Effects of Residential Learning Communities on Drinking Trajectories During the First Two Years of College*

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ABSTRACT. Objective: Participation in residential learning communities (RLCs) is associated with lower rates of alcohol consumption among college students. This study used variable- and pattern-centered analytic approaches to examine the influence of RLCs on the drinking behavior of students during their first 2 years in college. **Method:** A Web-based survey was administered to a stratified random sample of 1,196 first-year students (51.8% women) attending a large university. The sample included 456 students (38.1%) who lived in and participated in RLCs and 740 students (61.9%) who did not participate in RLCs (non-RLCs). During their first semester, students reported on their precollege and current drinking. Students also completed measures of alcohol involvement 6 months later during their second semester and 18 months later during their fourth semester. **Results:** Mixed factorial analyses of variance showed that RLC students reported fewer drinks per occasion than non-RLC students before college. RLC and non-RLC students showed

increases in maximum drinks per occasion from precollege to first and second semesters, but only non-RLC students continued to increase their drinking from second to fourth semester. Latent class growth analyses indicated four trajectory classes: (1) low stable (25.1%), (2) light increasing (19.2%), (3) moderate increasing (36.8%), and (4) heavy increasing (18.9%). Non-RLC students had higher odds of being in the heavy-increasing drinking trajectory class. **Conclusions:** Compared with their non-RLC peers, RLC students not only drink less before college and show smaller increases in drinking over time but also are less likely to be in a high-risk drinking trajectory group. Identification of selection, socialization, and reciprocal influence processes that underlie RLC effects can better inform prevention efforts for sustained lower risk drinking among college students. (*J. Stud. Alcohol Drugs*, Supplement No. 16: 86-95, 2009)

STARTING COLLEGE REPRESENTS a major developmental transition for many adolescents in the United States (Schulenberg and Maggs, 2002). Nearly 70% of American high school graduates attended an institution of higher education within 12 months after completing high school in 2005 (Department of Education, 2007). For many of these individuals, the transition to college begins when they move away from their parents' homes to start college and move into new collegiate living environments such as residence halls. The new campus environment presents in-

dividuals with various demands, such as being independent, exploring new ideas, forming new attitudes, succeeding academically, adjusting to a new living arrangement, and establishing new friends and social networks (Cantor et al., 1987; Pascarella and Terenzini, 1991). This period marks a time of growth but also a time of increased vulnerability (Schulenberg and Maggs, 2002). New undergraduates are often presented with more opportunities for—and a higher expectation of—alcohol and other drug use.

Alcohol involvement among college students has received increasing attention as a major public health problem (Ham and Hope, 2003; Hingson et al., 2005). Several studies have documented increases in alcohol involvement among first-year college students (for a review, see Borsari et al., 2007), and these increases among matriculating students are consistent with more general developmental trends (White et al., 2006b). For example, Schulenberg and Maggs (2002) found that heavy episodic drinking increases rapidly between high school and the first and second years of college among traditional-age students attending 4-year colleges. Similar findings of an escalation in alcohol involvement during the transition to college have been reported by several research teams (Baer et al., 1995; McCabe et al., 2005).

Living arrangements are among the many factors that influence college student drinking (Harford et al., 2002). Research has shown that heavy episodic drinking among college students varies considerably as a function of living arrangements such as social fraternity or sorority housing,

*This research was supported by National Institute on Alcohol Abuse and Alcoholism grants AA015275 and AA014738. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Alcohol Abuse and Alcoholism or the National Institutes of Health.

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residence halls, off-campus housing, and residential learning communities (RLCs) or with parents (Bachman et al., 1997, 2002; Dawson et al., 2004; Gfroerer et al., 1997; McCabe et al., 2007; Wechsler et al., 2001). In the present study, we examined the influence of RLCs on the drinking behavior of students during their first 2 years in college.

RLCs have a long history in higher education, dating back to early learning communities such as the "Experimental College" at the University of Wisconsin in the 1920s (Meiklejohn, 1932). Currently, more than 500 U.S. colleges and universities offer some form of learning community (Smith, 2003). RLCs were developed on many college campuses in an attempt to counteract the estrangement of undergraduates' experience and enhance academic involvement, particularly at large institutions. There is a wide range of different RLCs with varying themes and objectives that are typically organized around shared interest areas and prospective academic majors. RLCs often offer first-year seminars, special courses, faculty partnerships, study groups, and other special activities.

Research supports that living in RLCs has a significant positive influence on school persistence, graduation rates, intellectual abilities, and academic autonomy among undergraduate students (Inkelas et al., 2007; Inkelas and Weisman, 2003; Pascarella and Terenzini, 1981, 1991). In addition, three studies found that college students living in RLCs reported lower rates of alcohol misuse than college students residing in traditional residence halls (Brower et al., 2003; McCabe, 2002; McCabe et al., 2007). For example, previous findings from the current longitudinal study found lower rates of alcohol misuse among RLC students predated their entrance into college, and the increase in drinking early in college was weaker in magnitude among RLC students compared with their non-RLC peers (McCabe et al., 2007). These findings indicated that selection and socialization processes may underlie the association between RLCs and alcohol involvement. Selection refers to "the preexisting differences that lead individuals to choose different environments," and socialization refers to "the actual impacts of the new environments" (Bachman et al., 1997, p. 180; cf. Gotham et al., 2003; Read et al., 2005). In the context of college drinking, incoming students who intentionally seek out living arrangements or peer groups that facilitate their preexisting drinking patterns is an example of selection. By contrast, changes in student drinking patterns that result from exposure to living arrangements or peers are examples of socialization (Capone et al., 2007). For example, Capone et al. surveyed incoming students before matriculation and again in the spring of their freshman and sophomore years and found that fraternity/sorority membership predicted higher levels of prematriculation alcohol use and problems and a greater increase in alcohol use and problems during the first 2 years of college. Other studies of alcohol involvement and fraternity/sorority membership have found similar selection

and socialization effects (e.g., Baer et al., 1995; McCabe et al., 2005; Park et al., 2008; Sher and Rutledge, 2007).

Past studies have also found evidence for gender and racial differences in the patterns, risk factors, and consequences associated with heavy drinking among undergraduate students (McCabe, 2002; Sher and Rutledge, 2007; Wechsler et al., 2002; for reviews, see Borsari et al., 2007; Ham and Hope, 2003; Jackson et al., 2005). However, the few studies that have examined main and interactive effects of living arrangement, gender, and race on alcohol involvement have yielded mixed results (Dawson et al., 2004; McCabe et al., 2007). Given the elevated rates of drinking among men and whites, and the apparently detrimental effects that living off-campus has on alcohol abuse among men but not women, we hypothesized that the effects of RLCs might be most evident among these groups.

To date, studies examining the associations between participation in RLCs and drinking behaviors have relied solely on variable-centered approaches. As defined by Bates (2000), variable-centered approaches are "those that emphasize differences between individuals and seek to explain behavior in terms of dimensional concepts that represent ideas about interrelationships between variables" (p. 879). These approaches focus on the relationships between variables (e.g., living arrangements and heavy episodic drinking) and use correlation, regression, and other commonly used statistical techniques for modeling associations between manifest and latent independent and dependent variables (Muthén and Muthén, 2000).

Several researchers have suggested using pattern-centered approaches in addition to variable-centered approaches when examining changes in drinking behaviors among adolescents, young adults, and college students over time (Magnusson and Bergman, 1988; Muthén and Muthén, 2000; Schulenberg et al., 1996). In contrast to variable-centered approaches, pattern-centered approaches focus on intra-individual or within-person change over time. The goal of pattern-centered approaches "is to group individuals into categories, each one of which contains individuals who are similar to each other and different from individuals in other categories" (Muthén and Muthén, 2000, p. 882). For example, Schulenberg et al. (1996) assigned participants to seven predefined trajectory groups based on their longitudinal patterns of heavy episodic drinking over four waves of data from ages 18 to 24: frequent, chronic, decreased, "fling," rare, never, and remaining trajectories. Thus, the present study used pattern- and variable-centered approaches to examine changes in drinking as a function of participation in RLCs, gender, and race.

Summary

The present study is based on the sample reported on in an earlier article (McCabe et al., 2007) and includes an additional wave of data. This study examines trajectories of

drinking behaviors over an 18-month period among first-year college students. Participants were asked about their drinking behaviors before college, during their first semester (Time 1 [T1]), approximately 6 months after baseline during their second semester (Time 2 [T2]), and 18 months after baseline during their fourth semester (Time 3 [T3]). In an earlier article based on these data (McCabe et al., 2007), we found that drinking behavior increased during the transition to college for RLC students and non-RLC students, and that this increase was stronger among non-RLC students. In this article, we included data collected at T3. Using variable- and pattern-centered analytic approaches, we assessed whether the differences between RLC and non-RLC students were maintained at the 18-month postbaseline follow-up and, if so, the extent to which gender and/or race moderated the effects of RLC status on trajectories of drinking behavior.

Method

After receiving institutional review board approval and a Certificate of Confidentiality, a stratified random sample of 2,502 full-time first-year undergraduate students was selected to take part in a longitudinal Web-based survey. The first wave of data was collected during the fall 2005 semester (T1), the second wave of data was collected approximately 6 months after baseline during the winter 2006 semester (T2), and the third wave of data was collected about 18 months after baseline during the winter 2007 semester (T3). At each wave, students were invited to participate in the study via a prenotification letter that explained the study and included a URL address at which the Web survey could be accessed. The prenotification letters contained a \$2.00 pre-incentive for T1, a \$10.00 pre-incentive for T2, and a \$20.00 pre-incentive for T3. As an additional incentive, participants were entered into a sweepstakes drawing that included travel vouchers, iPods, and field passes to athletic events. Informed consent was obtained online from each participant. At all waves, participants were sent up to three reminder emails (see McCabe et al., 2002, 2007, for more details on method).

A total sample of 1,196 first-year students from a large midwestern public research university participated at the beginning of their first semester (T1), for a response rate of 47.8%. The sample was drawn from a population of 6,115 incoming first-year students. There was no significant difference between the percentage of women in the final T1 sample (51.8%) and in the target population (50.5%; $z = 0.8$, ns). By contrast, compared with the total population, the final T1 sample had a higher percentage of whites (66.7% vs 62.5%; $z = 2.79$, $p < .01$), a lower percentage of blacks (5.1% vs 7.2%; $z = -2.68$, $p < .01$), and a higher percentage of other racial groups (11.3% vs 8.4%, $z = 3.25$, $p < .01$). However, there was no significant difference between (1) the percentage of Asians in the T1 sample (11.5%) and in the total population (12.9%; $z = 1.38$, ns) or (2) the per-

centage of Hispanics in the T1 sample (5.4%) and in the total population (5.1%; $z = -0.48$, ns). Participants at T1 included 456 students (38.1%) who lived and participated in RLCs and 740 students (61.9%) who did not live in RLCs (non-RLCs). Approximately 6 months after baseline, when students were in their second semester of college, all of the original T1 participants were invited to participate in the T2 survey; 923 (77.2%) of the original T1 sample completed the survey. About 18 months after baseline, when students were in their fourth semester of college, all of the original 1,196 participants were invited to participate in the T3 survey; 819 (68.5%) of the original sample completed the survey. Of those who participated in all three waves ($n = 707$, 59.1% of the original sample), the final longitudinal sample included 279 (39.5%) RLC students and 428 (60.5%) non-RLC students. The final longitudinal sample consisted of 54.9% women and 45.1% men. The racial/ethnic composition of the longitudinal sample was 70.0% white, 10.8% Asian, 5.1% Hispanic, 4.2% black, and 9.9% reported another racial category. As a result of small sample sizes, we used a binary variable for race (0 = nonwhite, 1 = white) in all analyses.

Measures

Maximum drinks in the past 28 days. At T1, participants were asked: "In the 28 days before your first day of classes at the [name of University], what is the largest number of drinks you consumed in a two hour period?" Responses ranged from 0 to 20 drinks (mean [SD] = 2.9 [3.6]). Also at T1, participants were asked: "What is the most number of drinks you had on any one day in the past 28 days?" Responses ranged from 0 to 23 drinks (mean = 4.4 [4.7]). Participants were asked this same question at T2 and T3, and responses ranged from 0 to 25 drinks (mean = 4.8 [4.8]) at T2 and from 0 to 35 drinks (mean = 4.9 [4.9]) at T3. Test-retest reliability of this maximum consumption measure was .62 from T1 to T2 and .64 from T2 to T3.

The following three variables were used for attrition analyses:

LIFETIME ALCOHOL USE: At T1, participants were asked: "On how many occasions (if any) have you had alcohol to drink (more than a few sips) in your lifetime?"

PAST-12-MONTH ALCOHOL USE: At T1, participants were asked: "On how many occasions (if any) have you had alcohol to drink (more than a few sips) during the past 12 months?"

DRINKS PER DRINKING OCCASION IN PAST 28 DAYS: A modification of the Consumption Models Analysis Program developed by Gruenwald and Nephew (1993) was used to calculate a drinks-per-occasion value for each respondent at T1.

Attrition analyses. Four groups were formed for attrition analysis: (1) participated at T1 only; (2) participated at T1 and T2 only; (3) participated at T1 and T3 only; and (4) participated at T1, T2, and T3. Attrition analyses revealed

that, compared with those who participated at T1 only, T1 and T2 only, and T1 and T3 only, those retained in the longitudinal sample for all waves were more likely to be female, white, and from RLCs. They also had lower rates of lifetime alcohol use (compared with the T1-only and T1- and T2-only groups), lower frequency of past-12-month alcohol use at T1 (compared with those who completed T1 and T2 only), and fewer drinks per drinking occasion in the past 28 days at T1 (compared with those who completed T1 only).

Analytic strategy. Variable-centered analyses took the form of a series of mixed-factorial analyses of variance (ANOVAs) on the maximum number of drinks per drinking occasion in the past 28 days. For these analyses, only cases with complete data across all time points ($n = 707$) were used. We assessed main and interactive effects of time, RLC status, gender, and race. For post hoc comparisons, we used a modified Bonferroni procedure to maintain the per-comparison α at .05 (Holland and Copenhaver, 1988). Each ANOVA was followed up with a mixed-factorial analysis of covariance that controlled for high school grade point average, mother's education, father's education, annual combined parental income, parental influence on residence hall choice, and frequency of religious service attendance. Controlling for these variables did not change the results, and thus we report results from the ANOVAs only. Prevalence of lifetime alcohol use was higher among non-RLC students (90.0%) compared with RLC students (86.8%), and this difference approached statistical significance ($\chi^2 = 2.8$, 1 df, $p = .09$). There were no substantive changes in results using (1) only lifetime drinkers or (2) only those who indicated active alcohol use during the past 28 days on all occasions across the course of the study. We report results only from factorial ANOVAs that included drinkers and nondrinkers.

Pattern-centered analyses took the form of a series of latent class growth analyses (LCGAs). Muthén and Muthén (2000) described the application of LCGA to the longitudinal study of alcohol involvement. The goal of LCGA is to identify distinct latent trajectory classes for a given variable within a given population (Nagin, 1999). For our LCGAs, we used the SAS PROC TRAJ software developed by Nagin and colleagues (Jones and Nagin, 2007; Jones et al., 2001). PROC TRAJ uses maximum likelihood estimation and can include data from participants who do not have complete data at all time points (Jones et al., 2001). A zero-inflated Poisson model was specified for the maximum number of drinks in the past 28 days as assessed at all four waves. Based on suggestions by Muthén and Muthén (2000), the optimal number of latent trajectory classes was determined by examining (1) the Bayesian information criterion (BIC) statistic; (2) the BIC log Bayes factor approximation (Jones and Nagin, 2001); (3) the average posterior probabilities for each class; and (4) the utility of the latent classes in practice, including the similarity of trajectories between classes, the number of cases within each trajectory class, and how

well class membership predicts relevant outcomes (also see Nagin, 1999; Nagin and Tremblay, 2001). Finally, a series of chi-square and multinomial logistic regression analyses examined main and interactive effects of RLC status, gender, and race on trajectory classes.

Results

Variable-centered approach for examining gender differences in the effects of RLC status on change in drinking across precollege, T1, T2, and T3

We conducted a 4 (Time: precollege, T1, T2, and T3) $\times$ 2 (RLC Status: RLC vs non-RLC) $\times$ 2 (Gender: male vs female) mixed-factorial ANOVA on the maximum number of drinks per drinking occasion in the past 28 days. There was a statistically significant main effect of RLC Status ($F = 17.3$, 1/581 df, $p < .01$), and RLC students reported fewer drinks per drinking occasion (mean = 4.3) compared with non-RLC students (mean = 3.0). The main effect of Time was also statistically significant ($F = 45.5$, 3/1,743 df, $p < .01$), and post hoc comparisons showed statistically significant increases in drinking from precollege (mean = 2.6) to T1 (mean = 3.6) and from T1 to T2 (mean = 4.1). However, the increase from T2 to T3 (mean = 4.3) was not significant ($p = .07$). There was also a statistically significant main effect for gender ($F = 12.6$, 1/581 df, $p < .01$), and men reported more drinks per drinking occasion (mean = 4.2) compared with women (mean = 3.1). However, the two-way interaction between gender and time was statistically nonsignificant ($F = 1.2$, 3/1,743 df, $p = .31$).

Results also showed that the two-way interaction between gender and RLC status was statistically nonsignificant ($F = 1.3$, 1/581 df, $p = .25$). Thus, the difference between RLC and non-RLC students did not vary by gender. However, the two-way interaction between RLC status and time was statistically significant ($F = 3.2$, 3/1,743 df, $p < .05$). Post hoc comparisons showed that, for non-RLC students, there were statistically significant increases in drinking from precollege (mean = 3.0) to T1 (mean = 4.4), from T1 to T2 (mean = 4.8), and from T2 to T3 (mean = 5.2). For RLC students, there were statistically significant increases in drinking from precollege (mean = 2.2) to T1 (mean = 2.8) and from T1 to T2 (mean = 3.3). However, the increase from T2 to T3 (mean = 3.5) was not significant ($p = .47$). Means for this two-way interaction effect are plotted in Figure 1. Results showed that the three-way interaction effect was statistically nonsignificant ($F = 1.7$, 3/1,743 df, $p = .20$).

Variable-centered approach for examining racial differences in the effects of RLC status on change in drinking across precollege, T1, T2, and T3

Next, we conducted a 4 (Time: precollege, T1, T2, and T3) $\times$ 2 (RLC Status: RLC vs non-RLC) $\times$ 2 (Race: white vs

FIGURE 1. Trajectories of maximum drinks in past 28 days by residential learning community (RLC) status among first-year college students. Note: Post hoc comparisons using a modified Bonferroni correction showed that, for non-RLC students, there were statistically significant increases in drinking from precollege (mean = 3.0) to Time 1 (mean = 4.4), from Time 1 to Time 2 (mean = 4.8), and from Time 2 to Time 3 (mean = 5.2). For RLC students, there were statistically significant increases in drinking from precollege (mean = 2.2) to Time 1 (mean = 2.8) and from Time 1 to Time 2 (mean = 3.3). However, the increase from Time 2 to Time 3 (mean = 3.5) was not significant ($p = .47$).

nonwhite) mixed-factorial ANOVA on the maximum number of drinks per drinking occasion in the past 28 days. Because there were no substantive differences between the main or interactive RLC and time effects in this analysis compared with the previous one for gender, we report only the results specific to the effects of race. Results showed a statistically significant main effect for race ($F = 5.4$, 1/581 df, $p < .05$), and whites reported more drinks per drinking occasion (mean = 3.8) compared with nonwhites (mean = 3.0). Results showed that the two-way interaction between race and time was statistically nonsignificant ($F = 2.1$, 3/1,743 df, $p = .10$); and the two-way interaction between race and RLC status was statistically nonsignificant ($F = 0.4$, 1/581 df, $p = .52$). Thus, the difference between RLC and non-RLC students did not vary by time or race. Finally, results showed that the three-way interaction effect was statistically nonsignificant ($F = 0.3$, 3/1,743 df, $p = .85$).

Pattern-centered approach using latent class growth analyses for examining changes in drinking trajectories across precollege, T1, T2, and T3

Because 31 cases had missing data on the drinking measure at all four waves, LCGAs were based on a total sample of 1,165. Results indicated that a four-class solution appeared to be optimal. The four-class solution had a lower BIC value (-8,454.1) than the three-class solution (-8,708.6), $2\log_e(B_{10}) = 508.8$. As illustrated in Figure 2, we used the intercepts and slopes to label these trajectory classes: (1) the low-stable group (25.1%) showed a very low level of drinking that remained stable over time; (2) the light-increasing group (19.2%) was composed of light drinkers who showed a small increase in drinking from precollege to T1 with a sharper linear increase thereafter; (3) the moderate-increasing group (36.8%), characterized by a relatively steep

FIGURE 2. Trajectories of maximum drinks in past 28 days based on latent class growth analysis ($n = 1,165$). Note: Prevalence for each trajectory class: low stable (25.1%), light increasing (19.2%), moderate increasing (36.8%), and heavy increasing (18.9%).

increase in drinking from precollege to T1, a more shallow increase from T1 to T2, and a stable trajectory of drinking from T2 to T3; and (4) the heavy-increasing group (18.9%), which showed the steepest increase in drinking from precollege to T1, a more shallow increase from T1 to T2, and a stable (but still high) trajectory of drinking from T2 to T3.

Here we note that models with more than four trajectory classes resulted in progressively smaller values of the BIC statistic; yet, models with five and six trajectory classes yielded smaller groups that were similar in form to the light-increasing group, and thus were not retained (cf. Muthén and Muthén, 2000). The 7-, 8-, 9-, and 10-class models yielded groups with low prevalence rates (i.e., <5% of the sample) and were not considered further because of concerns about overextraction (Bauer and Curran, 2003). The average posterior probabilities for the four classes are presented in Table 1. As indicated in Table 1, high values for the diagonal elements and low values for the off-diagonal elements suggest that classification quality was good (Muthén and Muthén, 2000).

Combining variable- and pattern-centered approaches: Predictors of drinking trajectories

Our final analyses combine the variable- and pattern-centered approaches by testing predictors of trajectory class. Bivariate associations of RLC status, gender, and race with trajectory class are given in Table 2. RLC status was signifi-

TABLE 1. Average posterior probabilities for four-class solution ($n = 1,165$)

Assigned group	Group			
	Low stable	Light increasing	Moderate increasing	Heavy increasing
Low stable	.88	.08	.07	.003
Light increasing	.06	.92	.00	.00
Moderate increasing	.04	.00	.90	.06
Heavy increasing	.02	.00	.03	.94

Notes: Individuals were assigned to trajectory groups based on the maximum posterior probability rule (Nagin, 1999). High diagonal elements (**bolded**) and low off-diagonal elements indicate good classification quality.

TABLE 2. Bivariate correlates of four trajectory classes of maximum drinks in past 28 days ($n = 1,165$)

Variable	Group				χ^2 (3 df)
	Low stable %	Light increasing %	Moderate increasing %	Heavy increasing %	
RLC status					30.8†
RLC	29.6	18.9	41.2	10.3	
Non-RLC	22.8	17.0	37.4	22.7	
Gender					97.4†
Female	26.9	21.5	44.0	7.6	
Male	23.8	13.7	33.3	29.2	
Race					21.2†
Nonwhite	32.7	18.6	35.2	13.6	
White	21.8	17.3	40.7	20.2	

Note: RLC = residential learning community.

† $p < .01$.

cantly associated with class membership. As seen in Table 2, RLC students were more likely than non-RLC students to be in the low-stable group and less likely than non-RLC students to be in the heavy-increasing group. A significant association between gender and class membership was also observed, and men were more likely than women to be in the heavy-increasing group. Results also showed that whites were more likely than nonwhites to be in the heavy-increasing group.

Finally, we used multinomial logistic regression analysis (Agresti, 1996) to test the main and interactive effects of RLC status, gender, and race on trajectory group membership. For this analysis we treated the low-stable class as the reference group. Main effects were entered first, followed by the product terms for the two- and three-way interaction effects. As seen in Table 3, being a non-RLC student, male,

TABLE 3. Multinomial logistic regression analysis of main and interactive effects of residential learning community (RLC) status, gender, and race as predictors of trajectory class membership ($n = 1,165$)

Variable	Trajectory class		
	Light increasing	Moderate increasing	Heavy increasing
RLC status			
Non-RLC	1.23	1.18	2.15†
RLC	— ^a	— ^a	— ^a
Gender			
Male	0.70	0.84	3.87†
Female	— ^a	— ^a	— ^a
Race			
White	1.37	1.71†	2.17†
Nonwhite	— ^a	— ^a	— ^a
Product terms			
RLC Status $\times$ Gender	1.31	1.30	1.05
RLC Status $\times$ Race	0.89	1.18	1.17
Gender $\times$ Race	0.85	0.74	1.24
RLC Status $\times$ Gender $\times$ Race	1.01	0.87	0.90

Notes: Reference group is "low-stable." Values are adjusted odds ratios from multinomial logistic regression analysis. RLC = residential learning community. ^aReference group.

† $p < .01$.

and white significantly increased the odds of being in the heavy-increasing group compared with the low-stable group. Being white was also associated with higher odds of being in the moderate-increasing group compared with the low-stable group. None of the two- or three-way interaction effects was statistically significant. Thus, the odds of being in the heavy-increasing group compared with the low-stable group were higher among non-RLC compared with RLC students, and this association was not moderated by gender or race.

Discussion

Using the first three waves of data from this project, McCabe et al. (2007) found increases in drinking from precollege to first semester and from first to second semester. The present study included data from students' fourth semester and showed that drinking continued to increase for non-RLC but not for RLC students. Consistent with McCabe et al., we believe that the pattern of means in Figure 1 reflects selection and socialization processes. The precollege differences between RLC and non-RLC students indicate selection effects, and McCabe et al. showed that these selection effects appear to be driven in part by parental influence; that is, the RLC students in this sample expressed stronger agreement with the statement, "I chose to live in my current residential learning environment because *my parents wanted me to live here*." This interpretation is consistent with other findings showing that parental influence is associated with lower levels of alcohol involvement among college students (Wood et al., 2004).

Results from latent class growth analyses revealed four trajectory classes (cf. Muthén and Muthén, 2000; Schulenberg et al., 1996). Our results are similar to those reported by Greenbaum et al. (2005), who identified five trajectory classes based on students' weekly alcohol consumption across the 32 weeks of freshman year. The heavy-increasing class accounted for nearly 19% of the sample (29% men and 8% women; 20% whites and 14% nonwhites), with drinking levels (eight or more drinks) that far exceeded the typical threshold for heavy episodic drinking (four or more drinks in a row for women and five or more drinks in a row for men). Similarly, White and colleagues (2006a) analyzed data from a cross-sectional study and found approximately 20% of first-year college men consumed 10 or more drinks in a day, and 8% of first-year women consumed eight or more drinks in a day at least once in the past 2 weeks.

These pattern-centered analyses complement the variable-centered results by providing a different perspective on possible reciprocal influences between selection and socialization processes: Classes with higher levels of precollege drinking showed sharper increases in drinking over time (cf. Capone et al., 2007). Results showing higher odds of being in the heavy-increasing group for non-RLC students also suggest another reason for RLC differences in drinking. Said

another way, RLC students are less likely to belong to the group with the greatest vulnerability to excessive drinking (i.e., highest precollege drinking and sensitivity to socialization effects on matriculation). Further, RLC students were more likely to belong to the low-stable group, characterized by low levels of drinking before college and no escalation over time. Consistent with our previous work (McCabe et al., 2007), these results highlight selection and socialization as two possible pathways whereby RLCs have beneficial effects.

Beyond these RLC/non-RLC differences, it is noteworthy that the largest trajectory class in this sample was the moderate-increasing group. After making the transition to college, this group continued to drink at levels that exceeded the typical threshold for heavy episodic drinking (four or more drinks in a row for women and five or more drinks in a row for men). Schulenberg et al. (1996) examined trajectories of frequent heavy episodic drinking (two or more episodes of consuming five or more drinks in a row in the past 2 weeks) for young adults (ages 18-24) across four waves of data and identified six trajectories. The "increased" group identified by Schulenberg et al. also showed an escalation of drinking from the late teens through the early 20s. Muthén and Muthén (2000) analyzed trajectories of heavy drinking (frequency of having six or more drinks in a row on one occasion in the past 30 days) for young adults (ages 18-30) across seven waves of data and identified four trajectories. In their analysis, the largest trajectory class was the "normative" group, characterized by an escalation of heavy drinking during the early 20s and a declining rate thereafter. Chassin et al. (2002) analyzed trajectories of heavy episodic drinking (frequency of having five or more drinks in a row on one occasion in the past 1 year) for adolescents who were ages 10.5-15.5 at T1 and ages 18-23 at T4 across four waves of data and identified four trajectories. Two trajectory classes (the "early-heavy" and "late-moderate" groups) showed peak levels of drinking in their late teens and early 20s. Thus, our results indicate that this pattern of escalation in drinking during the late teens also characterizes a large subgroup during the transition to college.

Based on evidence for higher levels of alcohol involvement among male and white college students, we hypothesized that associations between RLC status and alcohol involvement would be moderated by gender and race. Neither hypothesis was supported. Although we did not find evidence for moderator effects, our variable- and pattern-centered findings both indicated main effects for gender and race. The variable-centered analyses replicated the consistent finding of higher alcohol involvement among men and whites. The pattern-centered analyses shed additional light on gender and race differences, and suggest they may have been driven by the relatively high proportions of men and whites in the heavy-increasing group (cf. Schulenberg et al., 1996; also see Hill et al., 2000).

The present study has some limitations that should be weighed when considering the research findings. First, unlike previous studies that estimated trajectory classes of drinking behavior based on measures of heavy episodic drinking (Chassin et al., 2002; Schulenberg et al., 1996), we analyzed a measure of maximum drinks consumed in the past 28 days. A recent study compared same-gender (female) twins who were discordant for college attendance on various measures of alcohol involvement and found that the only difference between the college-attending and the non-college-attending twin was on the maximum quantity of alcohol consumed during a single drinking day in the past 1 year (Slutske et al., 2004). Although their sample was limited to women, Slutske et al. observed that the drinking patterns of college-attending twins "were more likely to be characterized by occasional atypical episodes during which large quantities of alcohol were consumed in a single day" (p. 537) and speculated that measures of maximum quantity consumed may be particularly sensitive to changes in drinking among college students. Further work will clarify whether the hypothesized beneficial effects of RLCs extend to other measures of alcohol involvement, including alcohol-use disorders (Slutske, 2005). In this regard, researchers will benefit from using alternate indices of alcohol involvement to estimate trajectory classes (see Jackson and Sher, 2005, 2006) and examining transitions between different classes of alcohol use over time (Auerbach and Collins, 2006).

Second, the sample was drawn from a single institution, which limits the generalizability of the findings. Clearly, additional research is needed to replicate the study on other college campuses. Third, the present study was a naturally occurring experiment. In addition to lower levels of precollege drinking, students who chose to live in RLCs may have been different in other important ways compared with their peers who chose more traditional housing. Future studies should attempt to account for the "self-selection" nature of RLC membership, with randomized assignment and quasi-experimental designs featuring wait-listed RLC students. Fourth, nonresponse may have introduced potential bias in the present study; nonresponse bias was examined via a telephone follow-up survey of a random sample of 640 RLC and non-RLC students who did not respond to the T1 survey. There were no statistically significant differences between T1 responders and T1 nonresponders in lifetime frequency of drinking, past-12-month frequency of drinking, or alcohol-related consequences, and nonresponders reported significantly lower frequency of drinking and lower rates of heavy episodic drinking during the past 28 days (Cranford et al., 2008). Fifth, the precollege drinking measure was measured retrospectively and specified a 2-hour timeframe, which differed from the drinking measures in the subsequent three waves during college. Finally, additional work is needed to further examine gender and racial differences in the influence of RLCs on drinking behaviors.

Despite these limitations, the present study provides important insights regarding the relationships between participation in RLCs, gender, race, and drinking behaviors over time. Based on variable- and pattern-centered approaches, the results indicate that selection, socialization, and reciprocal influence processes may account for lower levels of alcohol involvement among RLC students during the first 2 years of college. Research that further specifies these selection and socialization effects will guide efforts to reduce risky drinking during the transition to college.

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