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Heavy Episodic Drinking and Its Consequences: The Protective Effects of Same-Sex, Residential Living-Learning Communities for Undergraduate Women

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Abstract

Gender and living environment are two of the most consistent factors associated with heavy episodic drinking on college campuses. This study aimed to determine group differences in alcohol misuse and its attendant consequences between undergraduate women living in four distinct on-campus residential environments. A Web-based survey was self-administered to a stratified random sample of full-time students attending a large Midwestern University, and living in four distinct on-campus residential environments: 1) single-sex (all female) Residential Learning Communities (RLCs), 2) mixed-sex (male and female) RLCs, 3) single-sex (all female) non-RLCs and 4) mixed-sex (male and female) non-RLCs. Respondents living in single-sex and mixed-sex RLCs had significantly lower rates of alcohol use, heavy episodic drinking and related primary alcohol-related consequences when compared to respondents living in non-RLCs; however, *women in single-sex RLCs had the lowest rates*. RLCs – particularly single-sex learning communities – appear to provide undergraduate women with an environment that supports lower rates of alcohol use and abuse.

Keywords

undergraduate women; residential learning communities; heavy episodic drinking

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1. Introduction

Heavy episodic drinking among college students—which we define here as 5 or more drinks in a two hour period for men, and 4 or more drinks for women—is a well-established concern among college health experts (Boyd, McCabe, and Morales, 2005). Researchers have identified several social and environmental factors associated with this problem, including gender and living arrangements. One robust risk factor, demonstrated in numerous studies, is that college-age males, particularly those in fraternities, engage in heavy episodic drinking with greater frequency than their female counterparts; although recent research reveals that the sex, gender and/or living arrangement gaps may be narrowing, especially among high school age students (Johnston et al., 2006, Wechsler et al., 2000; for an international review see Holmila and Raitasalo, 2005).

Despite lower rates of heavy drinking, women are particularly vulnerable to the negative consequences in a college co-educational setting. It is estimated that alcohol is involved in at least half of all cases of heterosexual assault among college students (for reviews see Abbey, 2002; Mohler-Kuo et al., 2004) and the likelihood of sexual assault increases nine fold on days in which college women engage in heavy alcohol consumption (Parks and Fals-Stewart, 2004). Among college students, the majority of sexual assaults occur within heterosexual relationships in which both people are acquainted and a male student perpetrates the assault; usually alcohol has been consumed by one or both people (Abbey, 2004).

1.1 Environmental Correlates of College Student Alcohol Use

Of the environmental factors impacting college students' alcohol consumption, living arrangement has been identified as an especially important predictor of alcohol use (Bachman et al., 1997, Boyd et al., 2004; Presley et al., 2002; Weitzman, Nelson, & Wechsler, 2003). Research from single-sex institutions finds that women attending all-women's colleges engage in heavy episodic drinking at significantly lower levels than women attending co-educational institutions (Wechsler et al., 2002a). Students living in fraternity or sorority houses consistently report heavier levels of alcohol use, higher levels of intoxication and more alcohol-involved social activities (for a review, see Baer, 1994; Cashin, Presley and Meilman, 1998; Glindermann and Geller, 2003) while students residing in college sponsored, living-learning communities tend to drink less (Brower, Golde & Allen, 2005; McCabe et al., 2007). Although these living-learning communities were not created to address underage drinking, they were created to engage students in both curricular and co-curricular aspects of university/college life.

1.2 Gender and the College Living Environment

Wechsler et al. (2002a) found that nearly twice as many women attending coeducational institutions could be classified as frequent heavy episodic drinkers (defined as three or more occasions of heavy episodic drinking in the past two weeks) than women attending all-women's colleges (21.2% vs. 11.9%), suggesting that interaction with male students may affect the quantity and frequency of women's alcohol consumption. Young and colleagues found some support of this association, using qualitative data from undergraduate women classified as "frequent heavy episodic drinkers." Using focus-group discussions, these researchers reported that female students who tolerate high levels of alcohol consumption often receive special attention from their male peers, and are included as "one of the guys" unlike other less-heavy drinking, "light-weight" females (Young et al., 2005). However tempting it is to reduce "risk" to gender differences, there are data supporting that it is not that simple.

1.3. Consequences of Collegiate Alcohol Abuse

There are multiple primary and secondary consequences related to collegiate alcohol abuse. In a sample of 1,649 undergraduate past year drinkers, Boyd and colleagues (Boyd, McCabe, d'Arcy, 2003) found that 77% reported at least one negative consequence from their drinking, the most common being a "hangover" followed by "vomited", "felt embarrassed", "had memory loss" and "missed class" among others. Eleven percent reported being sexually harassed and four percent reported sexually harassing another person. Data from the CAS show that secondary consequences of heavy episodic drinking among college students, including verbal or physical assault, vandalism, and interruptions to sleep or study time among others (Wechsler et al., 1994), are ubiquitous on college campuses. McCabe and colleagues also found that the majority of undergraduates in their sample reported negative, secondary consequences from their peers' alcohol abuse (McCabe et al., 2006).

1.4 Residential Learning Communities

Heavy episodic drinking may serve a "community-building function" on college campuses. In a provocative editorial, Bruffee (1999) suggested that collective alcohol consumption may serve to create a kind of community on campuses that may otherwise feel large and alienating. To address the problem of student alienation, educators have suggested small, residential learning communities might help students navigate the first-year experience, integrate and deepen their learning, and in the case of women and minorities, succeed in fields in which they have traditionally been under-represented (Hathaway, Sharp and David, 2001; Inkelas and Weisman, 2003).

McCabe and colleagues (2007) also found that RLC students reported lower drinking rates and fewer alcohol-related consequences than non-RLC students during their first year in college. When comparing RLC and non-RLC students, McCabe et al. (2007) reported a significant "drinking" difference between these groups during their first semester on campus. Although in both groups, the maximum number of drinks (consumed on one occasion) increased from pre-college to first semester on campus, the number of drinks per occasion was larger among non-RLC compared to RLC students. Of note, however, is that RLC students reported less drinking before college than their non-RLC counterparts, leading McCabe et al. (2007) to conclude that the differences between RLC and non-RLC drinking patterns may result from both *selection and initial transition to college socialization effects*.

1.6 Hypotheses

Given the aforementioned, we set out to study drinking behavior and its consequences among undergraduate women who live in one of four types of university living arrangements (same- and mixed-sex arrangements within Residential Learning Community (RLC) and non-RLC). We focus on women and their living arrangements for two reasons: first, because at large co-educational colleges women are increasing their heavy use of alcohol (Wechsler et al., 2002a) and second, because sexual assault among college students is one of the negative consequences associated with college drinking; the assaults most often are perpetrated by males, within the context of heterosexual, acquaintance-type relationships (Rennison, 2002).

Using secondary data from a large, federally funded study, we were interested in the following: Among female, first-year undergraduates living in university-sponsored housing: 1) Does alcohol consumption vary as a function of RLC status (living in an RLC versus living in a non-RLC)? 2) Does alcohol consumption vary as a function of the sex of floor residents (single-sex floors versus mixed-sex floors)? 3) Do the primary and secondary consequences of heavy episodic drinking, including being taken advantage of sexually, vary as a function of RLC status and sex of floor residents?

II. Methods

2.1 Procedure and Recruitment

This on-going, longitudinal study represents a collaborative relationship between researchers at The University of Michigan (UM) and San Diego State University (SDSU), with each Institutional Review Board approving the protocols. Using an incoming, 2005 population of over 5,000 undergraduate students at a large Midwestern research university, a stratified random sample of 2,502 full-time, first-year undergraduate students was selected from three residential environments that included RLCs and non-RLCs. Further, all respondents were asked if the residents on their floor were: all male, all female, or mixed male and female.

Data were collected during the students first year at the university (Fall 2005 and Winter 2006 semesters and we report on data from wave 1 here); at each wave, students were invited to participate in the study via a pre-notification letter. The letter explained the study and provided directions for taking the survey on the Web. In Wave 1, the pre-notification letters were sent via federal mail and contained a \$2.00 bill as a pre-incentive. Respondents were also entered into a sweepstakes drawing as an additional incentive that included travel vouchers, iPods, and field passes to athletic events. Respondents gave their consent to participate by checking an “I consent” assent box at the bottom of an online consent form before they started the web-based survey.

Several strategies were used to increase the validity of the study. All respondents were informed that a research team, unaffiliated with the UM, was contracted to set-up the Web survey as well as store and maintain data; further, respondents were reminded that UM officials, faculty and staff were unable to access any contact information connected with the data. Students were informed that participation was voluntary and that all responses would be kept confidential pursuant to a NIH Certificate of Confidentiality. The Web survey was maintained on a hosted secure Internet site running under the secure sockets layer (SSL) protocol to insure respondent data were safely transmitted between the respondent’s browser and the server. Similar web-based protocols have been used by this investigative team and have been described in detail elsewhere (Boyd, et al., 2004; McCabe et al., 2002).

2.2 Measures

The Residential Community Engagement Survey (RCES) used in the present study was developed and pilot-tested in 2005. The RCES includes items from the *Monitoring the Future* study (Johnston et al., 2006), the *CORE* survey (Presley et al., 1996), the *College Alcohol Study* (Wechsler et al., 2002a), and the *Student Life Survey* (McCabe et al., 2002). The following measures represent the dependent measure outcomes used in the present study.

2.2.1 Alcohol Use—We screened for current alcohol use with the following question. Alcohol use (lifetime and during the 12 months before classes started) was assessed using the following question: “On how many occasions (if any) have you had alcohol to drink (more than just a few sips) [in your lifetime or during the 12 months BEFORE your first day of classes]? The response choices were: (1) no occasions, (2) 1–2 occasions, (3) 3–5 occasions, (4) 6–9 occasions, (5) 10–19 occasions, (6) 20–39 occasions, (7) 40 or more occasions ($M=4.2$, $SD=2.1$ and $M=2.2$, $SD=1.9$ for lifetime and past 12-month alcohol use, respectively). A drink was defined as one beer is 12 ounces of beer at 5% alcohol, one wine cooler is 12 ounces at 5% alcohol, one glass of wine is 5 ounces of wine at 12% alcohol, and one serving of liquor is 1.5 ounces of 80-proof liquor. If answered affirmatively (answer > than no occasions), then respondents received additional questions (see below).

2.2.2 Maximum number of drinks—Current drinking was assessed and respondents were asked: “In the past 28 days, what is the largest number of drinks you consumed in a two hour period?” Responses ranged from 0 to 20 drinks ($M=3.5$, $SD=3.5$). This variable functions as a control variable in some analyses.

2.2.3 Heavy Episodic Drinking—Heavy episodic drinking was assessed by asking questions: “Over the past two weeks, how many occasions have you had [FIVE (male)/FOUR (female)] or more drinks in a row?” Responses were categorized as either no heavy episodic drinking in the past two weeks or at least one heavy drinking episode in the past two weeks.

2.2.4 Primary Consequences—Primary Consequence items were adapted from two national studies of alcohol and other drug use among college students (Wechsler et al. 2002a; Presley et al., 1996; Wechsler et al., 1995). Students could endorse as many as 16 negative consequences that they had experienced from their drinking (e.g. hangover, nauseated or vomited, blackout, missed class, hurt or injured, argument or fight, trouble with police, someone you know said you should cut down). We coded each item as 0=no, 1=yes and then summed the items to create an overall score for each respondent. Although this means that all consequences are reduced to equal value, this is how other studies have operationalized both primary and secondary consequences.

2.2.5 Secondary Consequences—Secondary Consequence items were adapted from previous college-based national studies (Presley et al., 1996; Wechsler et al., 1995). Secondary consequences were measured using the following item: “Please indicate how often during the past 28 days you have experienced the following as a result of other people’s drinking.” Items included: event spoiled, study disrupted, sleep disrupted, property stolen or damaged, took care of someone, found vomit, sexually assaulted, physically assaulted, and unwanted sexual advance. We coded each item as 0=no, 1=yes and then created an overall score for each respondent by summing the items.

2.2.6 Participants and Demographics—A total sample of 1,196 first-year students from a large Midwestern public research university participated during the Fall semester (Wave 1), for a response rate of 47.8%. The sample consisted of 66.5% White, 12.0% Asian, 4.2% Hispanic, 6.3% African American and 11.0% reported another racial/ethnic category, with a mean (SD) age of 18.5 (0.3) years and was generally representative of the population of first-year, incoming students. The modal category for parental income was \$50,000 to \$99,999, and 29.5% of women had at least a part-time job.

We examined data from 611 women (51% of the total sample) who completed Wave 1. Four groups were created: 82 women (13%) who lived in single-sex RLCs, 212 women (35%) who lived in mixed-sex RLCs, 147 women (24%) who lived in single-sex, non-RLCs and 170 women (28%) who lived in mixed-sex, non-RLCs. We refer to this 4-level categorical variable as “RLC co-ed status.”

To assess non-response bias, we conducted a telephone follow-up survey of 221 randomly selected students who did not respond to the wave 1 Web survey. There were no differences in reasons for non-response between students living in RLCs and non-RLCs. There were no statistically significant differences between responders and non-responders on lifetime frequency of alcohol consumption, past 12-month frequency of alcohol consumption, or maximum number of drinks on one occasion in the past 28 days (see Cranford et al., 2008 for a more detail on non-response analysis).

III. Results

SPSS for Windows 14.0 software was used to conduct all analyses. We used chi-square tests and analysis of variance to examine whether past two week heavy episodic drinking varies as a function of the RLC co-ed status variable. In a previous report based on data from all males and females in this sample (McCabe et al., 2007), we found lower levels of pre-college drinking among non-RLC compared to RLC students. Although we did not publish the results for “women only” living arrangements in McCabe et al. (2007), at that time, we knew there were differences in pre-college drinking by RLC co-ed status. A one-way ANOVA showed a main effect of RLS co-ed status on pre-college drinking $F(3, 552)=3.13, p<.05$, and Tukey HSD post-hoc comparisons showed that maximum drinks in the 28 days before college started was higher among the non-RLC, co-ed group ($M=2.6$) compared to the RLC single-sex group ($M=1.4$), $p<.05$. These results supported our decision to statistically control for pre-college drinking in this study. In this study we were interested in the associations between residential environments and alcohol involvement among incoming college women, thus, we statistically controlled for pre-college drinking in all analyses unless otherwise indicated. This allowed us to account for selection effects as an alternative explanation for our results.

In order to assess amount of drinking, one-way analysis of covariance (ANCOVA) was used to determine whether the maximum number of drinks consumed in a two-hour period in the past 28 days varied as a function of RLC co-ed status (single-sex RLC, mixed-sex RLC, single-sex non-RLC and mixed-sex non-RLC) after controlling for the maximum number of drinks consumed in a two-hour period in the past 28 days before classes started. Women’s drinking behaviors varied as a function of RLC status and the sex (single-sex versus mixed-sex) of the floor residents; in fact, we found a significant effect for RLC co-ed status, $F(3, 540)=3.0, p<.05$. As seen in Table 1, women in single-sex ($M=2.8$) and mixed-sex RLCs ($M=2.9$) reported a significantly lower number of drinks in a 2-hour period ($p < .05$) than the mixed-sex, non-RLC women ($M=3.6$).

Using a chi-square analysis, we examined the prevalence of heavy episodic drinking (in the past two weeks) across the four residential groups and found statistically significant differences between the groups ($X^2=25.4, df=3, p<.01$). We conducted post-hoc comparisons between proportions with a modified Bonferroni correction to maintain the alpha level at .05 (Jaccard & Becker, 1997). As seen in Table 1, only fifteen percent ($n=12$) of the single-sex RLC women reported heavy episodic drinking in the past two weeks, as contrasted with 29% ($n=60$) in the mixed-sex RLC ($z=-2.6, p<.05$), 39% ($n=72$) in the single-sex non-RLC ($z=-3.8, p<.05$), and 45% ($n=197$) in the mixed-sex, non-RLC ($z=-4.7, p<.05$). We then conducted a multiple logistic regression analysis in order to examine the association between RLC co-ed status and past 2-weeks heavy episodic drinking after controlling for pre-college drinking. Three dummy variables were constructed to represent the information in the 4-category RLC co-ed status variable, with single-sex RLC women as the reference group. Past 2-weeks binge drinking was treated as the criterion variable in this analysis. Results indicated that the odds of past 2-week binge drinking were significantly higher among single-sex non-RLC women ($OR=3.6, 95\% CI=1.5-8.7$) and mixed-sex non-RLC women ($OR=3.8, 95\% CI=1.6-9.0$) compared to single-sex RLC women, even after pre-college drinking was statistically controlled. The odds of past 2-weeks binge drinking was also higher among co-ed RLC women ($OR=2.0, 95\% CI=0.8-4.6$), but this effect was nonsignificant ($p=.11$).

To examine primary consequences as a function of living arrangements, we conducted one-way ANCOVAs with pre-college drinking as a covariate. Results showed a statistically significant effect of RLC co-ed status, $F(3, 544)=4.2, p<.01$, with women living in single-sex RLCs ($M=0.7$) and mixed-sex RLCs ($M=1.1$) having a lower mean number of consequences than mixed-sex non-RLC women ($M=1.8, p<.01$) (see Table 1). We used chi-square tests to

examine the association between residential status and two specific negative consequences: a) sexual assault after drinking in past 28 days and b) regretted sex as a result of drinking in past 28 days. We found group differences, but *they were not statistically significant* – probably because of low base rates. For instance, 5% (n=3) of respondents in single-sex RLCs reported being taken advantage of sexually in contrast to 9% (n=14) in mixed-sex RLCs, 9% (n=10) in single-sex non-RLCs and 13% (n=18) in mixed-sex RLCs, $\chi^2(3)=3.4$, $p=.3$. Only 2% (n=1) of the respondents in single-sex RLCs regretted sex (after drinking) while 6% (n=9) in mixed-sex RLCs, 4% (n=4) in single-sex non-RLCs and 7% (n=10) in mixed-sex non-RLCs regretted sex after drinking, $\chi^2(3)=3.2$, $p=.3$.

A one-way ANCOVA of the number of secondary drinking consequences was conducted, with pre-college drinking as a covariate. As seen in Table 1, we found that the number of secondary consequences varied as a function of residential status but the overall *F*-ratio was nonsignificant, $F(3, 543)=1.1$, ns. Respondents in the single-sex RLCs had the lowest mean number of secondary consequences ($M=2.0$) and women in the mixed-sex, non-RLCs had the highest ($M=2.5$).

IV. Discussion

Residential learning communities have been proposed as an environmental intervention that is protective against heavy episodic drinking; however, it is impossible to assess the true impact of RLCs on undergraduate drinking without a randomized trial. Perhaps as RLCs become more popular on college campuses, and thus, RLC living space becomes more limited, a randomized trial will be conducted to further test the effects of selection and socialization.

Findings from this study indicate that women living in RLCs, whether single or mixed-sex, drank less than their non-RLC counterparts. By comparison, women living in mixed-sex, non-RLCs reported more drinks in a two-hour period when compared to all other residential groups; these non-RLC women – “living with the guys” – were also more likely to participate in heavy episodic drinking. And while single-sex living arrangements appear protective when compared to mixed-sex arrangements, it is the RLCs that appear to confer an added protection as shown by the non-significant differences between same-sex non-RLCs and mixed-sex RLCs residents.

Our data lend support to the Brower, Golde and Allen (2005) findings. They investigated the impact of collegiate residential learning communities (RLCs) on alcohol consumption using a random sample of 6,100 first-year students from a large, Midwestern research university. Students in the RLCs were significantly less likely to consume alcohol, and less likely to have had a heavy drinking episode in the past two weeks in comparison to students not living in RLCs (37.7% vs. 57.1%). There were no demographic differences between students involved in learning communities (RLC students) and those who were not, although RLC students were significantly more involved in community service and volunteer activities, as well as in campus-sponsored activities and events.

Not surprisingly, when residents drink less, their floor-mates are less likely to report secondary consequences and thus, women in single-sex living arrangements report fewer primary and secondary consequences from excessive alcohol consumption although secondary differences were not statistically significant. However, we also found that women living in single-sex, RLCs reported fewer primary consequences than their peers living in single-sex, non-RLC environments ($M=0.7$ and $M=1.3$, respectively). It is remarkable that mixed-sex RLC residents reported fewer consequences ($M=1.1$) than women residing in single-sex, non-RLCs (1.3), a finding that provides additional support for the RLC environment; it is possible that the RLC provides a protective factor, independent of the sex composition of the living environment.

We questioned whether women living in mixed-sex, residential environments, particularly environments with higher drinking rates, would be more likely to regret having sex (because of drinking) or to report being taken advantage of sexually (while drinking). Our data revealed no statistically significant group differences on these two variables, albeit cell sizes were very small and make firm conclusions impossible. However, the raw numbers were consistent with our other findings: fewer residents in single-sex RLCs reported either being taken advantage of sexually (n=3) or regretting sex after drinking (n=1) when compared to mixed-sex RLC residents (14 and 9, respectively), single-sex, non-RLC residents (10 and 4, respectively) and mixed-sex, non-RLCs (18 and 10, respectively).

In previous work, McCabe et al. (2007) noted that RLCs could deter heavy drinking by providing alternative activities (e.g., structured co-curricular) that are less available to non-RLC students. Our data suggest that RLCs provide structured activities and increase student engagement; they are protective and create an environment in which undergraduate women drink less. In turn, women living in any co-educational arrangement, and particularly non-RLC's, may increase their alcohol consumption because they are with men (who have higher levels of drinking) and thus, the alcohol is more available.

V. Conclusion

There are several limitations with this study design that require consideration. The sample was drawn from a single institution and this limits the generalizability of the findings. In the future, longitudinal data are needed to characterize the mechanisms by which women's living arrangements may influence alcohol involvement (Tinto, 1994; Inkelas, 1999; Inkelas and Weisman, 2003) and longitudinal, panel designs should be considered. Further, because the primary and secondary consequences measures were dichotomous and did not take into account the frequency of each consequence, there may have been a ceiling effect. As a result, a student whose sleep was disturbed once would receive the same score as a student who was disturbed up to 5 times. This ceiling effect may explain the finding that mixed-sex RLC women reported fewer negative consequences than same-sex RLC's.

The present study relied on retrospective recall of pre-college drinking and the pre-college drinking measure was limited to the maximum number of drinks in a 2-hour period. We recognize that selection effects may be present; students who chose RLCs may be less interested in drinking than their peers and a better pre-drinking measure may help establish the role "selection" plays. Further, women who choose single-sex living arrangements are likely to be different than women who do not. And finally, we did not collect data on either women who live in all women dormitories or men who live on same-sex floors; these groups could have provided additional insights into the role same-sex, living arrangements play with respect to drinking behaviors. Nonetheless, despite these limitations, this study contributes to a growing literature that suggests that residential learning communities provide environments that encourage more learning –and less drinking.

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Table 1
Prevalence of Alcohol Involvement and Alcohol-Related Consequences by RLC-Co Ed Status (N=611)

	Single-Sex RLC (n=82) M or %	Co-Ed RLC (n=212) M or %	Single-Sex Non-RLC (n=147) M or %	Co-Ed Non-RLC (n=170) M or %	F or χ^2
Total	13.4%	34.7%	24.1%	27.8%	
Max Drinks in Past 28 Days	2.8 ^a	2.9 ^a	3.2 ^{a,b}	3.8 ^b	3.0 [*]
Heavy Episodic Drinking(Past 2 weeks)	14.6 ^b	29.3 ^b	38.7 ^{b,c}	44.7 ^{c,d}	25.4 ^{**}
Primary Consequences	0.7 ^a	1.1 ^a	1.3 ^{a,b}	1.8 ^b	4.2 ^{**}
Secondary Consequences	2.0 ^a	2.3 ^a	2.3 ^a	2.5 ^a	1.1

Note. Within rows, means and percentages with different superscripts are significantly different at $p < .05$.

* $p < .05$.
** $p < .01$.