identifying individuals showing signs of preaddiction³⁴ for screening, brief intervention, and treatment referral.³⁵

Table 1. Descriptive Statistics for Initiation and Escalation Measures, Covariates, and Drinking Outcomes at Age 20 Years^a

| | % or Mean (SE) [95% CI] |
|---|----------------------------|
| Initiation measures | |
| Continuous | |
| First drink initiation (range, grade 8-12) ^b | 9.7 (0.1) [9.5-9.8] |
| Binge initiation (range, grade 8-14) | 10.7 (0.1) [10.6-10.9] |
| HID initiation (range, grade 8-14) | 11.5 (0.1) [11.3-11.6] |
| Dichotomy, % | |
| By grade 11 | 46.7 (2.9) |
| Grade ≥12 | 53.3 (2.9) |
| Escalation measures | |
| Continuous | |
| First drink to HID escalation (range, 0-5 years) | 1.9 (0.1) [1.8-2.1] |
| First binge to HID escalation (range, 0-5 years) | 0.7 (0.1) [0.6-0.8] |
| Dichotomous first drink to HID, % | |
| Same year | 17.2 (2.3) |
| ≥1 y | 82.8 (2.3) |
| Dichotomous first binge to HID, % | |
| Same year | 47.6 (2.9) |
| ≥1 y | 52.4 (2.9) |
| Drinking outcomes at modal age 20 y | |
| Average weekly consumption (range, 0-50 drinks) | 9.2 (0.6) [8.1-10.3] |
| Past 2-wk HID frequency (range, 0-8 drinks) | 0.5 (0.1) [0.4-0.7] |
| AUDIT score ^c | |
| Continuous (range, 0-28) | 7.6 (0.3) [7.1-8.1] |
| AUDIT score ≥16, % | |
| 0-15 | 92.5 (1.5) |
| ≥16 | 7.5 (1.5) |
| Covariates, % | |
| Sex | |
| Female | 38.0 (2.5) |
| Male | 62.0 (2.5) |
| Race and ethnicity | |
| Hispanic | 21.4 (2.4) |
| Non-Hispanic White | 66.6 (2.7) |
| Non-Hispanic other ^d | 11.9 (1.6) |
| At least 1 parent has college education | |
| No | 36.4 (2.9) |
| Yes | 63.6 (2.9) |
| Family history of alcohol problems | |
| No | 73.4 (2.6) |
| Yes | 26.6 (2.6) |
| College status at age 20 y | |
| Full-time at 4-y college | 40.8 (3.0) |
| Other | 59.2 (3.0) |

Abbreviations: AUDIT, Alcohol Use Disorders Identification Test; HID, high-intensity drinking.

^a Unweighted (N = 451) for all measures other than AUDIT (n = 442), parental education (n = 440), and family history of alcohol problems (n = 447). Weighted percentages and mean (SE) estimates are reported.

^b Because the sample was limited to individuals reporting past 30-day alcohol use in 12th grade, no respondents reported a first drink after high school.

^c The AUDIT items were asked only of those reporting any past 12-month alcohol use.

^d Non-Hispanic other included American Indian or Alaska Native; Arab, Middle Eastern or North African; Asian or South Asian; Black or African American; Native Hawaiian or Other Pacific Islander; other; and multiracial.

Family history of alcohol problems was associated with earlier HID initiation. Prior research has indicated that family history of alcohol problems is associated with high-risk alcohol

Table 2. Multivariable Associations Between Covariates and Initiation of and Escalation to High-Intensity Drinking (HID)^a

| | HID initiation, MEst (95% CI) ^b | aIRR (95% CI) Escalation: first drink to HID ^c | Escalation: first binge to HID ^c |
|---|--|--|---|
| Sex (vs female) | | | |
| Male | 0.007 (−0.303 to 0.317) | 0.90 (0.77 to 1.05) | 0.72 (0.57 to 0.91) |
| Race and ethnicity (vs non-Hispanic White) | | | |
| Hispanic | 0.183 (−0.279 to 0.645) | 1.10 (0.88 to 1.37) | 0.81 (0.56 to 1.17) |
| Non-Hispanic other ^d | 0.409 (−0.006 to 0.825) | 1.01 (0.80 to 1.28) | 0.87 (0.74 to 1.01) |
| At least 1 parent has college education (vs no) | | | |
| Yes | −0.051 (−0.460 to 0.358) | 0.88 (0.73 to 1.07) | 1.08 (0.77 to 1.53) |
| Family history of alcohol problems (vs no) | | | |
| Yes | −0.459 (−0.837 to −0.081) | 0.97 (0.80 to 1.18) | 1.21 (0.93 to 1.56) |
| Full-time at 4-y college (vs no) | | | |
| Yes | 0.440 (0.073 to 0.807) | 1.06 (0.88 to 1.29) | 1.30 (0.94 to 1.80) |

Abbreviations: aIRR, adjusted incidence rate ratio; MEst, multivariable estimate.

^a Unweighted N = 451.

^b Initiation of HID measured in grade or year, ranging from 8 (grade ≤8) to 14 (2 y after high school) and modeled using ordinary least-squares regression.

^c Escalation for both first drink to HID and first binge to HID ranged from 0 (same year) to 5 y; both outcomes modeled using negative binomial regression.

^d Non-Hispanic other included American Indian or Alaska Native; Arab, Middle Eastern, or North African; Asian or South Asian; Black or African American; Native Hawaiian or Other Pacific Islander; other; and multiracial.

Table 3. Negative Binomial Regression Associations Between High-Intensity Drinking (HID) Initiation and Escalation and Average Weekly Consumption and HID Frequency at Age 20 Years^a

| | Average weekly consumption | | HID frequency | |
|--|----------------------------|------------------------------|-------------------------|------------------------------|
| | Bivariate, IRR (95% CI) | Multivariable, aIRR (95% CI) | Bivariate, IRR (95% CI) | Multivariable, aIRR (95% CI) |
| HID initiation (vs grade 12 or later) | | | | |
| By grade 11 | 1.28 (1.01-1.61) | 1.40 (1.10-1.79) | 1.83 (1.13-2.97) | 2.01 (1.25-3.22) |
| Escalation from first drink to HID (vs ≥1 y) | | | | |
| Same year | 0.85 (0.58-1.25) | 0.87 (0.62-1.23) | 1.27 (0.61-2.64) | 1.29 (0.70-2.38) |
| Escalation from first binge to HID (vs ≥1 y) | | | | |
| Same year | 1.03 (0.81-1.32) | 1.12 (0.87-1.44) | 1.49 (0.92-2.41) | 1.66 (1.06-2.61) |

Abbreviations: aIRR, adjusted incidence rate ratio; IRR, incidence rate ratio.

^a Unweighted N = 451. Separate models were run for each initiation and escalation risk factor. All models simultaneously controlled for sex, race and ethnicity, parental education, family history of alcohol problems, and current college status.

Table 4. Associations Between High-Intensity Drinking (HID) Initiation and Escalation and Alcohol Use Disorders Identification Test (AUDIT) Scores at Age 20 Years^a

| | AUDIT≥16 ^b | | Continuous AUDIT ^c | |
|--|------------------------|-----------------------------|-------------------------------|-----------------------------|
| | Bivariate, OR (95% CI) | Multivariable, aOR (95% CI) | Bivariate, OR (95% CI) | Multivariable, aOR (95% CI) |
| HID initiation (vs grade 12 or later) | | | | |
| By grade 11 | 1.55 (0.67-3.55) | 1.68 (0.73-3.85) | 1.14 (0.99-1.31) | 1.17 (1.02-1.34) |
| Escalation from first drink to HID (vs ≥1 y) | | | | |
| Same year | 0.67 (0.17-2.66) | 0.72 (0.18-2.85) | 0.94 (0.75-1.17) | 0.99 (0.80-1.21) |
| Escalation from first binge to HID (vs ≥1 y) | | | | |
| Same year | 0.82 (0.35-1.94) | 0.88 (0.39-2.00) | 0.94 (0.81-1.08) | 1.00 (0.87-1.16) |

Abbreviations: aOR, adjusted odds ratio; OR, odds ratio.

^a Unweighted N = 451. Separate models were run for each initiation and escalation risk factor. All models simultaneously controlled for sex, race and ethnicity, parental education, family history of alcohol problems, and current college status.

^b Modeled using logistic regression.

^c Modeled using negative binomial regression.

use and alcohol-related negative consequences.^{27,36-39} This study provides further evidence that family history of alcohol problems could be a robust indicator for vulnerability to high-risk alcohol behavior, which in turn could lead to alcohol problems in young adulthood.

Initiation of HID was earlier among noncollege respondents than college students, and escalation from first drink to HID within the same year was associated with HID frequency

among college students but not among noncollege respondents at age 20 years. There may be shared risk factors for both earlier HID initiation and not attending college. Among those who do attend college, having escalated quickly to HID may be associated with engaging in HID more frequently depending on social contexts and risk factors such as HID norms.^{1,26} Unlike other sociodemographic characteristics assessed, college attendance typically occurred after HID initiation. The as-

sociations observed here should not be interpreted as causal. Future research should examine the degree to which early HID initiation may be associated with subsequent educational achievement and alcohol use among college and noncollege young adults.

Directions for Future Research

Directions for future research include (1) evaluation of initiation and escalation across more detailed measures of sex and gender and racial and ethnic identities; (2) evaluation of initiation and escalation in both higher-risk (ie, school dropout) and lower-risk (alcohol use initiation after high school) samples; and (3) a more direct focus on HID prevention and intervention targets, such as anxiety and depression.^{27,40}

Limitations

This study has several limitations. First, participants were recruited from 12th grade and did not include individuals who dropped out of high school. School dropout is associated with greater alcohol use risk.⁴¹ Second, initiation was based on year in school and not biological age (to facilitate recall); responses were retrospective and subject to recall (eg, forward telescoping⁴²) and social desirability biases. Third, analyses did not use sex-specific thresholds for binge (≥ 4 drinks for females and ≥ 5 drinks for males) or HID (≥ 8 and ≥ 10 drinks,

respectively),¹ which may have attenuated associations among females. Fourth, family history of alcohol problems was self-report and may have been unknown. Fifth, outcomes were assessed during the COVID-19 pandemic, which could have been associated with recent behavior survey responses. Sixth, small sample sizes across racial and ethnic groups required aggregating data, which limits generalizability across subpopulations.

Conclusions

Because of consequences associated with HID, researchers, clinicians, and policy makers must understand risk factors for young adult engagement in HID, including early initiation and faster escalation from experimenting with alcohol to HID. This cohort study revealed that HID is typically initiated in late high school, with higher early initiation risk among individuals with a family history of alcohol problems and those not attending a 4-year college at age 20 years. Most adolescents escalated from first drink to HID within 2 years; males were particularly likely to escalate from binge to HID within the same year. This information could facilitate screening for adolescents and young adults who are drinking and at risk for HID initiation and escalation.

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