Patterns of Alcohol Use and Related Consequences in Non-College-Attending Emerging Adults

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ABSTRACT. Objective: Among emerging adults, those who do not attain postsecondary education are at highest risk for experiencing long-term problems related to alcohol use, including alcohol dependence. The purpose of the current study was to identify latent classes of alcohol users among non-college-attending youth and examine correlates of class membership. **Method:** Screening criteria were used to select emerging adults between ages 18 and 22 years with no postsecondary education ($N = 264$) from a prerecruited probability-based Web panel. Latent class analysis (LCA) was used to identify common patterns of alcohol use. Grouping variables and demographic variables were added to the LCA model, and rates of alcohol-related consequences across the LCA classes were compared. **Results:** Four classes of drinking patterns were identified: (a) current nondrinkers (34%), (b) weekend light drinkers (38%), (c) weekend risky drinkers (23%), and (d) daily drinkers (5%). Class membership was associated with early onset of alcohol use (age 14 or younger), marital status, employment status, and urban residency (area populated by 50,000 or more people). The number of latent classes did not differ across sex and legal drinking age status, although proportions of subjects within classes varied by age. Weekend risky drinkers were most likely to report sickness and feelings of guilt because of drinking, whereas daily drinkers were most likely to report getting into fights, driving a car after drinking, and missing work. **Conclusions:** Similar to college samples of emerging adults, most of this noncollege sample belonged to latent classes defined by rare or moderate alcohol use. Nevertheless, nearly a quarter of the sample reported high-risk drinking behaviors, and a small number reported drinking alcohol on a daily basis. Both of these classes were at elevated risk for experiencing a number of alcohol-related consequences. (*J. Stud. Alcohol Drugs, 74,* 84–93, 2013)

ALCOHOL USE ACCELERATES DURING adolescence and peaks among youth between ages 18 and 25 years (Substance Abuse and Mental Health Services Administration, 2011). Prevalence rates of heavy drinking and alcohol misuse also peak during this stage of life (Naimi et al., 2003). Consequently, emerging adults are at highest risk for experiencing alcohol-related problems, including accidental injury and sexual violence (Hingson et al., 2009). Most research examining drinking and related problems among emerging adults has focused on full-time, 4-year college students. However, only 42% of high school graduates enroll the following fall at 4-year institutions and 28% at 2-year institutions (Aud et al., 2011). Further, at least 20% of all U.S. eighth graders will drop out of high school, with higher rates for minority youth (Heckman and LaFontaine, 2010). Thus, a substantial proportion of young people fall outside the purview of college-based studies. This study addresses this gap by focusing on alcohol use among emerging adults with no more than a high school education, a group at high risk for experiencing short- and long-term problems associated with alcohol use (Muthén and Muthén, 2000; White et al., 2005).

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Patterns of alcohol use among emerging adults

Recent studies confirm that not all emerging adults exhibit the same pattern of alcohol use (e.g., Tucker et al., 2003). Rather, subgroups of alcohol users exist, including abstainers, moderate drinkers, and chronic heavy drinkers. However, most studies include limited, community-based samples of emerging adults, such as predominantly White, suburban youth (e.g., Windle et al., 2005). Even studies using the Monitoring the Future project (e.g., Schulenberg et al., 1996), which is a large, nationally representative sample, exclude youth who drop out of high school, who may be at highest risk for alcohol problems (Muthén and Muthén, 2000).

Past studies have also typically relied on single measures of alcohol use. However, multidimensional models that take into account frequency, quantity, and problematic alcohol use provide more accurate representations of drinking patterns (Auerbach and Collins, 2006). Such an approach is important in identifying problem drinking among emerging adults, who are likely to drink infrequently but

in large amounts. For instance, Johnston et al. (2004) estimated that nearly 30% of high school seniors engaged in heavy episodic drinking (HED), yet only 3% drank daily. Similarly, Del Boca et al. (2004) found that although most first-year college students did not report any alcohol use during any given week, of those who drank, about one half reported HED. Such results underscore the importance of distinguishing between different types of problematic drinkers in emerging adult populations. Although some youth may experience alcohol-related problems attributable to frequent, regular alcohol use, it is likely that others occasionally engage in risky drinking behaviors, which also place them at risk (Chung et al., 2002).

Latent class analysis (LCA; Collins and Lanza, 2010) offers an empirically based method for identifying subgroups within a population. Several studies have applied LCA and its longitudinal extension—latent transition analysis (LTA)—to alcohol use in emerging adult samples (e.g., Chung and Martin, 2001; O'Connor and Colder, 2005).

One recent study (Reboussin et al., 2006) identified three types of drinkers among a community sample of youth between ages 16 and 20 years: non–problem drinkers, risky problem drinkers, and regular problem drinkers. Although the latter two groups were equally likely to experience alcohol-related problems, they were distinguished by three risky behaviors: drinking at least 6 days in the past month, recent HED, and getting drunk in the past year.

Another recent study (Cleveland et al., 2012) used LTA to identify classes of alcohol users in a sample of matriculating college students. Two classes were weekend-only (Fridays and Saturdays) drinkers; one was characterized by recent HED, blood alcohol concentration (BAC) levels greater than .08 on their most recent drinking occasion, and being drunk within the past month, whereas the second did not report risky drinking behaviors. A third class also reported risky drinking behaviors in addition to a strong likelihood of drinking on Thursdays and an elevated probability of reporting weekday (Sunday through Wednesday) drinking. The final group was nondrinkers.

Current study

We used LCA to examine drinking patterns among emerging adults with no post–high school education. Expanding on Reboussin et al. (2006), our LCA model included indicators of frequency and quantity of alcohol consumed, risky drinking behaviors, and variability in drinking across the week. The current study also represents an extension of Cleveland et al. (2012), who used similar indicators to examine drinking among college freshmen. For this study, we specified separate indicators for each day of the week rather than collapsing weekly drinking behaviors into three indicators (Sunday–Wednesday, Thursday, Friday–Saturday) as was done in the previous study.

Our rationale for this specification was that although we expected the findings presented in Cleveland et al. (2012) to generalize to all emerging adults, we also thought that patterns of daily drinking might differ for nonstudents (O'Malley and Johnston, 2002). For example, increased drinking by college students on Thursdays is influenced by whether the student is enrolled in Friday classes (Wood et al., 2007). We speculated that non-college-attending youth may have different responsibilities during the course of a typical week (e.g., full-time employment) and may thus avoid Thursday-night heavy drinking. On the other hand, we also speculated that emerging adults with less than full-time employment or flexible working hours might be more likely to drink on a daily basis because of fewer demands and perhaps more willingness to experience alcohol-related consequences.

Our study was guided by four research questions: (1) Can the same classes of alcohol users identified in a college-student sample be found in non-college-attending emerging adults? (2) Does membership in the classes differ for male and female participants or for those at or below the legal drinking age? (3) What demographic characteristics are associated with class membership? (4) Do members of the different classes experience different alcohol-related consequences?

Method

Recruitment

Participants were drawn from a prerecruited Web panel (KnowledgePanel®), designed to be representative of the U.S. population and maintained by Knowledge Networks (KN). KnowledgePanel® members are randomly recruited through probability-based sampling of addresses from the U.S. Postal Service's Delivery Sequence File, which covers approximately 97% of U.S. households. Sampled households are provided a laptop computer and free access to the Internet if needed. Participants complete an initial profile survey of demographic information, which allows KN to compute a sample base weight accounting for known sources of deviation from an equal probability of selection design. Demographic and geographic distributions for the noninstitutionalized, civilian U. S. population ages 18 and older from the August 2011 Current Population Survey were used as benchmarks for this adjustment (for greater detail, see Chang and Krosnick, 2009).

A random sample of KnowledgePanel® members who met eligibility criteria (were ages 18–22, were not enrolled in high school, and had no more than a high school education) was selected. In the fall of 2011, 1,631 eligible panelists received an email invitation from KN that described the study and included a link to an online survey, which included additional screening criteria to select only panelists who had no postsecondary training of any type (e.g., technical or trade school)

at the time of the survey. Of those selected, 666 consented to participate and completed the screening items, yielding a study completion rate of 41%—a number consistent with web-based recruitment (Larimer et al., 2007). Among those, 264 (40%) met eligibility criteria and completed the anonymous, web-based survey. On average, panelists (59.1% female; M_{age} = 20.61 years) completed the survey within 18 minutes and were compensated via a "point" system administered by KN. A poststratification process was used to adjust the final data for the study's design and survey nonresponse. Using the base weight described above, comparable distributions were calculated by using all completed cases from the field data, including eligible and noneligible panelists. The poststratified and trimmed weights were then scaled to fit the total sample size of the qualified respondents.

Measures

Using an open-ended format, participants responded to an item that assessed age at alcohol use onset (more than a few sips). Next, participants indicated the number of drinks consumed each day of a typical week in the last 3 months, using the Daily Drinking Questionnaire (DDQ; Collins et al., 1985). From these items, a dichotomous indicator of drinking status was created; "lifetime abstainers" were those who indicated never drinking alcohol for the *age at onset* item and reported "0" for all seven DDQ measures.

Participants identified as "drinkers" responded to four additional items. They reported the maximum number of drinks consumed and the number of hours spent drinking on the occasion that they drank the most in the previous month, using the Quantity/Frequency/Peak Questionnaire (Marlatt et al., 1998). From these responses, peak BAC was calculated using weight and sex following established guidelines (Matthews and Miller, 1979). Participants were also asked how many times during the past month they had gotten drunk and the number of times they had consumed four (females) or five (males) or more drinks within 2 hours. The items were used to create 12 dichotomous indicators of drinking for the LCA models: (1) any previous alcohol use; (2) alcohol use in the past month; (3) drunkenness in the past month; (4) peak BAC greater than .08 on last drinking occasion; (5) HED in the past month; and (6–12) dichotomous indicators of alcohol use for each day of a typical week. A standard drink definition was included for all measures.

Participants identified as drinkers also completed 12 items adapted from the Young Adult Alcohol Problems Screening Test (Hurlbut and Sher, 1992), which asked how many times in the previous year they experienced a variety of alcohol-related consequences (see Figure 2 for the complete list). Only 12 items were included because of survey time constraints. The items were dichotomized to indicate whether the participant had experienced the particular outcome in the past year.

Demographic characteristics were included in the model as grouping variables and covariates. These included dichotomous measures of early onset of alcohol use (1 = first use at age 14 years or younger; 0 = first use at age 15 years or older), legal drinking age status (1 = age 21 years or older; 0 = less than 21 years), education status (1 = high school; 0 = less than high school), race (1 = White; 0 = other), employment status (1 = currently working as a paid part-time or full-time employee or self-employed; 0 = currently unemployed or disabled), and urban residency (1 = a core urban area of 50,000 or more people; 0 = nonmetropolitan area).

Two dummy codes captured the participants' living arrangements. Participants who were living with their childhood family received a score of 1 for the first variable; those who reported living with a romantic partner received a score of 1 for the second variable. All other participants received a score of 0 for both variables. A second set of dummy codes was created to capture marital status, each relative to never been married (0): those who were currently married, divorced, or separated received a score of 1 for the first variable, while those cohabitating with partner received a score of 1 for the second dummy variable.

Analytic strategy

Our analyses were organized into four phases, corresponding to our research questions. We first examined a series of LCA models to determine the optimal number of classes. We used relative measures of fit (Akaike's information criterion [AIC] and Bayesian information criterion [BIC]) to compare models, with lower values indicating better-fitting models. Parsimony and model interpretability were also considered (Collins and Lanza, 2010). The resulting LCA model was expressed as a function of two sets of parameters: class membership probabilities (gammas) represented the proportion of the population in each latent class, and conditional item-response probabilities (rhos) represented the probability of reporting each drinking behavior within each class.

In the second phase, two grouping variables (sex and legal status) were added to the LCA model. These analyses involved two tests regarding measurement and prevalence of the latent classes. We examined measurement invariance by comparing the LCA model with the rho parameters constrained to be equal across the groups (i.e., males and females, at or above age 21 and below age 21) to a model with these parameters freely estimated across groups. The difference likelihood ratio test (LRT) was used to determine which of these two nested models provided the best fit. If measurement invariance was confirmed, we examined whether the prevalence rates of class membership (i.e., gamma parameters) differed across the groups. In these analyses, we compared the fit of a model with the gamma probabilities freely estimated across groups to a model that constrained

all group proportions to be equal. A nonsignificant LRT indicated that the proportion of individuals within each respective class was equal across the two groups. Significant differences in this omnibus test were followed by comparison of models with the prevalence of each class constrained to be equal and freely estimated across groups.

In the third phase, demographic characteristics were added as covariates to the LCA model via multinomial logistic regression. Hypothesis testing was conducted by comparing the fit of the unconditional model to a model with the covariate using the LRT. Logit coefficients and associated odds ratios (ORs) represented the influence of the covariate on the log-odds that an individual belonged to a particular class, relative to a specified reference class. Because the choice of the reference class may affect interpretation of the coefficients (but not the LRT), models with significant LRT values were repeated with each class specified as the reference class. ORs less than 1.0 were reported using inverse values (1 / OR). For example, an OR of 0.5 can be inverted (1 / 0.5 = 2.0) and reported as 2^{-1}. This notation allows one to easily compare values for different covariates, even when the direction of change is opposite.

In the fourth phase, we examined the association between class membership and alcohol-related consequences using a model-based approach (Lanza and Rhoades, 2011). This approach estimates the association between a latent variable (drinking class) and an observed outcome (consequence), taking into account the uncertainty of each individual's class membership. Each consequence was separately added as a covariate to obtain logit coefficients, as described above. Marginal distributions of each consequence (i.e., conditional on class membership) were then estimated by multiplying the observed distribution of the consequence and the associated logit coefficient. Overall tests of significance, using the LRT, provided evidence of differential probabilities of experiencing each consequence across the classes. Bonferroni-corrected p values were used to take into account multiple comparisons ($p < .004$ [0.05 / 12]).

All analyses were conducted using PROC LCA (Lanza et al., 2011). PROC LCA accommodates sampling weights with the pseudo-maximum likelihood approach (Vermunt and Magidson, 2005) and handles missing data among the indicator variables using full-information maximum likelihood. There were no missing data among the grouping variables, demographic characteristics, or consequence items; thus, the full sample was used in all analyses.

Results

Descriptive statistics

Weighted frequencies of demographic characteristics of the sample are presented in Table 1. Table 2 displays the estimated adjusted mean percentage of participants who reported each drinking behavior, by the two grouping variables. Only one significant difference was found: Sunday drinking was more common among male than female participants (22% and 6%, respectively). No differences in rates of drinking behaviors were found between participants of legal drinking age (i.e., 21 years or older) and minors.

Table 1. Demographic characteristics of sample (N = 264)

	Unweighted		Weighted	
Variable	Frequency	Percentage	Frequency	Percentage
Age at alcohol use onset				
Age ≤ 14 years	201	76.14	202.69	76.78
Age ≥ 15 years	63	23.86	61.29	23.22
Race and ethnicity				
White, non-Hispanic	156	59.09	149.85	56.77
Black, non-Hispanic	26	9.85	29.90	11.33
Other, non-Hispanic	10	3.79	6.39	2.42
Hispanic	55	20.83	70.06	26.54
≥2 races, non-Hispanic	17	6.44	7.78	2.95
Education level				
High school diploma	164	62.12	152.61	57.81
GED or high school certificate	47	17.81	50.16	19.00
<High school	53	20.08	61.21	23.19
Living arrangements				
Childhood family	87	33.08	103.91	39.42
Other relatives	40	15.21	45.17	17.14
Romantic partner	96	36.50	79.97	30.34
Friends (unrelated)	16	6.08	12.82	4.86
Group quarters	4	1.52	1.82	0.69
Alone	17	6.46	10.51	3.99
No regular place to stay	3	1.14	9.37	3.55
Marital status				
Never married	136	51.52	156.88	59.43
Married	53	20.08	48.55	18.39
Divorced/separated	8	3.04	8.03	3.03
Living with partner	67	25.38	50.52	19.14
Employment status				
Working (paid employee)	92	34.85	94.70	35.87
Working (self-employed)	13	4.92	17.14	6.49
Not working (temporary layoff)	6	2.27	7.40	2.80
Not working (looking for work)	101	38.26	99.22	37.59
Not working (disabled)	5	1.89	2.27	0.86
Not working (other)	47	17.80	43.25	16.38
Urban residency status				
Non-metro area	56	21.21	40.95	15.51
Metropolitan area	208	78.79	223.03	84.49

Notes: GED = general equivalency degree; high school certificate refers to a certificate of attendance or certificate of completion. Metropolitan area defined as a core urban area of population 50,000 or more.

Identification of classes of alcohol use

Based on AIC and BIC values, we determined that the four-class model provided a more optimal solution than the one-, two-, or three-class models (Table 3). The modal G^2 of the four-class solution was also the lowest in 95 of 100 random starting values, indicating the solution was identified. Five- and six-class models were explored; however, these more complex models exhibited identification and conver-

TABLE 2. Estimated percentage of respondents reporting drinking behaviors, by sex and legal drinking age status (accounting for survey weights)

	Gender				Legal status			
	Male (n = 108)		Female (n = 156)		Age < 21 years (n = 111)		Age ≥ 21 years (n = 153)	
Alcohol behavior	*M*	[CL]	*M*	[CL]	*M*	[CL]	*M*	[CL]
Ever drink	0.72	[0.59, 0.86]	0.75	[0.64, 0.87]	0.65	[0.52, 0.78]	0.82	[0.69, 0.95]
Past month	0.64	[0.50, 0.78]	0.55	[0.41, 0.70]	0.84	[0.74, 0.94]	0.80	[0.69, 0.90]
Been drunk	0.36	[0.22, 0.50]	0.33	[0.18, 0.48]	0.51	[0.31, 0.72]	0.43	[0.27, 0.59]
Past month HED	0.24	[0.12, 0.37]	0.24	[0.11, 0.36]	0.40	[0.20, 0.60]	0.27	[0.14, 0.39]
BAC > .08	0.11	[0.03, 0.19]	0.16	[0.06, 0.27]	0.15	[0.03, 0.27]	0.21	[0.09, 0.32]
Sunday	**0.22**	**[0.10, 0.35]***	**0.06**	**[0.02, 0.10]***	0.19	[0.06, 0.32]	0.12	[0.05, 0.18]
Monday	0.12	[0.00, 0.24]	0.04	[0.00, 0.12]	0.04	[0.00, 0.10]	0.13	[0.00, 0.26]
Tuesday	0.05	[0.00, 0.11]	0.05	[0.00, 0.12]	0.05	[0.00, 0.10]	0.06	[0.00, 0.13]
Wednesday	0.10	[0.02, 0.17]	0.04	[0.00, 0.12]	0.08	[0.00, 0.12]	0.09	[0.01, 0.17]
Thursday	0.13	[0.03, 0.23]	0.08	[0.00, 0.16]	0.26	[0.00, 0.17]	0.13	[0.03, 0.22]
Friday	0.35	[0.21, 0.48]	0.28	[0.15, 0.40]	0.43	[0.14, 0.40]	0.36	[0.23, 0.50]
Saturday	0.52	[0.37, 0.68]	0.45	[0.30, 0.59]	0.40	[0.27, 0.58]	0.55	[0.40, 0.69]

Notes: Entries in **bold** and followed by * indicate nonoverlapping CL between the two compared groups. CL = upper and lower 95% confidence limits; HED = heavy episodic drinking; BAC = blood alcohol concentration.

gence problems with no single best solution emerging from multiple starting values.

Table 4 presents the results of the four-class model. According to the model, 34% of the sample belonged to the current nondrinker (CND) class. This class was defined by very low probabilities of reporting any of the current drinking behaviors, although there was a moderate probability that persons belonging to this group had used alcohol at some point in their life. Weekend light drinkers (WLDs; 38% of the sample) were likely to report using alcohol in the previous month but were most likely to report drinking only on weekends; they were unlikely to report any of the risky drinking behaviors (i.e., HED, drunk in the past month, or peak BAC above .08). Nearly a quarter of the sample (23%) were classified as weekend risky drinkers (WRDs), who were also characterized by drinking primarily on weekends but distinguished by moderate or high probabilities of reporting all three risky drinking behaviors. Daily drinkers (DDs; 5% of the sample) were distinguished by elevated probabilities of endorsement of alcohol use on all 7 days of the week. Members of this class, however, had only a moderate probability of being drunk in the previous month or achieving a peak BAC greater than .08 and a low probability of recent HED.

TABLE 3. Model fit statistics for LCA models with 2 to 6 latent classes

Model	-LL	G^2	*df*	AIC	BIC
Two class	1,137.99	612.83	4,070	662.83	752.22
Three class	1,037.02	410.89	4,057	486.89	622.77
Four class	**952.70**	**242.25**	**4,044**	**344.25**	**526.62**
Five class	929.78	196.42	4,031	324.42	553.28
Six class	912.24	161.35	4,018	315.34	590.69

Notes: LL = log likelihood; G^2 = likelihood-ratio test statistic; AIC = Akaike's information criterion; BIC = Bayesian information criterion. The optimal four-class solution is in **bold.**

Sex and legal drinking age status differences

The top panel of Table 5 displays the results of models with legal status as a grouping variable. Comparing M1 (i.e., rho parameters vary across legal status) and M2 (rho parameters equal across legal status) tested measurement invariance. The LRT for this test was nonsignificant, $\Delta G^2(48) = 5.72$, $p = 1.00$, and the AIC and BIC for the constrained model (M2) were smaller than values for the freely estimated model (M1). These results indicated that the same four classes were identified in participants at or above as well as below the legal drinking age. Given measurement invariance, Models P1 through P6 (see Table 5 for the descriptions of these) were used to compare prevalence rates across the two

TABLE 4. Item-response probabilities and class prevalence rates for four-class LCA model

	Latent class			
Alcohol use behavior	Current nondrinker	Weekend light drinker	Weekend risky drinker	Daily drinker
Ever drink alcohol	.23	**1.00**	**1.00**	**.99**
Any drink in past month	.00	**.84**	**1.00**	**.99**
Been drunk in past month	.00	.27	**.92**	.59
Past month HED	.02	.01	**.99**	.14
Peak BAC > .08	.00	.03	.44	.46
Any drink Sunday	.00	.08	.39	**.62**
Any drink Monday	.00	.08	.02	**.98**
Any drink Tuesday	.00	.00	.01	**.98**
Any drink Wednesday	.00	.00	.10	**.98**
Any drink Thursday	.00	.05	.16	**.98**
Any drink Friday	.00	.38	.53	**.99**
Any drink Saturday	.00	**.68**	**.79**	**.99**
Estimated prevalence rate	34%	38%	23%	5%

Notes: Entries in **bold** font indicate class-defining probabilities (>.60). Estimated prevalence rate refers to model-based estimate of latent class prevalence. HED = heavy episodic drinking; BAC = blood alcohol concentration.

TABLE 5. Model fit statistics for tests of group differences in latent class measurement and latent class prevalences

Model	-LL	G^2	*df*	AIC	BIC
Grouping variable = legal status					
Model M1: Rho parameters vary across legal status	949.68	377.47	8,089	581.47	946.22
Model M2: Rho parameters equal across legal status	946.82	371.76	8,137	479.76	672.86
Model P1: All class prevalences vary across legal status	946.80	371.71	8,137	479.71	672.81
Model P2: All class prevalences equal across legal status	952.68	383.49	8,140	485.49	667.86
Model P3: CND class prevalence equal across legal status	950.35	378.83	8,138	484.83	674.35
Model P4: WLD class prevalence equal across legal status	951.48	381.09	8,138	487.09	676.61
Model P5: WRD class prevalence equal across legal status	947.26	372.64	8,138	478.64	668.16
Model P6: DD class prevalence equal across legal status	947.13	372.39	8,138	478.39	667.91
Grouping variable = sex					
Model M1: Rho parameters vary across sex	917.06	314.56	8,089	518.56	883.30
Model M2: Rho parameters equal across sex	952.43	385.29	8,137	493.29	686.40
Model P1: All class prevalences vary across sex	952.41	385.25	8,137	493.25	686.35
Model P2: All class prevalences equal across sex	952.68	385.79	8,140	487.79	670.17

Notes: LL = log likelihood; G^2 = likelihood-ratio test statistic; AIC = Akaike's information criterion; BIC = Bayesian information criterion; CND = current nondrinker; WLD = weekend light drinker; WRD = weekend risky drinker; DD = daily drinker.

legal status groups. The first comparison (P1 and P2) provided an omnibus test that indicated the class prevalences were not equivalent across these two groups, $\Delta G^2(3) = 11.76$, $p = .008$. Thus, subsequent models that constrained only one of the four classes to be equal across the legal status groups (Models P3–P6) were compared with Model P1. As seen in Figure 1, participants younger than age 21 had a higher probability of belonging to the CND class, $\Delta G^2(1) = 7.1$, $p = .008$, whereas participants of legal drinking age were more likely to belong to the WLD class, $\Delta G^2(1) = 9.36$, $p = .002$.

The bottom panel of Table 5 displays results of models with sex as a grouping variable. Although the LRT for this comparison was significant, $\Delta G^2(48) = 70.74$, $p = .02$, the AIC and BIC for the constrained model (M2) were much smaller than values for the freely estimated model (M1). We thus inferred that the four classes had similar meanings across male and female participants and compared the prevalence rates for the four classes across sex. Comparing Models P1 and P2 revealed a nonsignificant LRT, $\Delta G^2(3) = 0.54$, $p = .91$, which confirmed that male and female participants showed equivalent probabilities of belonging to each of the four classes (Figure 1).

Characteristics associated with class membership

Table 6 presents results of models that included the demographic variables. Early onset of alcohol use was associated with membership in the classes (LRT = 10.13, $p < .05$).

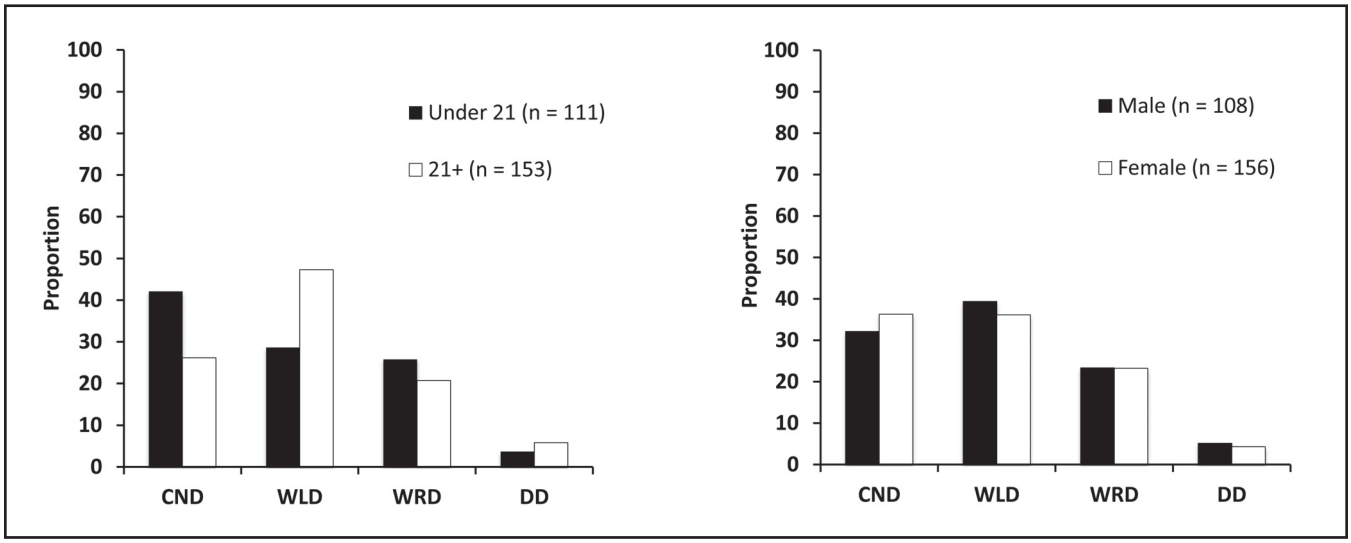

FIGURE 1. Latent class membership probabilities by grouping variables of legal drinking age status (left) and sex (right). CND = current nondrinker; WLD = weekend light drinker; WRD = weekend risk drinker; DD = daily drinker.

TABLE 6. The association between demographic variables and latent class membership

			Corresponding OR between reference class and comparison class							
			Current nondrinker		Weekend light drinker		Weekend risky drinker		Daily drinker	
Covariate	LRT	*p*	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]	OR	[95% CI]
Early-onset alcohol use	10.13	.02	***14.29^{-1}***	[99^{-1}, 2.86^{-1}]	***6.67^{-1}***	[50^{-1}, 1.03^{-1}]	ref.	–	7.14^{-1}	[25^{-1}, 5.54]
Race	2.22	.53								
Education status	5.03	.17								
Living . . .										
with family	2.30	.51								
with partner	3.47	.33								
Marital status										
Married	0.97	.81								
Cohabit	8.62	.03	ref.	–	***4.47***	[1.06, 18.80]	***5.26***	[1.36, 20.33]	1.45	[5^{-1}, 10.54]
Employment status	9.39	.02	***6.23***	[1.21, 35.05]	***11.96***	[2.11, 67.86]	***18.41***	[3.17, 106.96]	ref.	–
Urban residency	10.15	.02	***4.17^{-1}***	[14.29^{-1}, 1.23^{-1}]	2.86^{-1}	[11.11^{-1}, 1.30]	ref.	–	***67.47***	[18.86, 270.06]
			100^{-1}	[500^{-1}, 100^{-1}]	***100^{-1}***	[500^{-1}, 99^{-1}]	***100^{-1}***	[500^{-1}, 16.67^{-1}]	ref.	–

Notes: Entries in **bold** and *italic* font indicate the 95% confidence interval (CI) of the odds ratio (OR) *does not include* 1.00. LRT = likelihood ratio test (change in log-likelihood due to addition of the covariate to baseline model; *df* = 3); ref. = latent class specified as reference class.
**p* < .05.

Specific comparisons revealed that participants who initiated alcohol use at age 14 years or younger were significantly less likely to belong to the CND and WLD classes relative to the WRD class (ORs = 14.29^{-1} and 6.67^{-1}, respectively). However, early onset of alcohol use did not differentiate between the CND and WLD classes, nor was early onset associated with membership in the DD class relative to the other three classes.

Of the two dummy variables indicating marital status, only the comparison between participants who reported cohabiting and those who were never married was significantly associated with class membership (LRT = 8.62, $p < .05$). Those who reported cohabitation were more likely to belong to the WLD and WRD classes, compared with belonging to the CND class (ORs = 4.47 and 5.26, respectively). The comparison of married, divorced, or separated participants with nonmarried participants was not significantly associated with class membership.

Employment status and urban residency were also associated with class membership (LRTs = 9.39 and 10.15, respectively, both *p*s < .05). Participants who reported that they were currently working or self-employed were more likely to belong to the CND, WLD, or WRD classes compared with the DD class (ORs = 6.23, 11.96, and 18.41, respectively). In contrast, participants who resided in urban areas were less likely to belong to CND, WLD, or WRD classes compared with the DD class (all ORs = 100^{-1}). Urban residents were also significantly less likely to belong to the CND class relative to the WRD class (OR = 4.17^{-1}).

Class membership and alcohol-related consequences

In the final set of analyses, we computed the probability that members of the classes experienced each of the alcohol-related consequences in the past year. The left panel of Fig-

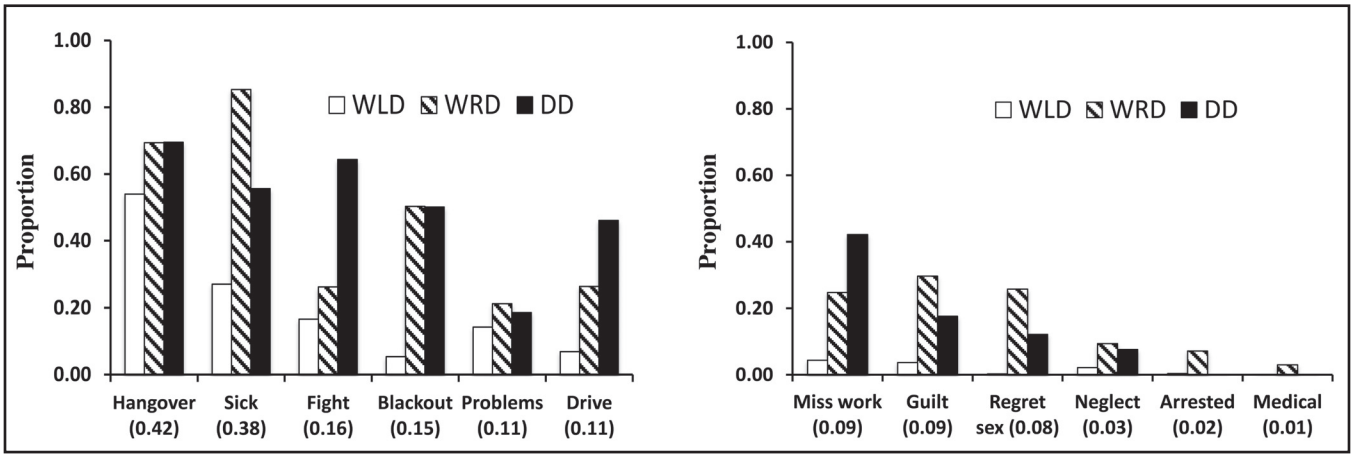

FIGURE 2. Estimated probability that participants in the drinking classes experienced each alcohol-related consequence in the past year. The values in parentheses refer to probability for the overall sample. Estimated probabilities for members of the current nondrinker class were equal to zero for each consequence item and are not displayed. WLD = weekend light drinker; WRD = weekend risk drinker; DD = daily drinker.

ure 2 displays the probabilities for the six consequences that were experienced by at least 10% of the overall sample; the right panel displays the probabilities for the less frequently experienced consequences. The overall test of significant differences among the classes was significant ($p < .004$) for all consequence items, except for driving after drinking ($p = .018$). As seen in the figure, among the three current drinking classes, WLDs were least likely to experience any of the consequences whereas WRDs had the highest probability of being sick, feeling guilty, and regretting sexual situations because of drinking. In contrast, DDs were most likely to have gotten into a physical fight or serious argument, driven a car after drinking, and missed work because of drinking.

Discussion

This study identified four classes of alcohol users among a sample of emerging adults with a high school education or less. Although these youth are at risk for alcohol-related problems (Muthén and Muthén, 2000), they are less likely than their college-attending peers to be included in research focusing on alcohol use. Notably, a substantial proportion of our sample (20%) had received less than a high school diploma, a group often excluded in studies of emerging adults, such as the Monitoring the Future study. Thus, our sample comprised a unique but vulnerable population of emerging adults that are often underrepresented in the literature.

Importantly, the same four classes were identified across male and female participants as well as those at or below the legal drinking age, although the proportion of participants within the classes differed across legal drinking age status. Recent research has found that male and female college students report similar rates of alcohol use, perhaps because of evolving norms regarding drinking (Tremblay et al., 2010; White and Jackson, 2004/2005). The present results indicate that not only did male and female participants report similar rates of drinking behaviors, but they were also equally likely to belong to each of the four drinking classes. To our knowledge, this study is the first to report similar patterns of drinking among male and female emerging adults who are not enrolled in college.

Problem drinking classes and alcohol-related consequences

The four classes identified in this study are similar to those found in a sample of first-year college students (Cleveland et al., 2012). In fact, three of the four classes (CND, WLD, and WRD) had identical interpretation across the two studies. Prevalence rates of CNDs and WRDs were comparable in both studies; however, membership in the WLD class was more common in this study than in the college sample (38% and 19%, respectively). The most notable difference lies in the interpretation of the fourth class, which was labeled "heavy drinkers" (HDs) in Cleveland et al. (2012). This class was very likely to engage in all three risky drinking behaviors (HED, being drunk, BAC above .08) but had only moderate probability of weekday (Sunday through Wednesday) drinking. In contrast, DDs in this study were very likely to drink every day of the week but were less likely to report risky drinking behaviors. HDs comprised more than a quarter of the college sample; thus, more than half of college students were characterized as risky drinkers (WRDs or HDs), whereas less than a third of the current sample were either WRDs or DDs. Thus, emerging adults without postsecondary education may be less likely to engage in HED, although a small but discernible class may be more likely to drink alcohol on a daily basis.

These differences may reflect a "maturing out" process in the present sample that was not captured in the sample of first-year college students. Studies suggest that as college students take on more responsibilities in both social and academic domains, drinking quantity and negative consequences decrease (Baer et al., 2001). Emerging adults who do not attend college likely experience a similar pattern of desistance as they experience certain life events (Fleming et al., 2010). Longitudinal studies are needed to identify youth who may be at risk for escalating to problem drinking during this vulnerable transition. Although there is a well-established foundation for prevention of high-risk drinking by college students (Larimer and Cronce, 2007), virtually no efforts are directed toward preventing high-risk drinking among emerging adults who do not receive postsecondary education (Spoth et al., 2008).

Consistent with Reboussin et al. (2006), we identified three classes of drinkers, of which two could be characterized by risky drinking. Our findings, however, suggest that the two risky drinker classes were distinguished by variability in daily patterns of alcohol consumption and rates of risky drinking behaviors. Both behaviors are cause for concern, which is reflected in the finding that the two classes experienced different types of alcohol-related consequences. Whereas WRDs were more likely to report sickness and feelings of guilt attributable to drinking, DDs were most likely to get into fights, drive a car after drinking, and miss work because of drinking. These results confirm that some youth experience alcohol-related problems because of frequent, regular alcohol use, whereas others are at risk because of HED (Chung et al., 2002).

Demographic variables and drinking class membership

Class membership was associated with several individual and demographic characteristics. In particular, participants reporting early onset were most likely to belong to the WRD class. Thus, early initiation of alcohol use in our sample was associated with HED, rather than daily drinking patterns. Adolescents who initiate alcohol use early are more likely

to experience alcohol dependence and problem use later in life (Grant and Dawson, 1997; Hingson et al., 2006; Sartor et al., 2009) and are also more likely to suffer alcohol-related consequences (Hingson and Zha, 2009). We would expect that, compared with other classes, DDs are more likely to develop tolerance to the effects of alcohol as a result of frequent drinking, placing them at higher risk for alcohol dependence. Additional analyses (not shown) revealed that, of the three drinking classes, DDs reported the highest average number of drinks per drinking day (5.00 drinks) and the most time spent drinking on their most recent peak occasion (7.19 hours). This compares to only 4.08 and 2.02 drinks per drinking day and 5.05 and 2.96 hours for the WRD and WLD classes, respectively. These results suggest multiple pathways from early initiation to problem use of alcohol and related consequences. However, longitudinal studies that follow youth from early adolescence to adulthood are needed to distinguish these trajectories.

We also found that getting married or living with one's childhood family did not proffer the same protections in our sample as they have in other studies of emerging adults (Fleming et al., 2010; White et al., 2006). One possibility for these discrepancies may be that our sample included only individuals with no formal training beyond high school, a substantial proportion of whom had less than a high school education. In contrast, previous studies have often excluded individuals who have dropped out of high school (O'Malley and Johnston, 2002; White et al., 2006). It may be that other lifestyle changes, particularly having children, are more important among this group in terms of alcohol consumption and risky drinking patterns. Unfortunately, questions regarding children were not measured in our survey or provided as part of the demographic profile provided by KN, and we could not explore this issue.

Several other limitations of our study should be mentioned. Simulation studies indicate that sample sizes of approximately 300 are necessary to yield good estimates of LCA parameters and standard errors (Muthén, 2004), and thus the size of our sample raises some concerns. Most important, membership in the DD class, which included only 5% of the sample, may have been less reliable than membership in the remaining classes. Small sample sizes may have also limited our ability to detect associations between certain covariates (e.g., living arrangement, education level, and race) and the classes.

Our study was only a cross-sectional assessment of demographic characteristics, drinking behaviors, and related consequences. Thus, caution must be used when interpreting the results in terms of causal direction, and replication of the results with longitudinal data is required to better understand these associations. Finally, we note that the sampling technique used by KN relies on address-based sampling. Although address-based sampling overcomes some known limitations of random-digit dialing techniques (e.g., high rate of cell phone relative to land-based telephone service), residential mobility is highest during emerging adulthood (Arnett, 2005). Thus, address-based sampling may show bias attributable to differential nonresponse among this hard-to-reach population (Link and Lai, 2011).

Conclusion

This study identified four classes of alcohol users among emerging adults with a high school education or less. Although most of the sample belonged to classes defined by rare or moderate use, nearly a quarter reported high-risk drinking behaviors, such as HED and achieving BACs above .08. In addition, a small but detectable class reported drinking alcohol on a daily basis, although not necessarily heavy episodic use. Both of these classes were at elevated risk for experiencing alcohol-related consequences. Research that builds on these findings is needed to better understand patterns of alcohol use and related consequences among the entire population of emerging adults, including the vulnerable but often overlooked group of youth who do not attend college.

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