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Who Will Experience the Most Alcohol Problems in College? The Roles of Middle and High School Drinking Tendencies

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Abstract

Background—Previous work examining college drinking tendencies has identified a disproportionately small (20%), but uniquely high-risk group of students who experience nearly 50% of the reported alcohol-related consequences (i.e., the multiple repeated consequences, or MRC, group). With the goal of reducing drinking-related consequences later in college, the current study sought to identify potential MRC group members in their first semester by examining: 1) early-risk subgroups based on analysis of early-risk screening constructs (e.g., age of drinking onset, middle school alcohol exposure, high school drinking and consequences); and 2) their association with MRC criteria early in the first semester of college.

Methods—A random sample of 2021 first year college student drinkers (56% female) completed a web-based drinking survey in their first semester on campus.

Results—Latent class analysis (LCA) revealed four early-risk subgroups: 1) an *Early Onset Risk* group who endorsed early age of drinking onset and engaged in heavy middle and high school drinking (10%); 2) a *Late Onset Risk* group who engaged in weekend drinking and drunkenness and experienced six or more unique consequences as seniors in high school (32%); 3) an *Early Onset Limited Risk* group who only endorsed early age of onset and middle school drinking (3%); and 4) a *Minimal Risk* group who did not engage in any early risk behaviors (55%). Members of both the *Early* and *Late Onset Risk* groups had significantly higher odds of MRC membership in their first semester of college (9.85 and 6.79 greater, respectively).

Conclusions—Results suggest age of onset, middle and high school drinking and drunkenness, and frequency of unique consequences could be particularly useful in brief screening tools. Further, findings support early screening and prevention efforts for MRC membership prior to college matriculation.

Keywords

early screening; high-risk college drinking; MRC group; alcohol-related consequences

INTRODUCTION

College students report a variety of physical, social, sexual, academic, and legal problems associated with alcohol use, with substantial numbers meeting criteria for more chronic problems such as alcohol abuse (31%) or dependence (6%; Knight et al., 2002). Although interventions implemented during the transition from high school to college (Turrissi et al., 2013), after matriculation (e.g., Saltz et al., 2010), and following alcohol violations (e.g., Carey et al., 2011) have shown promise, there are still several notable gaps in the efforts to reduce student alcohol problems. Further, the relation between drinking and problems is not consistent across students (Mallett et al., 2011a; 2011b), and many high-risk students remain unidentified and therefore receive limited exposure to evidence-based intervention efforts. As a result, leaders in the field have called for improved screening efforts to identify students who drink in the highest-risk manner and to intervene when prevention and treatment can have the greatest impact (e.g., Hingson et al., 2005).

Students at Highest Risk for Experiencing Consequences

Experiencing a variety of consequences, or the same consequences repeatedly, are both red flags signaling the need for intervention. Mallett and colleagues (2011c) have identified a particularly high-risk group of college students who experience both multiple and repeated consequences (i.e., the MRC group). Members of this group experienced 6 or more *unique* consequences and 5 or more consequences *repeatedly* (same consequence 2+ times) over the course of one year. Although the MRC group only accounted for approximately 20% of drinkers, they experienced nearly half of all alcohol-related consequences reported. Further, identification of this high-risk group has been replicated independently with similar proportions of MRC group members and consequences experienced (e.g., Varvil-Weld et al., 2012; 2013). The MRC group's repeated experience with consequences indicates these students do not modify their behavior to avoid subsequent problems, making them important targets for early intervention.

Despite the disproportionate number of consequences and the extremely high-risk nature of the MRC group, only a few studies have examined predictors of membership. For example, students who engaged in more risk behaviors (i.e., participated in drinking games) and who had higher perceived drinking norms and rates of weekly and peak drinking were likely to be in the MRC group at the end of their first year in college (Varvil-Weld et al., 2013). Additional research showed an association between parents who exhibited permissive orientations toward underage student alcohol consumption and MRC group membership, again identified at the end of the first year in college (Varvil-Weld et al., 2012). The present study extends this work by examining early-risk screening constructs and their utility in identifying individuals who meet MRC criteria early in their first semester on campus.

Early-Risk Screening Constructs: Middle and High School Drinking Tendencies

The selection of early-risk screening constructs was based on recommendations from the National Institute on Alcohol Abuse and Alcoholism (NIAAA) regarding alcohol screening (NIAAA, 2011). The selected screening constructs are discussed in turn.

Age of Drinking Onset—Studies have shown that by 8th grade, 1 in 3 students initiate alcohol consumption (Johnston et al., 2011). Early age of drinking onset is associated with higher risk of problematic alcohol use and chronic problems (Hingson et al., 2006; Warner and White, 2003). The current study examined age of onset prior to age 15 as a risk factor indicative of MRC group membership in college (Hingson et al., 2006; Mallett et al., 2010).

Middle School Alcohol Exposure and Drinking Behavior—Exposure to alcohol in early adolescence, operationalized by being in the presence of peers who are consuming alcohol, has been associated with increased risk of heavy drinking behaviors (Kosterman et al., 2000) and alcohol abuse and dependence later in life (Odgers et al., 2008). Further, individuals who drink more than a few sips in middle school are likely to have more positive alcohol expectancies, which in turn are related to drinking into high school (Dunn and Goldman, 1998). In the present study, early peer exposure and drinking more than a few sips in middle school were examined as early-risk screening constructs hypothesized to be associated with subsequent MRC group membership.

High School Alcohol Exposure and Drinking Behavior—Based on the above noted associations between exposure and increased risk of heavy drinking, the present study will also examine associations between being in the presence of high school peers who consumed alcohol and membership in early higher-risk subgroups and subsequently the MRC group. In addition, based on Cleveland et al. (2012) showing associations between drinking in high school and college student drinking tendencies, the present research will examine drinking during the week, weekend drinking, and frequency of getting drunk during students' senior year of high school. Thus, high school peer exposure, and frequent and heavy drinking, were examined as early-risk screening constructs hypothesized to be associated with subsequent MRC group membership.

High School Alcohol Consequences—Mallett et al. (2011a) have observed that the number of pre-college alcohol consequences uniquely predicts consequences at the end of

the first year, even after controlling for pre-college weekend drinking. The relationship between drinking and consequences is complicated in that the former is necessary, but not sufficient in predicting future problems (e.g., Mallett et al., 2011a; 2011b). The present study expands on this work by including consequences to complement a wide range of drinking constructs at different developmental periods to examine early-risk screening constructs expected to be associated with subsequent MRC group membership.

The Current Study

Each of the early-risk screening constructs described above has been individually associated with increased drinking and/or consequences using variable-centered approaches. These approaches suggest that anyone who exhibits an early onset of drinking or alcohol problems prior to college will be at greater risk for problems in college (e.g., Sher & Rutledge, 2006; White et al., 2006). However, it is possible adolescents may exhibit different risk behaviors at different times in development, differentially affecting college risk. To explore how early-risk constructs might collectively be utilized to identify MRC group members, the present study used a person-centered Latent Class Analysis (LCA; Collins and Lanza, 2010). LCA classifies individuals into mutually exclusive and exhaustive subgroups according to common constellations of attributes (i.e., responses on the diverse early drinking constructs) and permits an examination of the relationships between the subgroups that emerged from the analysis and subsequent behavioral outcomes (Laursen and Hoff, 2006). This approach has been used extensively to identify subgroups of college drinkers based on quantity and frequency of typical drinking and drunkenness to assess their relationships with consequences experienced while in college (Cleveland et al., 2012; 2013; Mallett et al., 2014; Varvil-Weld et al., 2012). The present study extends this work to identify early-risk subgroups based on middle and high school drinking constructs (e.g., age of drinking onset, middle school alcohol exposure, high school drinking and consequences) and to examine their association with MRC criteria early in the first semester of college.

MATERIALS AND METHODS

Participants

Participants included a random sample of 2021 first-year students attending a large, public northeastern university. On average, participants were 18.2 ($SD = 0.4$) years old, and primarily identified as female (56.0%) and Caucasian (87.5%). However, other races and ethnic groups were represented at rates similar to those of the larger university population (4.7% Asian; 3.2% African American; 4.6% other/multiracial; 5.1% identified as non-white Hispanic/Latino). Given the study's focus on early screening constructs for identifying alcohol-related problems, participation was limited to those who identified as drinkers (based on typical and peak drinking reported in the month prior to the study). Participants reported an average number of 5.5 ($SD = 6.6$) drinks per week during their senior year of high school and 10.9 ($SD = 8.4$) drinks per week during their first semester of college.

Procedures

In the first weeks of the fall of their first semester on campus, 4000 students were randomly selected from the university registrar's database of first-year students. Participants received

a pre-notification letter and an email invitation describing the study and inviting their participation in a web-based survey. All recruitment materials (the pre-notification letter, an invitation email, and up to seven reminder emails) included a URL and a personal identification number (PIN) for accessing the survey. Informed consent information was presented to students upon logging in, and participants received \$25 for completion, with a \$5 bonus for rapid response (i.e., within 5 days of receiving the invitation email). Approximately 67% ($n = 2690$) of invited students elected to participate in the study, which is comparable to response rates reported in other studies using similar web-based recruitment and data collection methods (e.g., Turrisi et al., 2009; 2013). Of those who chose to participate, 75% ($n = 2021$) identified as drinkers and were included in the current study. All study procedures were reviewed and approved by the university's Institutional Review Board.

Measures

Measures included students' self-reported assessments of: 1) drinking behaviors in middle school and high school; and 2) consequences experienced in high school and in the first semester of college. Identification of MRC group status utilized the college-based consequence measures, while the early-risk subgroups were derived from pre-college drinking behaviors and consequences. All measures were assessed in the fall semester of participants' first year of college.

Identification of the MRC Group

Identification of MRC group membership was a four-step process (Mallett et al., 2011b). First, students were asked to indicate how many times in the current semester they had experienced each of 18 consequences from the Young Adult Alcohol Screening Questionnaire (YAACQ; Read et al., 2006) and 4 items from the Young Adult Alcohol Problem Screening Test (YAAPST; Hurlbut and Sher, 1992) that assessed a range of physical, academic, social, and sexual consequences ($\alpha = .92$). Second, responses on each consequence item were dichotomized (0 = Not at all; 1 = Any) and items were summed to obtain the total number of unique consequences experienced (43.4% experienced six or more; range = 0 to 21; $M = 5.5$, $SD = 4.5$). Third, each of the original consequence items were recoded again to identify the number of repeated consequences (0 = Not at all or 1 time; 1 = 2+ times; 28.1% repeatedly experienced at least five consequences; range = 0 to 20; $M = 3.3$; $SD = 3.7$). Finally, individuals who experienced 6+ unique consequences and 5+ repeated consequences were coded as being in the MRC group (27.5%; $n = 555$).

Early-Risk Screening Constructs

Age of Drinking Onset—A single item asked participants to indicate the age at which they had their first drink (more than a few sips). Response options ranged from *10 or younger* to *19* and were dichotomized based on previous literature defining an early age of onset as occurring before the age of 15 (Hingson et al., 2006; Mallett et al., 2010). Thus, the sample was split into individuals who initiated drinking prior to age 15 and those who initiated at 15 or later.

Middle School Alcohol Exposure and Drinking Behavior—Based on screening recommendations from the National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2011), two items assessed middle school alcohol exposure and drinking behavior. First, participants were asked whether they had any *friends* who drank beer, wine, or drinks containing alcohol in middle school (0 = no; 1 = yes). Second, they indicated whether *they* ever had more than a few sips of beer, wine, or any drink containing alcohol in middle school (0 = no; 1 = yes).

High School Alcohol Exposure and Drinking Behavior—First, to assess alcohol exposure (via peers) and general drinking behavior, the above middle school items were adapted for high school. Participants indicated whether they had any *friends* who drank in high school and whether *they* drank in high school. To assess more nuanced patterns of drinking, described by Cleveland and colleagues (2012), participants completed additional measures of typical and heavy drinking. The *Daily Drinking Questionnaire* (DDQ; Collins et al., 1985) was used to obtain measures of weekday and weekend drinking. Participants were asked to think about a typical week in their senior year of high school. They were then asked to indicate the typical number of drinks they would consume on each day (Monday–Sunday). On average, participants reported consuming 5.5 ($SD = 6.6$) drinks per week in high school. Based on previous work that identified Thursday night and weekday drinking as behaviors that increase one’s risk for long-term consequences (see Cleveland et al., 2012), the DDQ responses were summed and dichotomized to indicate whether an individual endorsed drinking at all during the week (Sunday–Thursday: 0 = no; 1 = yes) or on the weekend (Friday/Saturday: 0 = no; 1 = yes). Finally, a single item was used to indicate the frequency with which one got drunk in his/her senior year of high school. Response options ranged from *Never* to *9+ times*. Approximately 30% of the sample endorsed getting drunk 9+ times, suggesting a high frequency of drunkenness in a substantial portion of the sample. The latent class indicator was created to reflect this behavior (0 = 0–8 times; 1 = 9+ times).

High School Consequences—The same combination of YAACQ and YAAPST items (described above) was used to assess consequences experienced in high school. However, for these items, participants were simply asked to indicate which consequences they experienced at least once in their senior year. Items were summed to create an index of the total number of unique consequences individuals experienced ($M = 3.6$; $SD = 3.7$; $\alpha = .86$). To be consistent with the MRC group definition above, this indicator was dichotomized to identify individuals who endorsed experiencing 6+ unique consequences in high school (0 = 0–5; 1 = 6+). Previous work shows high school students who have experience with several different consequences are at greater risk for drinking problems when they get to college (Mallett et al., 2011a). Thus, for ease of use within brief screening tools, the measure of high school consequences focused solely on *unique* consequences, without accounting for whether those consequences were *repeated*.

Analytic Strategy

Preliminary Analyses—Missing data were minimal (< 1%) on all variables examined in the current study. Latent class analyses were conducted using PROC LCA (Lanza et al.,

2011) in SAS (version 9.3, SAS Institute, Inc.). PROC LCA handles missing data among the indicator variables using full-information maximum likelihood.

Selection of Early-Risk Screening Constructs—Nine early-risk screening constructs were assessed, but the items that assessed whether students had “more than a few sips in high school” and their “perceptions of high school peer use” were dropped, as nearly all high school students reported having more than a few sips and believed their friends to be drinking. Thus, the final set of constructs included seven early alcohol exposure and drinking behaviors (see Table 1 for frequencies).

Aim 1: Identifying Early-Risk Subgroups—Model-fitting strategies were accomplished following procedures recommended by Lanza and colleagues (2007). First, a restricted two-class solution was fit to the data. Additional classes were iteratively added until the best-fitting solution was identified. Goodness of fit was based on the Akaike information criteria (AIC; Akaike, 1974), the Bayesian information criteria (BIC; Schwarz, 1978), an adjusted BIC (aBIC), and entropy values. Lower AIC, BIC, and aBIC values (compared to those associated with the previous solution) indicated better model fit. The entropy value ranges from 0 to 1, and serves as an indication of the classification quality, or how accurately individuals are classified into the “correct” class. A value closer to 1 was interpreted to indicate better model fit. Finally, model convergence and practical utility of the identified classes were also considered when determining the best solution for the data (Collins and Lanza, 2010; Nylund et al., 2007). Once the best-fitting solution was determined, class membership and item-response probabilities were examined to ensure the identified early-risk subgroups were meaningful and adequately differentiated.

Aim 2: Predicting MRC Group Membership by Early-Risk Subgroup—To examine the likelihood of MRC group membership in college, given one’s early-risk subgroup, posterior probabilities were used to assign participants to their “most likely” class (Clogg, 1995). Next, preliminary analysis of group distribution was performed to examine racial, gender, and MRC group consistency across the subgroups. Finally, binary logistic analysis regressed MRC group membership onto the early-risk subgroups.

RESULTS

Identification of Early-Risk Subgroups

Examination of model fit criteria (AIC, BIC, aBIC, entropy) revealed the four-class solution was the best-fitting model. AIC, BIC, and aBIC decreased through four classes; however, the BIC and aBIC increased when the five-class model was tested. All models converged normally, and the final four-class solution had good classification quality (Entropy = .86). Fit indices for all tested solutions are presented in Table 2.

Results of the four-class solution, including item response probabilities and class membership proportions, are presented in Table 3. The resulting classes will be referred to as early-risk subgroups and discussed in turn. The first early-risk subgroup was described as *Early Onset Risk* and included 10.4% of the sample ($n = 210$). Individuals within this subgroup had the highest probability of endorsing all seven of the early-risk screening

constructs. These participants initiated drinking early and had friends who drank in middle school. In high school, they were also the most likely to endorse weekend (and some weekday) drinking, getting drunk nine or more times, and experiencing six or more consequences. The second subgroup, labeled *Late Onset Risk* (31.9%; $n = 645$), also endorsed high school drinking, drunkenness, and consequences; however, individuals in this subgroup were least likely to endorse drinking in middle school or earlier. The third subgroup (3.1%; $n = 62$) was identified as *Early Onset Limited Risk*. These participants only endorsed an early age of onset, middle school drinking, and having peers who drank in middle school. The last (and largest) subgroup described 54.7% ($n = 1104$) of the sample and was labeled *Minimal Risk*. A small proportion of these participants endorsed having friends who drank in middle school (36%), but they were unlikely to drink in middle school, and their age of onset was typically 15 or later. In terms of their high school drinking behaviors, the *Minimal Risk* subgroup reported some weekend drinking in high school (38%), but they were unlikely to drink during the week, get drunk, or experience consequences.

Preliminary descriptive statistics revealed there were no significant associations between subgroup membership and racial background. However, there was a significant association with gender, such that there were higher proportions of males in the higher risk subgroups (*Early & Late Onset Risk*) and a higher proportion of females in the *Minimal Risk* subgroup, $\chi^2(3) = 17.56, p = .001$.

Predicting MRC Group Membership in College

Individuals meeting criteria for MRC membership represented 27.5% ($n = 555$) of the sample and experienced 66.7% of the reported consequences. Preliminary examination of the MRC group revealed no significant differences in membership related to participant gender, $\chi^2(4) = 3.30, p = .51$, or racial background, $\chi^2(6) = 6.39, p = .38$. The proportions of each early-risk subgroup that identified as also being in the MRC group are presented in Table 3.

To examine the association between early-risk subgroup and college MRC status, MRC group membership was regressed onto the categorical variable of early-risk subgroup membership (ref = *Minimal Risk*). Results revealed subgroup membership was significantly associated with MRC group membership in college, such that participants in the *Early Onset Risk* ($B = 2.29, OR = 9.85, p < .001$) and *Late Onset Risk* ($B = 1.92, OR = 6.79, p < .001$) subgroups were nearly ten and seven times more likely to be in the MRC group, respectively. Participants who belonged to the *Early Onset Limited Risk* subgroup ($B = .51, OR = 1.66, p = .13$) did not experience higher risk for MRC group membership, relative to the *Minimal Risk* subgroup. To further differentiate the effects between the two higher-risk subgroups, the logistic regression was examined again after changing the reference group to *Early Onset Risk*. Consistent with findings from the initial model, relative to members of the *Early Onset Risk* subgroup, all other subgroups had significantly lower odds of being MRC group members in college ($p < .05$).

DISCUSSION

The current study found nearly 28% of participants met MRC group criteria and accounted for two-thirds of the reported consequences. Findings revealed four unique subgroups of students, who engaged in different patterns of middle and high school drinking behaviors (*Early Onset Risk*, *Late Onset Risk*, *Early Onset Limited Risk*, *Minimal Risk*), with differential risk for MRC group membership.

Both the *Early Onset Risk* and *Late Onset Risk* subgroups endorsed regular weekend drinking, frequent drunkenness, and a significant number of unique consequences in high school. This suggests a relatively large proportion of students engaged in “typical” college drinking behaviors in their senior year of high school, or sooner. Furthermore, nearly three-of-five individuals in the *Early Onset Risk* subgroup, and one-in-two individuals in the *Late Onset Risk* subgroup, also identified as MRC group members early in their first year. Together, these subgroups included nearly 80% of the first-semester students who met MRC criteria. The *Early Onset Risk* subgroup may be of particular importance to explore for several reasons. First, it is interesting that 10% of student drinkers engaged in risky drinking at an early age (middle school or earlier), yet they functioned well enough to finish high school and pursue higher education. Future work might examine strengths or protective factors that make these individuals resilient, despite their early-risk behavioral tendencies. In addition, because these drinking patterns seem to be sustained over such a long period of time, it is plausible to hypothesize this group might be less likely to “mature out” of risky drinking patterns. Future work should prospectively monitor this group’s maturation processes and risk for developing clinical problems over time.

Also of interest was a small subgroup of students who endorsed drinking at an early age, yet discontinued their risky drinking behaviors in high school (*Early Onset Limited Risk*). Despite their previously discontinued risk behavior, roughly one-in-five members of this subgroup met MRC group criteria early in their first semester of college. Because they revisited their risky behavioral tendencies after a period of stability, this subgroup warrants further investigation. First, their discontinued drinking is contrary to the risk associated with early drinking onset and the typical pattern of escalation observed throughout adolescence and into college (Baer et al., 1995; Gruber et al., 1996; Hingson et al., 2006). It is possible that these individuals are more vulnerable to the college-drinking context. Alternatively, they may have received early intervention, or perhaps they got in trouble, which motivated them to temporarily change their behavior. Future work should explore explanatory factors that might shed light on what is needed to alter the trajectory of longer-term problem behavior.

The *Minimal Risk* subgroup represented a large portion of drinkers who did not endorse any of the early-risk screening constructs. However, nearly 12% of this subgroup still met MRC criteria in their first semester of college. Some *Minimal Risk* drinkers may experience numerous consequences without exhibiting any early risk behaviors, making them especially difficult to identify early for intervention. Future work should seek to examine alternative methods of early identification for this group. For example, there could be something specifically about the college environment that increases one’s risk (e.g., being away from

parents, the college drinking culture), or the college environment could simply enable individual factors that might be part of a larger developmental trajectory (e.g., susceptibility to peer influence, individual maturation). Previous research would suggest it is likely an interaction of behavior and environment that places certain *Minimal Risk* drinkers at risk for MRC membership (Baer, 2002).

Implications for Prevention

The current study holds several implications for screening and intervention efforts. First, the person-centered approach moved beyond showing early onset drinkers are at risk for problems. When age of onset was included with other variables, the person-centered approach was able to distinguish certain subgroups of drinkers at increased risk—not all of whom identified as having an early age of onset. Further, a small subset of students who endorsed drinking at an early age changed their behavior prior to college. Together, findings suggest the person-centered approach offers a more refined assessment of risk, which can be used to develop more nuanced screening criteria for targeted interventions. Person-centered analysis also suggests added value in using several early-risk screening constructs in combination. Age of onset, frequency of drunkenness, number of unique consequences experienced, and measures of typical weekend drinking may be particularly useful in brief screening tools, as they demonstrated good differentiation quality in defining the early-risk subgroups. For example, added to brief screening tools (e.g., NIAAA, 2011), these items may further differentiate high school students who infrequently drank but socialized with drinkers from those who drank every weekend. Additionally, the inclusion of a brief measure assessing past consequences could be extremely telling. Response burden would be minimal, and there could be significant value in identifying those who might be at greatest risk to themselves or others (via secondary consequences). This is a distinction not made in current approaches that focus solely on drinking behavior.

Second, the findings support the notion that prevention efforts should target the most at-risk students before their drinking escalates in college (Hingson et al., 2012; White et al. 2006). Providing intensive prevention efforts to all students is often not feasible, and low dosage widespread prevention efforts may have little impact on high-risk students. However, targeting efficacious interventions to the highest-risk students may have a significant impact. For example, the parent-based intervention (PBI) by Turrise and associates has demonstrated efficacy in decreasing heavy drinking and in delaying heavy drinking onset during the transition from high school through the first year of college (see Turrise et al., 2013). Parents are in a position to intervene early (Borsari et al., 2007), and given MRC group membership is associated with high-risk drinking behaviors that manifest in middle and high school, early intervention seems warranted and feasible. Future work should examine the efficacy of PBI specifically with students at increased risk for meeting MRC criteria early in college.

Early screening for other forms of intervention may also be useful. For example, membership in the *Early Onset Risk* subgroup was indicated by exposure to peer drinking in middle school. Personalized normative feedback (Neighbors et al., 2004) might help this subgroup shift towards the *Early Onset Limited Risk* behavior pattern, decreasing their risk for MRC group membership over time. In addition, identification of the *Early Onset Risk*

and *Late Onset Risk* groups may represent a more manageable population of students who could benefit from brief motivational interviewing (BMI; e.g., BASICS; Marlatt et al., 1998). Among college student drinkers, this method has had the most consistent effect sizes (see Larimer and Crounse, 2002; 2007); however, BMI is typically reserved for mandated students because of the time and personnel required for efficacious implementation. Future work should examine the feasibility of screening for and implementing these forms of interventions with younger adolescents.

Limitations and Future Directions

Although the current study provides a unique, person-centered approach to screening for early behavioral risk factors, it is not without limitation. First, the study was conducted on a single campus consisting of primarily Caucasian students. Future studies would benefit from replication in more diverse samples. Second, the seven early-risk screening constructs used in the current study are not exhaustive. It is possible there are other constructs that might be useful in brief screening tools, or may help to further differentiate the high-risk subgroups. In addition, the current study used retrospective self-report data from high school, limiting the ability to make causal assumptions between the early-risk subgroups and MRC group membership. Longitudinal work following students through high school and into college would limit recall bias and allow for examination of transitions between early-risk subgroups. A longitudinal study starting in middle school or early high school could also identify additional at-risk subgroups that might be less likely to matriculate to college due to severe alcohol-related problems. Additionally, the cross sectional nature of the current study precludes our ability to understand students' transitions in and out of the MRC group. The first semester represents a particularly risky period for students, suggesting those who meet MRC criteria early in their first year may be in need of early intervention. It is also possible that as they acclimate to the college environment, some students may discontinue their MRC group membership by the end of their first year, or later in college. Similarly, students who do not meet MRC criteria early in their first year may transition into the group as they move off campus, turn 21, or join social organizations where heavy drinking is reinforced. Thus, future work should examine transitions in MRC group membership overtime. Finally, the current findings support previous work suggesting heavy drinking prior to college is associated with increased problems post-matriculation (e.g., Reifman & Watson, 2003; Sher & Rutledge, 2006; White et al., 2006). However, much of this work utilizes retrospective self-reported data, the validity of which has been questioned in younger populations and as recall time increases. Future work might explore the use of multiple data forms (e.g., behavioral and biomarker) collected from a variety of sources (e.g., parents, teachers, self-report) (see Graham & Shevock, 2012), to establish measures that do not solely rely on self-reported behavior from middle and high school.

Conclusion

The current study used a person-centered approach to identify unique early-risk subgroups of drinkers differentially associated with MRC group membership in the first semester of college. The highest risk subgroup, *Early Onset Risk* and *Late Onset Risk*, was characterized by the initiation of risky drinking behaviors (e.g., heavy weekend drinking, frequently getting drunk, experiencing numerous consequences) in high school or earlier, further

supporting the need for early-risk screening and intervention. Future work should utilize brief, multidimensional screening tools to identify at-risk individuals who might benefit from intervention prior to college matriculation. In addition, existing interventions should be tested for efficacy among individuals particularly at-risk for MRC group membership and within younger populations.

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Table 1

Preliminary examination of potential early-risk screening constructs

	% Endorsed (Whole Sample)	% Endorsed (w/in MRC Group)
<i>Middle School Alcohol Exposure & Drinking:</i>		
<i>Age of Drinking Onset < 15 years</i>	17.6	31.2
<i>Drank (at all) in Middle School</i>	13.0	22.0
<i>Had friends who drank in Middle School</i>	46.4	53.7
<i>High School Alcohol Exposure & Drinking:</i>		
<i>Drank (at all) in High School</i>	85.8	95.7
<i>Had friends who drank in High School</i>	97.3	98.9
<i>Engaged in weekday drinking</i>	4.3	7.7
<i>Engaged in weekend drinking</i>	63.2	81.3
<i>Got drunk 9+ times in senior year</i>	30.9	56.9
<i>Experienced 6+ unique consequences senior year</i>	27.0	64.3

Note. Italicized items were included as indicators in the final LCA model

Table 2
Model fit indices (AIC, BIC, aBIC, and Entropy Values) for 2- through 5-class solutions

Class Model	df	AIC	BIC	aBIC	Entropy
2	112	654.82	738.99	691.33	0.81
3	104	236.08	365.14	292.07	0.84
4	96	158.40	332.36	233.87	0.86
5	88	148.10	366.94	243.03	0.74

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; aBIC = Adjusted Bayesian Information Criterion; **Bolded** numbers indicate the lowest AIC, BIC, and aBIC values, and the highest entropy value, which together indicate best model fit.

Table 3

Class Membership and Item Response Probabilities for Early-Risk Subgroups

Class Membership Probabilities	Early Onset Risk	Late Onset Risk	Early Onset Limited Risk	Minimal Risk
%	10.37	31.90	03.08	54.65
n	210	645	62	1104
<hr/>				
% also in the MRC group	57.4	48.1	18.5	12.0

Item Response Probabilities:

Age of Onset (< 15)	0.7355	0.2027	0.7311	0.0221
Drank in MS	0.9408	0.0015	0.8330	0.0106
Friends drank in MS	0.9353	0.4499	0.9234	0.3561
Drank on Weekdays (HS)	0.1674	0.0681	0.0247	0.0061
Drank on Weekends (HS)	0.9841	0.9840	0.3204	0.3779
Got drunk 9+ times (HS)	0.7959	0.7000	0.1065	0.0002
Had 6+ unique consequences (HS)	0.6879	0.5573	0.0319	0.0357

Note. All probabilities > .50 are **bolded**; MS = middle school; HS = high school.