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## A Latent Profile Analysis of Drinking Patterns among Nonstudent Emerging Adults

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### Abstract

Research indicates that nonstudent emerging adults, as compared to their college-attending peers, are at higher risk for experiencing alcohol-related problems, including alcohol use disorders. The present study sought to extend the limited research on nonstudent drinking by (1) identifying sub-groups of nonstudent drinkers based on their drinking patterns and (2) determining the extent to which social-cognitive between-person factors related to drinking (i.e., social expectancies, perceived drinking norms, social drinking motivations) distinguish these sub-groups. Participants were 195 (65.1% men) nonstudent emerging adult heavy episodic drinkers recruited from the community. Mean age was 21.88 ( $SD = 2.08$ ) years and 45.4% were unemployed. Latent profile analysis identified two classes based on drinking across 30 days. The “moderate drinkers” group ( $n = 143$ ; 73.3%) reported consuming 10–11 drinks weekly and drinking two to three times per week, on average. The “heavy drinkers” class ( $n = 52$ ; 26.7%) reported consuming 42–43 drinks weekly and drinking six to seven days per week. Both groups exhibited a cyclic pattern of drinking whereby weekday drinking was lower, with increases on the weekend; the heavy drinkers class had stronger weekend increases starting earlier. Heavy drinkers reported greater volume, frequency, and problematic drinking behaviors, as compared to the moderate drinkers. The heavy drinkers class also endorsed stronger social motives and perceived their peers to drink more. The present study offered unique insights into nonstudent emerging adult drinking patterns by identifying sub-populations of drinkers based on their past 30-day use. Knowledge gained from this study could aide in tailoring existing alcohol interventions to nonstudents to reduce alcohol-related harms.

### Keywords

Alcohol; nonstudents; emerging adults; drinking patterns

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Peak rates of drinking and risk for alcohol-related problems are observed among emerging adults (i.e., ages 18 to 25; Hingson, Zha, & Weitzman, 2009; Substance Abuse and Mental Health Services Administration, 2014). Most of the drinking literature among this age group has been conducted largely with college student-based samples. Inclusion of emerging adults who are noncollege-attenders is needed as they may be a more vulnerable population of

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drinkers. Compared to college students, nonstudents are less likely to mature out of heavy drinking (Muthén & Muthén, 2000; White, Labouvie, & Papadaratsakis, 2005) and are at a higher risk for alcohol-related problems (Barnett et al., 2003; Muthén & Muthén, 2000; White et al., 2005). The current study sought to extend previous research on nonstudents by examining variations in past 30-day alcohol consumption and to identify potential sub-groups of nonstudent drinkers.

Prior work on drinking patterns is limited, with most primarily focused on first-year college students (e.g., Beets et al., 2009; Del Boca, Darkes, Greenbaum, & Goldman, 2004; Maggs, Williams, & Lee, 2011; Tremblay, Colley, Saunders, Healy, & Owen, 2010). There have been a handful of studies on daily drinking patterns among nonstudents. Findings have shown that a greater portion of daily drinking variation is attributable to the intra-individual (within) versus inter-individual (between) level (Lau-Barraco, Braitman, Stamates, & Linden-Carmichael, in press). Nonstudent drinking tends to peak during holidays (Goldman, Greenbaum, Darkes, Brandon, & Del Boca, 2011; Kushnir & Cunningham, 2014) and on weekends (Kushnir & Cunningham, 2014), with weekday to weekend drinking increases being uniquely associated with social alcohol outcome expectancies (Lau-Barraco, Braitman, Linden-Carmichael, & Stamates, in press). Furthermore, in an effort to understand drinking patterns in nonstudent emerging adults, Cleveland and colleagues (2013) used latent class analysis to identify classes of alcohol users. Drinking was measured in the study using aggregate indicators, such as typical alcohol consumption and frequency. To our knowledge, research has yet to identify sub-groups of nonstudent drinkers by examining drinking patterns based on retrospective reports of drinking for the previous 30 days. Given the variable nature of alcohol use, the current approach would provide a more fine-grain, nuanced perspective of drinking in this vulnerable population.

Drinking patterns of nonstudent sub-groups may differentially relate to key social-cognitive variables. Specifically, theory (Maisto, Carey, & Bradizza, 1999) and empirical evidence assert that cognitively-based social factors, such as social expectancies, perceived drinking norms, and social drinking motives, are each uniquely related to alcohol use outcomes. For example, social expectancies (i.e., beliefs about drinking's social effects) have distinguished latent classes of drinking trajectories (Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005) and accounted for increases in drinking on weekends (Lau-Barraco et al., in press). Perceived drinking norms (i.e., descriptive norms) also are influential in college student (e.g., see Borsari & Carey, 2003 for a review) and nonstudent (Lau-Barraco & Collins, 2011) drinking. The more one perceives others to drink, the greater their own drinking. Social motives (i.e., reasons for drinking; Cooper, 1994) are most commonly reported among college students (Arbeau, Kuiken, & Wild, 2011; LaBrie, Hummer, & Pedersen, 2007) and are predictive of drinking (see Kuntsche, Knibbe, Gmel, & Engels, 2005 for a review; Maggs et al., 2011). Research has yet to examine the association of these factors to latent classes of nonstudents based on their day-to-day drinking habits.

The present study contributes to the limited research on nonstudent drinking. We aimed to (1) identify sub-groups of nonstudent drinkers based on day-to-day drinking patterns, and (2) determine the extent to which social-cognitive between-person factors related to drinking

(i.e., social expectancies, perceived drinking norms, social drinking motivations) distinguish sub-groups.

## Method

### Participants and Procedure

Participants were 195 (65.1% men; mean age = 21.88 [ $SD = 2.08$ ]) individuals recruited from the community of a mid-size southeastern city in the U.S. via online advertisements and local newspaper listings for two separate studies (i.e., two phases of a larger study to develop a brief alcohol intervention). They were largely single/never married (64.1%), unemployed (45.4%), and African-American (52.9%). Study eligibility included being between ages 18–25 years, having no prior or current college attendance, consuming fewer than 40 drinks per week, engaging in at least two heavy drinking episodes (4+/5+ drinks for women/men) in the past month, and having no history of alcohol treatment. Eligible participants provided informed consent and completed a self-report questionnaire in-person. Participants were compensated \$40 to \$60, depending on the phase of the study. The study was approved by the university's Institutional Review Board and followed the American Psychological Association (2010) guidelines.

### Measures

Self-reported drinking for each day during the past 30 days was assessed using the Timeline Follow-back (TLFB; Sobell & Sobell, 1992). Alcohol-related problems were measured using the Brief Young Adult Alcohol Consequences Questionnaire (BYAACQ; Kahler, Strong, & Read, 2005). Alcohol use severity was assessed using the Alcohol Use Disorder Identification Test (AUDIT; Babor, de la Fuente, Saunders, & Grant, 1992). Alcohol expectancies were evaluated using the sociability subscale of Comprehensive Effects of Alcohol questionnaire (CEOA; Fromme, Stroot, & Kaplan, 1993). Social drinking motives were assessed using the social subscale from the Drinking Motives Questionnaire (DMQ-R; Cooper, 1994). Descriptive norms were measured using the Descriptive Norms Rating Form (DNRF; Baer, Stacy, & Larimer, 1991).

### Statistical Analyses

Latent profile analysis (LPA) was conducted using Mplus version 6.1 (Muthén & Muthén, 1998–2010). LPA was used to identify sub-populations based on drinking across 30 days (Aim 1). The number of standard drinks consumed on each day of the 30-day TLFB data served as the set of indicators. The square root of these values were used in the LPA to transform the skewed raw metric into a set of normally distributed variables. To match patterns across participants, the data for each participant was shifted so that Day 1 always started on a Sunday, resulting in 36 daily indicators with each participant contributing 30 days of data and having “missing” data for the other days. The best-fitting number of classes was determined by information criteria (AIC, BIC, aBIC), entropy values, the Lo-Mendell-Rubin likelihood ratio test, proportional class size, and interpretability of the identified classes. After finalizing the number of latent classes, class differences were explored for social-cognitive factors, alcohol-related problems, and general drinking levels using Wald tests based on posterior probability-based multiple imputations.

## Results

The information criteria indicated that model fit improved as number of classes increased, whereas entropy indicated that the model with 2 classes had the highest certainty for classification (see Table 1). Nylund, Asparouhov, and Muthén (2007) concluded after extensive simulations that no one indicator is consistently accurate across all models, and that examining multiple indices is necessary to see the complete picture. Given that LMR likelihood ratio probabilities also indicate that higher numbers of classes do not significantly improve model fit, this supports the 2-class model. Finally, the proportion of participants in the smallest class indicates that 2 classes may represent the most meaningful proportions of the population.

Demographic characteristics varied across latent classes (see Table 2). Class 2 (described below) had a higher proportion of males, and single participants who never married and are not living with a partner. They also varied significantly by race. While there was a trend toward higher unemployment in Class 2, this difference failed to reach significance.

### Drinking based on Class Membership

Mean drinks consumed each day is presented in Table 2 by latent class. For both groups, weekday drinking (Sunday [days 1, 8, 15, 22, 29] through Wednesday [days 4, 11, 18, 25, 32]) was lower, with increases on the weekend (Friday [days 6, 13, 20, 27, 34] and Saturday [days 7, 14, 21, 28, 35]). Patterns for Thursday (days 5, 12, 19, 26, 33) varied across groups. Mean drinks consumed stayed under or near 0.5 drinks for weekdays as well as Thursdays for class 1 (“moderate drinkers”;  $n = 143$  [73.3%]), then between 1.5 and 2.5 drinks per day on Friday and Saturday (except the final weekend which was slightly higher). In contrast, class 2 (“heavy drinkers”;  $n = 52$  [26.7%]) consumed more during the week (about three drinks per day), then increased on Thursdays with around four drinks, and peaked at eight or nine drinks per day on Friday and Saturday. In general, class 2 had higher base levels than class 1, as well as stronger weekend peaks starting earlier.

### Class Differences on Drinking Constructs

Class 2, “heavy drinkers,” reported significantly higher social motives and descriptive norms. There was a trend toward higher social expectancies, although this trend was non-significant. In addition, class 2 reported drinking at significantly higher quantity during the TLFB period, drinking more frequently, having a higher number of peak drinks, more heavy drinking days, a higher proportion of heavy drinking days, and experiencing more problems (via AUDIT and BYAACQ scores; see Table 2).

## Discussion

The current study sought to explore sub-populations of nonstudents based on retrospectively reported day-to-day drinking patterns as well as to investigate sub-group differences by examining social-cognitive between-person constructs relevant to the etiology and maintenance of drinking. In identifying homogenous sub-groups of drinkers based on drinking profiles, findings revealed two distinct classes of users. Class 1 (“moderate drinkers”) was most prevalent (73.3% of the sample) and characterized nonstudents who

reported consuming 10–11 drinks weekly, drinking two to three times per week. Their weekly pattern consisted of typically consuming very low levels (0 to 0.5 drinks) during the weekday but increasing one to two additional drinks per day on Fridays and Saturdays. On the other hand, class 2 (“heavy drinkers”) characterized individuals who reported consuming 42–43 drinks weekly, drinking almost each day of the week. Class 2 drank about three drinks per day during weekdays but then showed a steady increase starting one day earlier on Thursday (to around four drinks), and peaked on Friday and Saturday (eight to nine drinks per day). Thus, across both groups, although at varying degrees, users exhibited a cyclic pattern of drinking whereby weekday drinking is lower, with increases on the weekends. This pattern of weekday to weekend drinking escalation is consistent with prior findings with college student and general population samples (e.g., Goldman et al., 2011; Hoepfner et al., 2012; Kushnir & Cunningham, 2014; Maggs et al., 2011).

In addition to drinking quantity differences between the two classes identified, the latent groups also exhibited differences in the intensity and frequency of heavy drinking as well as alcohol use severity. Class 2 consumed close to 15 drinks on the highest drinking occasion compared to eight drinks for class 1. Class 2 reported 15 heavy drinking days while class 1 reported four heavy days over the course of 30 days. The apparent severity of drinking exhibited by class 2 was verified by comparing the two groups on indicators of problem drinking. Class 2 experienced greater alcohol-related harms as measured by the BYAACQ. Though both classes scored above the AUDIT cut-off of eight (class 1 = 11.2; class 2 = 17.9), reflecting risk for hazardous and harmful alcohol use patterns, class 2 fell within a range that suggests a high level of alcohol problems and for whom more intensive interventions such as brief counseling and continued monitoring may be appropriate (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). Overall, in the present study, we were able to discern different temporal patterns of drinking based on daily cycles that corresponded with differential risk levels. We extended previous findings by identifying two groups of nonstudent drinkers that not only differed in drinking patterns, but also diverged in the volume, frequency, and intensity of drinking.

Our LPA findings are in line with previous research conducted among adolescent and emerging adult samples. For example, Cleveland et al. (2013) found that nonstudent emerging adults reporting high-risk drinking and daily alcohol use in general were at an increased risk for experiencing alcohol-related harms. Similarly, among underage drinkers, studies have also identified subgroups of drinkers, whereby more frequent, heavy drinkers are at a greater likelihood to report more alcohol-related harms (Diestelkamp et al., 2015; Reboussin, Song, Shrestha, Lohman, & Wolfson, 2006). Heterogeneous subgroups have also been identified among college students showing that heavy drinking groups are often characterized by more alcohol-related problems (e.g., Beseler, Taylor, Kraemer, & Leeman, 2012; Kuvass, Dvorak, Pearson, Lamis, & Sargent, 2014) and behavioral risks (e.g., Chiauzzi, DasMahapatra, & Black, 2013). However, it is worth noting that classes of drinkers with the greatest risk level based on college samples still exhibit relatively lower consumption than the high risk class found in the present study. For example, in an undergraduate college sample, three latent classes emerged based on their Diagnostic and Statistical Manual of Mental Disorders-IV substance use disorder criteria endorsement (Beseler et al., 2012). The most severe class endorsed all DSM-IV criteria with high

probabilities and all met threshold for a dependence diagnosis. Their mean weekly consumption was 24.6 drinks per week. This is in contrast to the mean consumption of approximately 42 drinks weekly for participants found in the “heavy drinkers” class in our sample of nonstudents. This robust relative difference could suggest that our “heavy drinkers” class may represent a group of emerging adults who are especially at-risk for alcohol dependence and long-term alcohol-related impairment and should be specifically targeted for intervention efforts.

Our second aim was to examine the extent to which sub-groups differed on social-cognitive predictors (i.e., social drinking motives, descriptive drinking norms, social expectancies). We found support that normative drinking perceptions and social motivations distinguished classes of drinkers, such that “heavy drinkers” perceived their peers to drink more and they reported greater motivation to drink for social reasons. Both classes had similar levels of social alcohol expectancies. These findings suggest that, similar to college students (Maggs et al., 2011; O’Grady, Cullum, Tennen, & Armeli, 2011), nonstudent drinking patterns are associated with perceptions of peers’ drinking and motivations to drink to be social.

The current findings offer several implications that could guide efforts to enhance drinking reduction efforts for nonstudent heavy drinkers. Intervention strategies that target social-influence processes, such as correcting drinking norm misperceptions (e.g., Neighbors, Larimer, & Lewis, 2004) may be successfully tailored to meet the needs of nonstudent emerging adult populations. Another implication is that our results identified a particularly risky class of drinkers who drank almost daily, consistently engaged in binge drinking on weekends, and began their “weekend” drinking a day early (on Thursdays). In light of their vulnerability to experiencing alcohol-related harms, concerted efforts should be made to specifically reach this highly at-risk group. Further suggested by the results is that nonstudent drinkers are not a homogeneous group with similar alcohol use patterns. Because of the heterogeneity of drinking even among heavy drinking nonstudents, a universal standard approach may not be optimal but instead, tailored strategies may be necessary to meet varying needs based on drinker type.

Several study limitations should be noted. First, reports of drinking behavior were based on retrospective self-report data, which may be susceptible to recall or social desirability bias. Second, our findings may not generalize to other populations beyond heavy drinking nonstudent emerging adults. Conclusions beyond our sample should also be made with caution given that that 45% of our sample was unemployed and 60% of the sample identified as a minority. Third, other daily diary assessment methods (e.g., ecological momentary assessment) may be better suited for studying associations more in-depth. Finally, although all participants reported consuming *fewer than* 40 drinks per week at baseline screening for the study, class 2 reported consuming an average of *more than* 40 drinks per week. It is likely that participants underreported their alcohol use during study screening given they simply provided an overall estimate of their weekly drinking. A more detailed assessment may be needed at baseline to accurately screen for drinking inclusion/exclusion criteria.

Despite limitations, the present study offered unique insights into the drinking patterns of nonstudent emerging adults by identifying sub-populations of drinkers based on past 30-day

use. Findings revealed that these sub-groups of nonstudents are distinguished based on normative perceptions of others' drinking, social drinking motives, and alcohol outcomes. Knowledge gained from the current study could be used to help tailor existing alcohol interventions to nonstudents or guide for whom to direct intervention efforts as to reach those most in need.

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### Highlights

- Identified sub-groups of nonstudent drinkers based on daily drinking patterns.
- Two groups were identified with each group exhibiting a cyclic pattern of drinking.
- “Heavy drinkers” class reported greater volume, frequency, and problematic drinking behaviors, as compared to “moderate drinkers”.
- “Heavy drinkers” class endorsed stronger social motives and perceived their peers to drink more.

**Table 1**

## Model Fit Based on Number of Classes

Classes:	AIC	BIC	Adjusted BIC	Relative Entropy	LMR LRT $p$	Proportion of smallest group
1	18385.221	18620.877	18392.792	--	--	--
2	16518.688	16875.445	16530.149	.980	.0220	.268
3	15991.573	16469.431	16006.925	.976	.2321	.097
4	15733.011	16331.970	15752.253	.968	.7614	.086

*Note.* AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, LMR LRT = Lo-Mendell-Rubin likelihood ratio test. Entropy and LMR LRT are not available for models with only one class. Proportion of smallest group comes from estimated posterior probabilities rather than most likely class membership. Note that models with more than 4 classes were not estimated due to large number of parameters that would need to be estimated in comparison to the size of the sample.

Table 2

## Daily Drinking Indicator Means by Latent Class

Indicator	Latent Class 1			Latent Class 2		
	M	SE	Squared M	M	SE	Squared M
Day 1	0.53	0.17	0.28	1.74	0.32	3.02
Day 2	0.35	0.08	0.12	1.94	0.24	3.76
Day 3	0.33	0.07	0.11	1.75	0.18	3.07
Day 4	0.39	0.08	0.15	1.92	0.20	3.69
Day 5	0.51	0.08	0.26	2.17	0.22	4.70
Day 6	1.28	0.11	1.65	2.89	0.17	8.36
Day 7	1.46	0.11	2.14	2.94	0.17	8.61
Day 8	0.50	0.07	0.25	1.83	0.20	3.36
Day 9	0.44	0.07	0.19	1.58	0.17	2.48
Day 10	0.31	0.06	0.10	1.69	0.19	2.85
Day 11	0.41	0.07	0.17	1.69	0.17	2.86
Day 12	0.46	0.08	0.21	2.11	0.16	4.46
Day 13	1.34	0.11	1.78	2.92	0.18	8.52
Day 14	1.36	0.11	1.85	2.96	0.19	8.74
Day 15	0.44	0.07	0.19	1.90	0.21	3.63
Day 16	0.29	0.06	0.08	1.69	0.16	2.86
Day 17	0.33	0.06	0.11	1.63	0.15	2.66
Day 18	0.31	0.06	0.10	1.79	0.19	3.19
Day 19	0.51	0.08	0.26	1.75	0.16	3.06
Day 20	1.27	0.11	1.62	2.83	0.18	8.02
Day 21	1.39	0.11	1.93	2.98	0.17	8.88
Day 22	0.52	0.08	0.27	1.95	0.19	3.79
Day 23	0.40	0.07	0.16	1.78	0.17	3.15
Day 24	0.30	0.06	0.09	1.81	0.18	3.27
Day 25	0.42	0.07	0.17	1.49	0.17	2.22
Day 26	0.58	0.08	0.34	1.87	0.16	3.51

Indicator	Latent Class 1			Latent Class 2			$\chi^2$	p
	M	SE	Squared M	M	SE	Squared M		
Day 27	1.31	0.11	1.70	2.96	0.18	8.75	2.78	.095
Day 28	1.44	0.11	2.08	2.95	0.18	8.73	5.93	.015
Day 29	0.67	0.09	0.45	1.92	0.17	3.67	32.81	<.001
Day 30	0.40	0.07	0.16	1.86	0.17	3.46	34.32	<.001
Day 31	0.48	0.08	0.23	1.92	0.16	3.68	9.64	.002
Day 32	0.31	0.09	0.10	1.74	0.23	3.01	67.32	<.001
Day 33	0.83	0.24	0.68	2.01	0.40	4.04	396.49	<.001
Day 34	1.92	0.22	3.68	2.66	0.41	7.05	396.49	<.001
Day 35	1.86	0.27	3.46	2.62	0.37	6.84	23.77	<.001
Day 36	0.50	0.19	0.25	1.34	0.51	1.79	87.61	<.001
<b>Variable</b>	<b>M</b>	<b>SE</b>	<b>M</b>	<b>SE</b>	<b>M</b>	<b>SE</b>	<b>df</b>	
Social Expectancies	27.03	(0.34)	28.01	(0.48)	27.03	(0.34)	1	3.95
Social Motives	18.05	(0.37)	19.58	(0.51)	18.05	(0.37)	1	3.95
Descriptive Norms	4.62	(0.24)	8.05	(0.55)	4.62	(0.24)	3	15.18
AUDIT	11.22	(0.50)	17.85	(1.01)	11.22	(0.50)	3	15.18
BYAACQ	31.61	(0.45)	34.51	(0.82)	31.61	(0.45)	1	3.95
TLFB quantity	45.70	(2.80)	178.05	(15.91)	45.70	(2.80)	1	3.95
TLFB quantity per week	10.88	(0.67)	42.39	(3.79)	10.88	(0.67)	1	3.95
TLFB frequency	10.65	(0.53)	26.32	(0.58)	10.65	(0.53)	1	3.95
TLFB frequency per week	2.54	(0.13)	6.27	(0.14)	2.54	(0.13)	1	3.95
TLFB peak	8.09	(0.40)	14.65	(1.29)	8.09	(0.40)	1	3.95
TLFB number of HDD	4.23	(0.30)	15.30	(1.14)	4.23	(0.30)	1	3.95
TLFB proportion of HDD	0.44	(0.03)	0.61	(0.05)	0.44	(0.03)	1	3.95
Gender	<u>Prob.</u>		<u>Prob.</u>		<u>Prob.</u>			
Male	.61		.75		.61			
Female	.39		.25		.39			
Race								
Caucasian/White	.41		.37		.41			

Variable	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	$\chi^2$	<i>p</i>
Native American	.00	.04				
African American/Black	.51	.59				
Hispanic/Latino	.08	.00				
Employment			3	6.37		.095
Yes, part-time only	.26	.25				
Yes, full and part-time	.11	.10				
Yes, full-time only	.22	.09				
No	.41	.56				
Marital Status			3	16.09		.001
Single/Never married	.69	.87				
Living with partner	.17	.11				
Married	.08	.02				
Separated/Divorced	.06	.00				

Note: Means for day indicators reflect the square root of drinks consumed per day. Descriptive norms reflect estimated drinks per drinking day for a close friend. AUDIT = Alcohol Use Disorders Identification Test, BYAACQ = Brief Young Adult Alcohol Consequences Questionnaire, TLFB = Timeline Follow-back, HDD = heavy drinking days (4+ drinks for women, 5+ drinks for men). Proportion of HDD reflects the proportion of drinking days where the participant engaged in heavy drinking (i.e., number of HDD / number of drinking days). "Per week" for TLFB reflects dividing by 4.2 to represent the average quantity consumed per week during the TLFB period. Prob. = probabilities across classes, equivalent to proportions for the current data. Unless otherwise specified, chi-square tests had one degree of freedom.