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Impact of the "Peers as Family" Dormitory Wing-based Intervention on College Student Alcohol Use and its Secondhand Effects

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Abstract

An intervention to reduce college alcohol use and secondhand effects was tested. Freshmen dormitory wings at a large Mid-Atlantic public university were assigned to single-gender [SG] or mixed-gender [MG] Information-Motivation-Behavior (IMB) workshops implemented during the first weeks of school, or a control condition. Students were surveyed before school began and at 2- and 6-month follow-up. Analyses indicated that, among males, the adjusted mean weekly alcohol use was lower in the SG than the control condition (1.89 vs. 2.72, p=.041). Among females, the adjusted mean weekly alcohol use was lower in the MG than the SG (1.60 vs. 2.44, p=.021) and control condition (1.60 vs. 2.27, p=.056). Further research should identify underlying mechanisms for effective alcohol behavior change among male and female wing-mates.

Introduction

College alcohol use is highest upon college entry followed by moderated use, with event-related upturns, over the course of the first year (Del Boca, Darkes, Greenbaum, & Goldman, 2004; Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005). A survey of college students from across the United States indicates that freshmen males drink an average of 7.39 and females an average of 3.86 drinks per week (Southern Illinois University, 2005). Among other concerns, most college student drinkers and non-drinkers experience the negative secondhand effects of others' drinking such as interruptions to sleep and study (Park, 2004; Wechsler, Lee, Nelson, & Kuo, 2002; Windle & Windle, 2005; Langley, Kypri, & Stephenson, 2003; Perkins, 2002; Reis, Trockel, & Wall, 2003; Inkelas, Brower, Crawford, Hummel, Pope, Zeller, 2004; Weitzman & Chen, 2005). The magnitude of these problems among college freshmen warrants prevention intervention (Upcraft, 2007).

The alcohol intervention project described herein addresses the lack of alcohol risk reduction research targeting dormitory living-units of freshmen. Although a number of promising alcohol interventions have recently been conducted among Greek residents and

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incoming freshmen (Larimer et al., 2001; Caudill, Luckey, Crosse, Blane, Ginexi, & Campbell, 2007; LaBrie et al., 2008; Glindemann, Ehrhart, Drake, & Geller, 2007; LaBrie, Pederson, Lamb, & Quinlan, 2007), these studies do not specifically address freshmen dormitory living-unit culture. Recent intervention trials with collegiate groupings include peer intervention training among fraternity members (Caudill et al., 2007), incentives for alcohol reduction among fraternity party-goers (Glindemann et al., 2007), and motivational interviewing among volunteer males and separately, females (LaBrie, Pederson, et al., 2007; LaBrie et al., 2008).

As freshmen often reside in dormitories on campus grounds, the living-units in these buildings warrant specific consideration in alcohol risk reduction. Dormitories are often high-rise buildings in which living-units are formed within wings. Wings consist of rooms off a shared hallway with a communal bathroom, lounge space, and a resident advisor (RA). While college students' residence building and floor predict attitudes about drinking (Bourgeois & Bowen, 2001), wings may also have their own unique social environment that reflect the characteristics of wing-mates and engender wing-specific alcohol-related attitudes and behaviors (Yu, 2001). Incoming freshmen may be particularly vulnerable to wing-mates' alcohol attitudes and behavior because they, at least initially, often look to wing-mates for social relationships (Upcraft, 2007).

The project described herein also addresses confusion over whether group-based alcohol intervention should be single- or mixed-gender. From a practical perspective, single-gender wings provide natural and convenient settings for single-gender group interventions. Differences in motivation for alcohol use by gender suggest that single-gender groups with gender-specific approaches may be optimal (LaBrie et al., 2008; Musher-Eizenman, Holub, & Arnett, 2003; Treiman & Beck, 1996). Single-gender groups may engender a more open, honest, and trusting group dynamic for change (LaBrie, Thompson, Huchting, Lac, & Buckley, 2007). Single-gender dormitories have less drinking problems than coed dormitories suggesting that single-gender groupings may foster fewer alcohol problems (Harford, Wechsler, & Muthen, 2002; Dowdall, Crawford, & Wechsler, 1998). Nevertheless, mixed-gender groups afford inter-gender interaction regarding alcohol problem-solving. Males may be influenced by their female significant others to reduce substance use (Westmaas, Wild, & Ferrence, 2002). Mixed-group interventions may allow the college females who drink to engage with their male peers for inter-gender problem-solving regarding the negative consequences of drinking (Young, Morales, McCabe, Boyd, & Darcy, 2005). This study directly compares the impact of single- and mixed-gender alcohol interventions within both genders.

Finally, the project described herein evaluates the use of a multi-component intervention model borrowed from a successful HIV harm-reduction dormitory-based intervention, the Information-Motivation-Behavioral Skills (IMB) model (Fisher, Fisher, Misovich, Kimble, & Malloy, 1996). The IMB for AIDS risk reduction was previously applied to undergraduate dormitory residents and found to be effective in increasing condom use at long-term follow-up (Fisher et al., 1996). The model was informed by the Theory of Reasoned Action, the Health Belief Model, and Social Cognitive Theory (Glanz, Rimer, & Viswanath, 2008). Here, the IMB model is used to guide the alcohol intervention because it: facilitates a harm-reduction rather than risk elimination approach given the realities of the college drinking environment (Marlatt & Witkiewitz, 2002; Weitzman & Nelson, 2004), incorporates multiple theory-based strategies, was previously and effectively applied to risky behavior in college student dormitories, allows flexibility to accommodate alcohol risk reduction needs of both males and females as well as single- and mixed-gender learning groups, and provides an approach for translating the model to address different risky behaviors (Fisher et al., 1996; Fisher, Fisher, Williams, & Malloy, 1994). The IMB model posits that information

about risks is often necessary but insufficient to bring about behavior change; that motivation helps to drive behavior change and is derived from attitudes towards the preventive acts, normative beliefs, and perceptions of personal vulnerability; and that skills may be necessary for behavior change and include objective decision-making and behavioral skills as well as a sense of self-efficacy regarding application of the skills.

This project applies the IMB framework to male and female single-gender wings without tailoring the intervention differently for each gender, and directly compares single- versus mixed-gender workshops. Weekly alcohol use and secondhand effects were the primary outcomes of interest because they were relevant measures for primary prevention among all college students, and captured both one's own alcohol behavior and the effects of others' alcohol behavior. The goal of this study, titled "Peers-as-Family (PAF): Preventing Problem Drinking," was to examine differences in weekly alcohol use and secondhand effects across conditions in a three-armed (single-gender, mixed-gender, control condition) IMB-based intervention trial implemented with freshmen dormitory wings during the initial weeks of college.

Methods

This intervention trial was approved by the University Institutional Review Board.

IMB Translation for Workshops and Surveys

For the PAF trial, IMB was translated into a three-workshop intervention to address alcohol risk reduction among college wing-mates living in freshmen dormitory wings. Literature review of existing college alcohol program evaluations, college student focus groups (n= 47 participants) (Howard, Griffin, Boekeloo, Lake, & Bellows, 2007), Department of Resident Life Resident Director (RD) interviews (n=4 RDs), and Resident Advisor (RA) interviews (n=5 RAs) were used to inform the IMB translation. Although different perspectives on the same issues, the information from RDs and RAs was generally consistent with that from students. The research team and University advisors reviewed the information from all sources and determined that the intervention emphasis should be a harm-reduction approach that focuses on three areas of decision-making. The three focal areas of decision-making included: limiting alcohol consumption, helping others avoid negative alcohol-related consequences, and behaving in ways that shows respect for others.

Three workshop protocols were designed and then developed into facilitator guides and participant materials. Participant workshop materials were pre-tested with groups of college students not involved in the study trial (n=88 participants), and facilitator guides and workshop materials were pre-tested with the workshop facilitators (n=24). While the basic format of the three workshops was initially based on the Fisher et al. study (Fisher et al., 1996), the format was refined as feedback was obtained during pre-testing. Also implementation of each workshop provided feedback that led to adjustments in subsequent workshops. Hence, the format of workshop #1 is more consistent with the Fisher et al. format than workshop #3 which is shorter and less structured. What was maintained in each workshop was a focus on the constructs of the IMB model applied to the three areas of decision-making. All workshops were designed to allow students to participate fully in each workshop even if they had not attended a prior workshop.

Intervention Workshops

Workshop #1 included four activities as described below. The first three activities were conducted with two wings from the same study condition together in a dormitory lounge near the wings. The first activity was a self-administered quiz followed by a discussion of

the answers. The quiz addressed information such as alcohol content of beverages and alcohol's effects on the body, and motivation related to perceived susceptibility, perceived severity, costs/benefits of alcohol misuse, and normative beliefs. The second activity was a DVD of upperclassmen student testimonials. The testimonials addressed motivation regarding attitudes and normative beliefs. The third activity was three popular movie clips, one related to each of three areas of decision-making regarding drinking, followed by discussion and brain-storming of potential "I will…" pledges regarding each area of decision-making. This third activity addressed attitudes, decision-making skills and self-efficacy. The forth and final activity involved separating the two wings, and wing-mates voting on which "I will…" statements to include in their final wing "Peer Pledge". The pledge further addressed normative beliefs and self-efficacy and was subsequently printed on wallet-sized cards and provided to each wing member. Pizza, snacks, and sodas were offered as a workshop incentive. Workshop #1 (n=18 workshops) was planned and advertised as 150 minutes but facilitator evaluations indicated that it was completed in an average of 101 minutes (Range: 75–135 minutes). Facilitator evaluations indicated that 100% of all workshop activities were completed.

Workshop #2 included five skits as described below and was conducted with the same wing pairings as workshop #1 together in a dormitory lounge near the wings. The skits included information and addressed motivation related to perceived susceptibility, perceived severity, cost/benefit, attitudes, and normative beliefs; as well as skills and self-efficacy related to the three areas of decision-making. Wing members were provided with the skits and assigned parts in each skit to read out loud. Following each skit, wing members were posed questions for discussion. The skits were themed as follows: 1) Setting and sticking to drinking limits, 2) Avoiding drunkenness and risky situations, 3) Helping others regarding alcohol, 4) Preventing an alcohol health crisis, and 5) Confronting and showing respect of others regarding alcohol. Pizza, snacks, and sodas were offered as an incentive. Workshop #2 (n=18 workshops) was planned and advertised as 120 minutes but facilitator evaluations indicated it was completed in an average of 77 minutes (Range: 60-105 minutes). Facilitator evaluations indicated that only 66% of the male and female single gender workshops completed skits 1, 2 and 4; only 83% of the male and female mixed gender workshops completed skits 1, 3, 4, and 5. In workshops that not all skits were completed, facilitator evaluations indicated that students were interested in other activities that evening and would not stay for the entire workshop so the facilitators decided to let the students determine which skits to complete in the time available.

Workshop #3 focused on an "Adventure" and was conducted with the same wing pairings as workshop #1/#2 together in a dormitory lounge near the wings. The adventure included information and addressed motivation related to perceived susceptibility, perceived severity, cost/benefit, attitudes, and normative beliefs; as well as skills and self-efficacy related to the three areas of decision-making. There were seven stations set up in the lounge, each with multiple decision options and posted scenarios. Students carried a worksheet that tracked their decisions at each station and asked them to complete ancillary learning activities (e.g. calculating one's simulated blood alcohol content) throughout the adventure. Depending on the decisions made at each of the seven stations, students were directed to one of 17 scenarios. Regardless of the decisions made, students experienced the same things only from different perspectives (e.g. as a drinker versus a non-drinker). The scenarios constituted alcohol-related situations prior to, during, and after going out to socialize. Students could participate in the activity at their leisure. Ice cream was offered as an incentive. The adventure was set up and promoted for 90 minutes, but the adventure itself was timed to take 20 minutes to complete on average. All participants completed the adventure worksheet.

Workshop facilitators were targeted through e-mail announcements to graduate students at the study university and other local universities. Once screened, selected facilitators were hired to participate in three hours of materials review and four 4-hour training sessions that addressed facilitator guides. Each facilitator conducted a mock workshop #1 and workshop #2 while being observed by the research staff who provided feedback and assessed performance, leading to termination of one poor performer. After study implementation of workshop #2, facilitators received another 1-hour training session to prepare for workshop #3.

Final workshop facilitators included current or recent graduate students. There were 12 female facilitators and 6 male facilitators trained to implement the intervention workshops. Many fewer males responded to facilitator recruitment than females necessitating a workshop assignment strategy that required more females. Female facilitators conducted workshops in the female-only and mixed-gender conditions and males conducted workshops in the male-only condition. All facilitators completed evaluation forms at the conclusion of each of the three workshops which included time of workshop component completion and deviations from the protocol. Additionally, RAs for each study wing were trained in a 2-hour session about observation techniques and tracking the completion of workshop components using a form similar to that of the facilitators. All RAs observed the first two workshops delivered to their wing members and completed the evaluation forms. Ultimately, however, facilitator forms were universally complete and useable whereas RA forms were often incomplete and therefore, unusable.

All students on intervention (single-gender and mixed-gender) condition study wings were targeted to participate in the workshops via hand-delivered postcards, flyers hung on wings, and personalized emails. All of the recruitment materials included pertinent information about the workshops including expected length, location, incentives, and topics. In addition to including the pertinent information about the workshops in the recruitment materials, all students participating in a workshop received an information sheet (approved by the IRB) including the important workshop and study information. All workshops were conducted within the students' respective dormitories in common lounges at evening times. For logistic reasons, all mixed-gender workshops occurred in lounges on the same floor as the participating wings. Half of the single-gender workshops were conducted in lounges on the same floor as the participating wings and half in lounges on other floors within the same dormitory.

Intervention Trial Design

The trial constituted a three condition, longitudinal comparison of interventions with college students in freshmen single-gender wings over the first 6 months of the school year. The study dormitory wings were populated predominantly by incoming freshmen students and included some second-year students who had chosen to remain in their first-year housing. Of the eight on-campus, freshman, high-rise dormitories with single-gender wings supervised by a resident advisor, the four dormitories with the highest preponderance of incoming freshmen relative to more senior students were selected for participation. Because the study interventions were designed for delivery to wing-mates, all students on the study wings were targeted for inclusion in the study.

Given that freshmen students were housed within dormitories containing gender specific wings designated as living-learning (LL) and non-LL communities; LL communities are wings designated for students with similar academic interests and students apply and must be accepted to be members of these communities, the wing was chosen as the unit of sampling and assignment to study condition. Balance by condition within gender was achieved by identifying all wings with over 70% first-year freshmen, blocking the wings of

the same gender and LL status within dormitory, and assigning wings within the blocks to the conditions. While we could not protect against all student interaction between study wings, wings on the same floor (always opposite gender) were assigned to the same condition to minimize condition contamination. Hence, the final assignment of wings within a block to condition was done through matching on wing demographics and floor. This purposive sampling and assignment afforded balance across trial arms regarding number of wings by dormitory, student gender and LL community membership and minimized the potential for condition contamination: Single-Gender Condition (6 male wings including 4 LL wings; 6 female including 4 LL), Mixed-Gender Condition (6 male wings including 4 LL wings; 6 female including 4 LL), and Control-Condition (6 male wings including 4 LL wings; 6 female including 4 LL).

Residents of those wings assigned to single- or mixed-gender conditions were then targeted to participate in a series of three intervention workshops. In single-gender workshops, each wing was paired with another wing of the same gender and study condition for the workshops. In mixed-gender workshops, each wing was paired with a another wing of the opposite gender and same study condition for the workshops. Workshop #1 was held two days prior to the first day of the semester (August 28), workshop #2 was held one week after workshop #1 (September 4), and workshop #3 was held six weeks after workshop #2 (October 15).

As a small number of students moved on and off the study wings, particularly during the critical early wing-norm building and study intervention weeks of the semester, decisions were made about the study sample frame. Because all students on the wings for part or all of the early weeks of the semester could have contributed in some way to subsequent wing-mate perceptions and behaviors evaluated in follow-up surveys, it was decided that all students on wing rosters up until the third workshop would be included in the study sample frame (n=1291); the denominator for evaluation tracking purposes. No student was dropped from the sample frame for tracking purposes over the entire course of the study and no student was added to the study sample frame after the third workshop. One student moved from one control condition wing to another control condition wing.

Web-Based Surveys and Measures

Web-based surveys were administered to targeted students assigned to all study conditions: a baseline survey was administered just before the beginning of the Fall 2006 semester, a 2-month follow-up survey was administered two weeks after workshop #3, and a 6-month follow-up survey was administered 4 1/2 months after workshop #3. All students living on the 36 study wings were targeted to participate in the three web-based surveys with flyers hung on each wing and up to five personalized e-mails. Students who moved onto a study wing in time to attend a workshop (before the third workshop) were included in subsequent surveys. E-mails included the web-page link and a unique study identification number (ID) for accessing the survey. To increase the survey response rate during the 2-month follow-up survey administration only, a paper survey that exactly mirrored the format and questions in the on-line survey was mailed to non-responders after three e-mail recruitment attempts for the on-line survey. The paper survey respondents were tracked by a unique study ID and the same consent and incentive policies applied to on-line and paper responses. There were 11 usable paper responses and the data were merged into the web-based survey database. Incentives for all three web-based surveys (baseline, 2-month, and 6-month) included a $10 university bookstore coupon for completion. In addition, wings that had 85% or more participation in the baseline and 2-month follow-up were offered department store gift cards of $20 and $40, respectively, but no wing reached this threshold. For the 6-month survey completion, participants from each wing were entered into a lottery, and one participant from each wing was offered a $60 department store gift card.

Where possible, reliable measurements used in previous studies were used in the web-based surveys as cited below. For other measures, translation activities described above informed new measures. Measures were incorporated into a questionnaire and then pre-tested in multiple rounds of individual, face-to-face interviews with college students unrelated to this study. The survey was then formatted for web administration and pilot tested with 92 male and 153 female freshmen unrelated to this study sample of students and the psychometrics of scale measures were examined for adequacy. Final key study measures were the same at baseline, 2-, and 6-month follow-up. Provided below are psychometric data from the 2-month survey.

The web-based survey included graphics to illustrate serving sizes of alcohol. Participants were instructed to use these amounts as a guide when responding to survey items about their alcohol use. To measure weekly alcohol use, the primary alcohol use outcome measure, a modified timeline follow back measure was administered (Sobell, Maisto, Sobell, & Cooper, 1979). Participants were asked how many drinks they consumed during a typical day for each day of the week (Sunday through Saturday) during the previous 30 days. The coded response options were 0=none to 5=five or more. Participants' responses to each daily use item were then summed to create a single weekly alcohol use item. Scores ranged from 0-35 with mean=4.67, median=1.00, std.dev.=6.16, Cronbach alpha=0.78; 54.6% of males and 54.3% of females reported scores above zero for typical weekly drinking at 2-month follow-up.

The 2003-2004 National Study of Living Learning Programs instrument items measuring the frequency of students' experience with negative consequences as a result of others' alcohol use (secondhand effects) were administered using the time frame since arriving on campus for the present semester (Inkelas et al., 2004). Items addressed, for example: a) being harassed, insulted, or humiliated, b) having property damaged, and c) being inconvenienced from vomit in the hallway or bathroom. The coded response options for all items were 0=none to 3=three or more times. The 10 items were summed to create a single continuous item. Scores ranged from 0-23 with mean=4.48, median=3.00, std.dev.=4.14, Cronbach alpha=0.72.

Analysis Procedures

Measurements of student demographic characteristics were categorical and included race/ethnicity, gender, first-semester freshmen status, age, and LL membership. These characteristics were compared for participant and non-participant samples, as well as for participants across study conditions using Chi-Square.

The generalized linear mixed model approach (GLiMM) (Verbeke & Molenbergs, 1997; Littell, Milliken, Stroup, & Wolfinger, 1996; Lindsay, 1993; Fahrmeir & Tutz, 1994), using the SAS 9.1 GLIMMIX procedure (SAS, 2003), used all available data to fit longitudinal multi-level models that included random effects. Separate GLiMM models were fit to the two primary outcome measures (weekly alcohol use, secondhand effects), each of which were assumed to follow a Poisson distribution. Because each of these outcome variables appeared zero-inflated, a scale factor was also permitted in each model. Predictors were identical in each model and included: study condition (single-gender, mixed-gender, control), time (baseline, 2-month follow-up, 6-month follow-up), LL membership (yes, no), class standing as a first-time freshman (yes, no), race/ethnicity (White, Asian-American, Hispanic/Latino, Black-African American, mixed/other), gender (male, female), and age (17, 18, 19 and older). In addition, the interaction of study condition and gender was tested.

Because random assignment to study condition was conducted at the wing level, wing was included as a random effect in the model to control for any wing-level attributes. Also,

wings were single-gender and some wings were designated as LL communities. Therefore, wing effect was nested within student gender, study condition, and LL community membership. After each full model was fit, fixed effects significant at the $p<.05$ level were retained and the GLIMMIX procedure was re-run. Study condition, gender, and the interaction between study condition and gender were kept in the model, along with the random effect of wing (nested within gender, study condition, and LL membership) regardless of significance, as these were the main hypothesized predictors. Re-testing the model with only the significant effects determined whether an effect in the full model was conditional on seemingly non-significant effects.

The GLiMM modeling was first conducted on the full sample. Because 65% of the full longitudinal sample did not complete the survey at every time point, the GLiMM modeling was also conducted on the subsample that completed the survey at all time points as a way to determine whether findings were more pronounced in this higher fidelity subsample.

Results

Participation and Sample Characteristics

There were 648 male and 643 female students eligible for the study. Because the GLiMM approach to the analyses used all available data to fit longitudinal multi-level models, the sample consisted of the 830 students who completed one or more of the three surveys (baseline, 2-month, and 6-month). This full longitudinal sample (N=830) relative to survey non-participants (n=461) included more females (55.4% vs. 41.4% respectively, p<0.001), less Black/African-Americans (13.0% vs. 21.3% respectively, p<0.001), and more living-learning members (58.8% vs. 34.9% respectively, p<0.001). Different participation rates were obtained by gender; 58.3% (378/648) for males and 70.3% (452/643) for females (p<0.001). Characteristics of the longitudinal samples of males and females were compared by study condition (Table I). Among females, race/ethnicity differed among conditions with the highest proportion of African-Americans in the mixed-gender condition and the highest proportion of Whites in the single-gender condition. No ethnicity differences were observed among males by condition. Among females, rate of attendance in at least one workshop was lower in the single-gender (36.1%) than the mixed-gender condition (51.7%; p=.007). Among males in the single-gender relative to the mixed-gender condition, 37.3% versus 45.8% attended at least one workshop (p=.191).

Full Sample Outcome Analysis

The primary outcome measures were weekly alcohol use and secondhand effects. In the full longitudinal sample (n=830), GLiMM modeling indicated the presence of condition effects for weekly alcohol use only, not for secondhand effects, and these condition effects differed by study gender (Study condition x gender interaction F=3.91, p=.026). Differences between mixed model-derived exponentiated least squares adjusted means (*M*) were thus examined. Among males, weekly alcohol use in the single-gender condition (*M*=1.89, s.e.=.33) was lower than in the control condition (*M*=2.72, s.e.=43, p=.041) (Table II). Among females, weekly alcohol use in the mixed-gender condition (*M*=1.60, s.e.=.29) was lower than in the single-gender condition (*M*=2.44, s.e.=.38, p=.021) and tended toward being lower than in the control condition (*M*=2.27, s.e.=.37, p=.056) (Table II).

Visual inspection of the trajectories of adjusted means within gender and condition by time in this data suggested that among males, the single gender condition had lower weekly alcohol use than the control condition (Figure 2A) mirroring findings of GLiMM. Visual inspection of trajectories among females suggested that the mixed gender condition had

lower weekly alcohol use than the single gender and control condition (Figure 2B) mirroring findings of GLiMM.

Additional analyses were conducted to further clarify the impact of the study interventions. Workshop attendance was examined as a predictor in the mixed models and was not significant, but these models tended to be unstable due to small frequencies. The random effect of wing was insignificant in all models.

Subsample Outcome Analysis

The full longitudinal analysis sample (n=830) included 289 cases who completed all three study surveys. Although only a small subsample of all longitudinal study participants (34.8%), this subsample offered examination of condition trajectories in a panel of participants with relatively high rates of participation in at least one workshop, significantly higher among females (Completed all three surveys vs. did not complete all three surveys: Single male condition=43.6% vs. 34.6% [p=.189], Mixed male condition=44.8% vs. 43.5% [p=.525], Single female condition=41.8% vs. 26.7% [p=.02], Mixed female condition=63.2% vs. 39.7% [.002]) It was thought that the differences between conditions might be more detectable in this subsample although the sample size and power to detect differences were considerably less. GLiMM indicated, however, that there were no significant differences in either primary outcome by study condition in this subsample.

Discussion

This study utilized data from all study participants regardless of workshop participation. In spite of low workshop participation, a comparison of study conditions demonstrated different alcohol-related trajectories. The single-gender intervention with male wing-mates in freshmen dormitories reduced weekly alcohol use. Findings among females suggested that the mixed-gender intervention may have reduced weekly alcohol use. It should be noted that the reduced drinking in these intervention groups was only about one drink per week on average and may not decrease alcohol-related risks in this population.

Intervening with single-gender workshops at the beginning of the school year among males in single-gender freshmen dormitory wings, and using IMB-based education in regard to three areas of decision-making (drinking, helping others avoid alcohol risks, and showing consideration to others in relation to alcohol use) may modestly reduce alcohol use. Further research is needed to understand the mechanisms by which single- rather than mixed-gender workshops lead to improved outcomes in males. Potential explanations to be explored include: 1) Males may be more open, honest, and trusting regarding alcohol education without the presence of females (LaBrie, Thompson, et al., 2007), 2) single-gender intervention may promote more wing-mate bonding around reduced alcohol use (Hartzler & Fromme, 2003), and 3) the presence of female peers in mixed-gender workshops may distract males from addressing their distinct reasons for drinking (Treiman & Beck, 1996).

The findings that females in the mixed-gender condition had less weekly alcohol use than females in the single-gender condition and tended to have less weekly alcohol use than females in the control condition could suggest that female wing-mate alcohol use is better addressed in mixed-gender workshops. Further research is needed to understand the mechanisms by which mixed- rather than single-gender workshops may lead to improved alcohol outcomes in females. Perhaps the nexus of much of female drinking is associated with social interaction with males, rather than with their wing-mates (Dowdall et al., 1998; Young et al., 2005).

This study progressed with potential limitations. The non-random sample of dormitory wings included in the study may not represent all dormitory wings at the study university or elsewhere. Also, although the eligible study sample mirrored characteristics of all freshmen at the University, the respondent sample was proportionally more female, LL, and less minority. The under-representation of non-white students lends to the possible inability to generalize to non-white students. Finally, weekly drinking in this study population is lower than that reported for freshmen nationally (Southern Illinois University, 2005). In part, this may be due to the fact that the daily measures summed to create the weekly use scores were capped at five drinks. Consideration must be given to whether the trial findings could generalize to all students living in freshmen dormitories. Additionally, participation in the workshops and surveys was not mandatory. While all efforts were made to encourage students to participate, it may be that students who decided to participate in these surveys and workshops are less likely to engage in alcohol consumption. The subtle reduction of alcohol use related to study condition in this study may be related to this self-selection, as this may be a sample of relatively low-risk drinkers. Replication of this intervention in a group of high-risk (e.g., frequent, high-volume drinkers) freshmen living in dormitories may be warranted.

There were also several potential limitations regarding the internal validity of the trial. The self-report data allowed for potential recall or social desirability bias. No variables, however, were observed to have low or different reliability across study conditions. The gender of workshop facilitators may have also been a factor that influenced the results. Male facilitators were used for single-gender male workshops whereas female facilitators were used for single-gender female workshops as well as the mixed-gender workshops. Differential survey participation was not a concern given similar participation rates by study condition. For all conditions but the single-gender condition, attendance at workshops was more likely among students who were younger/new to college whereas older/returning students were less likely to attend. Of note among females, the mixed-gender condition had higher workshop participation than the single-gender condition. This differential workshop participation may have contributed to the trend for improved outcomes among mixed-condition females. Workshops were not videotaped or examined in any way to compare how single- and mixed-gender workshops functioned for each student gender. Food and gift incentives may have been too modest to maximize survey and workshop participation rates. Missing survey data appeared to be random across conditions limiting this as a threat to internal validity; an advantage of using GLIMMIX was that it did not require data for every study data collection point from every subject.

The primary threat to the validity of the trial was the low participation rate in the workshops (38.7% of eligibles participated in at least one workshop). Mixed gender workshops had higher participation than single-gender workshops among females. Decreases in length from the first to second to third workshop did not substantially increase participation in males or females so advertised length may not be a major predictor of participation. Although the workshops were designed to build on existing university programming related to improving wing-mate cohesiveness, there were many activities competing for student's attention during the first weeks of college. Future research should examine dynamics and strategies related to workshop recruitment, student-student and facilitator-student communication during workshops, student-wing influence, as well as the optimal timing, incentives, and format of workshops.

The low workshop participation in this study suggests that more effective strategies for encouraging voluntary wing-mate participation in workshop-based alcohol education could enhance intervention effect. It is possible that intervention effect was limited by lack of intervention exposure--too small of a "dose". Design of the study may, however, have

magnified the effects of the workshops. First, there were three opportunities for workshop participation so more wing-mates were exposed to workshop messages over time. Second, workshops were attended by wing-mates together as a group so that they could reinforce each other's changes motivated by the workshops. Third, wing-mates attending workshops could take away messages from the workshop and share them with non-attending wing-mates to bring about change on the wings. Fourth, the resident advisors observed their wing-mates' workshops so that they could support their residents' requests in response to the workshops. These "magnifying" intervention influences may have countered the limiting influence of low workshop participation to create any observable intervention effect.

In summary, this study demonstrated that alcohol use may be reduced when multiple, sequential IMB workshops are delivered to single-gender groups of male, and mixed-gender groups of female, wing-mates in freshmen dormitories at the beginning of the school year. The approach was not effective with mixed-gender groups of males and single-gender groups of females. Further research is needed to confirm and explain these findings.

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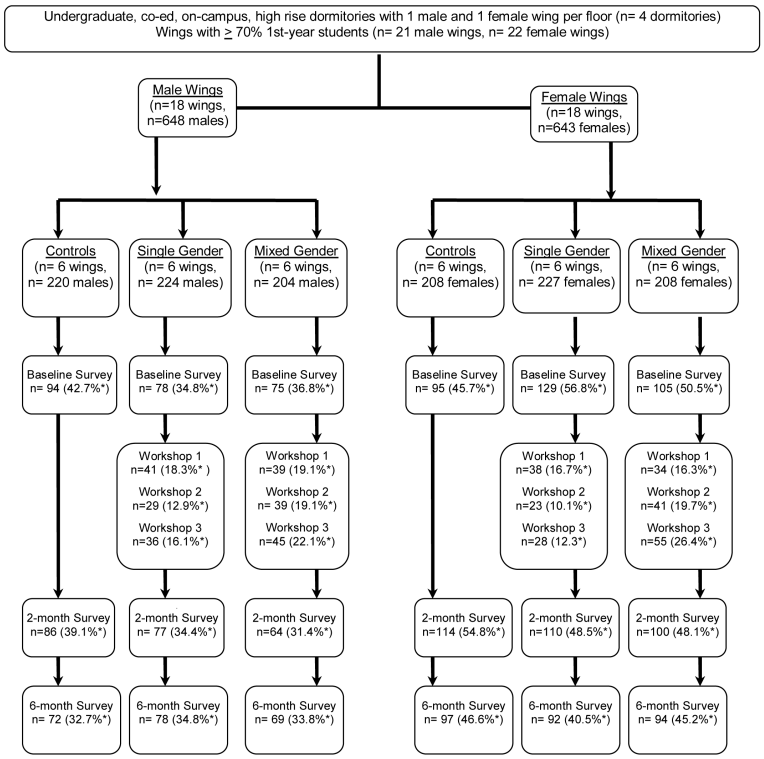

Figure 1.
Longitudinal study flow chart
*Follow-up rate among those assigned to condition

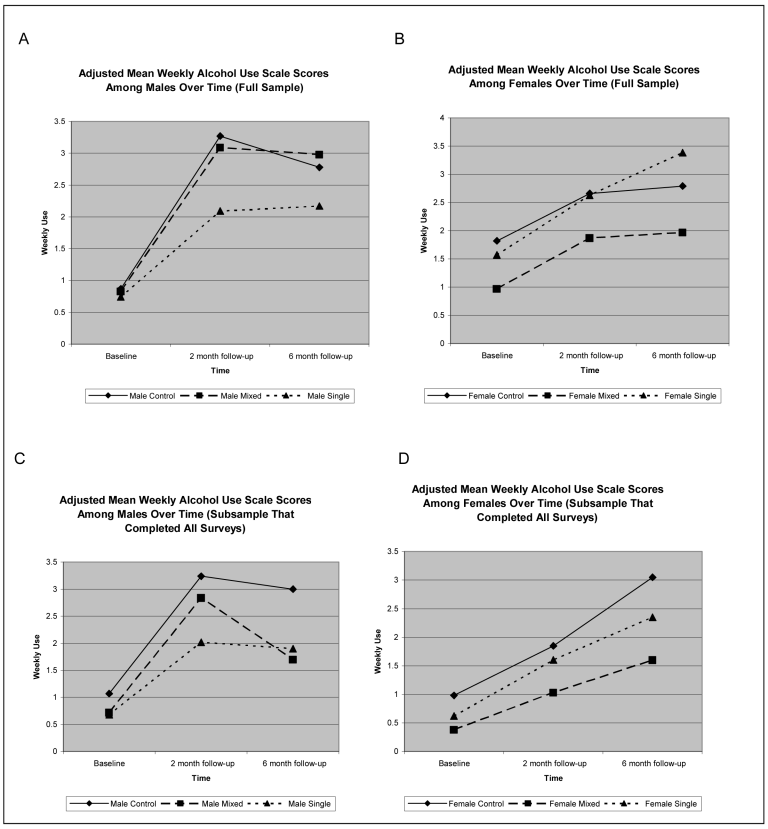

Figure 2.

Exponentiated least squares means of weekly alcohol use scale scores by gender and study condition over time among the full study sample (*N=830) and students completing all study surveys (n=289).

*N=830 refers to the study sample for generalized linear mixed modeling which included all students who completed at least one study survey.

NOTE: The range of individual values for weekly alcohol use is 0 to 35 drinks; the vertical axis only addresses the range of mean values for the study conditions in increments of .5 drinks to highlight differences across conditions.

Clinical/practical significance of these differences must be interpreted cautiously.

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Table 1

Characteristics of study sample by study condition and gender (N=830*)

	Study Condition				
Characteristic	**Single gender**	**Mixed gender**	**Control**	**χ^2**	**p-value**
Females (n=452)	n=158	n=147	n=147		
Age				3.126	.537
17 years	42 (26.6%)	40 (27.2%)	37 (25.2%)		
18 years	102 (64.6%)	101 (68.7%)	101 (68.7%)		
19+ years	14 (8.9%)	6 (4.1%)	9 (6.1%)		
First-semester Freshman				1.937	.380
Yes	144 (91.1%)	133 (91.5%)	139 (94.6%)		
Race/Ethnicity				18.483	**.018**
Hispanic/Latino	10 (6.3%)	6 (4.1%)	16 (10.9%)		
Asian/Pacific Islander	21 (13.3%)	23 (15.7%)	25 (17%)		
Black/African American	28 (17.7%)	35 (23.8%)	14 (9.5%)		
White	91 (57.6%)	71 (48.3%)	77 (52.4%)		
Other/Mixed	8 (5.1%)	12 (8.2%)	15 (10.2%)		
Living-Learning Member				.075	.963
Yes	97 (61.4%)	89 (60.5%)	88 (59.9%)		
Participated in Workshop #1	31 (19.6%)	27 (18.4%)	NA	.093	.760
Participated in Workshop #2	20 (12.7%)	34 (23.1%)	NA	5.611	**.018**
Participated in Workshop #3	23 (14.5%)	43 (29.3%)	NA	9.523	**.002**
Participated in ≥1 workshop	57 (36.1%)	76 (51.7%)	NA	7.311	**.007**
Participated in 2 workshops	12 (7.6%)	26 (17.7%)	NA	7.111	**.008**
Participated in 3 workshops	2 (1.3%)	1 (.7%)	NA	.268	.605
Males (n=378)	n=126	n=120	n=132		
Age				2.82	.588
17 years	37 (29.4%)	27 (22.5%)	29 (22%)		
18 years	78 (61.9%)	84 (70%)	90 (68.2%)		
19+ years	11 (8.7%)	9 (7.5%)	13 (9.6%)		
First-semester Freshman				.192	.908

Characteristic	Study Condition			χ^2	p-value
	Single gender	Mixed gender	Control		
Yes	115 (91.3%)	110 (91.7%)	119 (90.1%)		
Race/Ethnicity				10.757	.216
Hispanic/Latino	8 (6.3%)	10 (8.3%)	6 (4.5%)		
Asian/Pacific Islander	21 (16.7%)	8 (6.7%)	23 (17.4%)		
Black/African American	12 (9.5%)	11 (9.2%)	8 (6.1%)		
White	79 (62.7%)	81 (67.5%)	88 (66.7%)		
Other/Mixed	6 (4.8%)	10 (8.3%)	7 (5.3%)		
Living-Learning Member				1.265	.531
Yes	72 (57.1%)	72 (60%)	70 (53%)		
Participated in Workshop #1	23 (18.3%)	29 (24.2%)	NA	1.218	.270
Participated in Workshop #2	18 (14.3%)	23 (19.2%)	NA	.998	.318
Participated in Workshop #3	20 (15.9%)	29 (24.2%)	NA	2.552	.110
Participated in ≥1 workshop	47 (37.3%)	55 (45.8%)	NA	1.708	.191
Participated in 2 workshops	14 (11.1%)	15 (12.5%)	NA	.114	.736
Participated in 3 workshops	0 (0%)	5 (4.2%)	NA	5.359	**.021**

*N=830 refers to the study sample for generalized linear mixed modeling which included all students who completed at least one study survey..

Table 2

Eponentiated least squares model-derived means for the interaction of study condition and gender (N=830 *)

Factor	Mean (SE)	F[a]	p-value[a]
Weekly Alcohol Use		3.91	**.026**
Single Female	2.44 (.38) **		
Mixed Female	1.60 (.29) **, †		
Control Female	2.27 (.37) †		
Single Male	1.89 (.33)^		
Mixed Male	2.48 (.42)		
Control Male	2.72 (.43)^		
Secondhand Effects		2.31	.109
Single Female	3.05 (.30)		
Mixed Female	2.39 (.25)		
Control Female	3.03 (.30)		
Single Male	2.35 (.27)		
Mixed Male	2.69 (.30)		
Control Male	2.81 (.25)		

* N=830 refers to the study sample for generalized linear mixed modeling which included all students who completed at least one study survey.

[a] Study condition × gender interaction

** p=.021

^ p=.041

† p=.056