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Risk drinking and contraception effectiveness among college women

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Abstract

Risk drinking, especially binge drinking, and unprotected sex may co-occur in college women and increase the risks of STI exposure and pregnancy, but the relationships among these behaviors are incompletely understood. A survey was administered to 2012 women of ages 18–24 enrolled in a public urban university. One-quarter of the college women (23%) drank eight or more drinks per week on average, and 63% binged in the past 90 days, with 64% meeting criteria for risk drinking. Nearly all sexually active women used some form of contraception (94%), but 18% used their method ineffectively and were potentially at risk for pregnancy. Forty-four percent were potentially at risk for STIs due to ineffective or absent condom usage. Ineffective contraception odds were increased by the use of barrier methods of contraception, reliance on a partner's decision to use contraception, and risk drinking, but were decreased by the use of barrier with hormonal contraception, being White, and later age to initiate contraception. In contrast, ineffective condom use was increased by reliance on a partner's decision to use condoms, the use of condoms for STI prevention only, and by risk drinking. Thirteen percent of university women were risk drinkers and using ineffective contraception, and 31% were risk drinkers and failing to use condoms consistently. Risk drinking is related to ineffective contraception and condom use. Colleges should promote effective contraception and condom use for STI prevention and consider coordinating their programs to reduce drinking with programs for reproductive health. Emphasizing the use of condoms for both pregnancy prevention and STI prevention may maximize women's interest in using them.

Keywords

Binge drinking; contraception; college; women's health; pregnancy prevention

Introduction

Binge drinking is defined as a pattern of drinking that raises blood alcohol concentration to 0.08 gram percent or above (NIAAA, 2004). Binge drinking among college women remains normative despite increased prevention efforts aimed at college students over the past decade (Clapp et al., 2003; Wechsler, Lee, Nelson, & Kuo, 2002; Wechsler et al., 2002). While binge drinking rates for the general population range from 4 to 24% depending on locality (Nelson, Naimi, Brewer, Bolen, & Wells, 2004), rates for college students are considerably higher.

Binge drinking among college women may be just one of several types of risk behaviors that peak between the ages of 18 and 25 (Jessor, Donovan, & Costa, 1991), a period known as emerging adulthood (Arnett, 2000). Emerging adulthood is characterized by a prolonged period of volitional activities, identity formation, seeking novel experiences, taking risks, and ultimately, achieving a defined sense of the self as an adult (Arnett, 2000). While drinking, smoking, drug use, and sexual behavior are often initiated in adolescence, these behaviors increase in frequency and risk level during the emerging adulthood developmental phase, with risk behaviors such as binge drinking peaking at ages 21–22 according to the Monitoring the Future Survey (Bachman, Johnston, Malley, & Schulenberg, 1996). Increased drinking is associated with leaving the parental home after high school and reduced adult supervision, and declining drinking is associated with marriage and parenthood (Bachman et al., 1996).

Binge drinking is a prominent correlate of sexual risk among emerging adults, and this relationship is found across diverse studies. Dunn, Bartee and Perko (2003) using the 1993–1999 Youth Risk Behavior Survey found that binge drinking was a stronger predictor of adolescent sexual activity than lifetime and current use of alcohol. Early binge drinkers had significantly more sex partners, while later onset binge drinkers and marijuana users had more sexual partners and were less likely to use condoms (Guo et al., 2002). Binge drinkers were twice as likely as nonbinge drinkers to have participated in unplanned or regretted sex (Ketcham, 1999). Drinking, in general, increases the likelihood of unplanned or unprotected sex among college students (Wechsler, Lee, Kuo, & Lee, 2000; Wechsler et al., 2002). College risk drinkers report greater expectations of sexual enhancement and more high risk sexual behaviors when drinking in intimate situations (O’Hare, 2005). Unprotected sex that could lead to pregnancy or STI exposure is prevalent among college women (Mahoney, 1995; Simon, Roach, & Dimitrievich, 2003; Yarnall et al., 2003). Drinking among young adults increases the risk of unprotected sex, and also harmful consequences including STI exposure and vulnerability to sexual assault (Leigh, 1999). Risky drinking in combination with ineffective contraception could lead to unplanned pregnancy. Risky drinking may also increase the risk of ineffective condom use, possibly leading to STI exposure and infection. Although, some studies show links between drinking and unplanned sex among young adults in general, data are lacking on the relationship of risk drinking with ineffective contraception and condom use among college women, an important subgroup of emerging adults. The purposes of this study were to determine the rates of risk drinking, ineffective contraception, and ineffective condom use in a female college sample, and to identify

behaviors that increased the odds of ineffective contraception and condom use among college women.

Methods

Survey methods and target population

A survey of 17 branching items designed for this study, served as both a screener for an intervention and an epidemiological survey instrument. The survey contained mostly closed-ended questions and took 3–5 min to complete. Questions covered age, student status, sexually active status, use of contraception or STI prevention, manner of use of the contraception and/or condoms, multivitamin and folic acid use, reasons for use of contraception and/or condoms, age of initiation of contraception, and person who initiated use of contraception.

In addition, the questionnaire queried drinking habits. The NIAAA recommends that women consume no more than seven drinks per week on average with no binges (four or more drinks on one occasion for the average weight woman) to avoid health risks of alcohol (NIAAA, 2005). Therefore, the questionnaire inquired about drinking 0, 1–7, and 8 or more drinks per week. Binge drinking was queried following the methodology of a CDC, study of co-occurring drinking and pregnancy risk (Project CHOICES Research Group, 2002) and the Behavioral Risk Factor Surveillance Survey (BRFSS), that define a binge as five or more standard drinks per occasion for women (Centers for Disease Control and Prevention, 2004). While binge drinking for women is currently defined as four or more standard drinks per occasion, we used the definition in place at the time of the study and that would permit comparisons with large-scale epidemiologic surveys. Women reported the number of times they had consumed five or more drinks, and the highest number of drinks per occasion they had consumed in the past 90 days ranging from none, 1–4, 5–8, 9–11, or 12 or more.

Key variables were gleaned from the survey questions. Risk drinking was defined as reporting one or more binges in the past 90 days or drinking eight or more standard drinks per week on average over the past 90 days. Use of contraceptive methods was queried, followed by questions regarding effectiveness of use for each method reported. Specifically, women responded to the question, “in the past 90 days, what type(s) of birth control methods did you use?” answering yes or no to a list of methods including condoms, birth control pills, diaphragm, cervical cap, depo provera injections, lunelle injections, emergency contraception/morning after pill, spermicide, IUD, norplant, and other (specify). Women answered follow-up questions related to the methods they reported that they were using. Ineffective contraception was defined as having vaginal intercourse with a male partner without using a contraceptive method, or while using it ineffectively, according to the study’s effectiveness guidelines. Effective use of each method was defined and written guidelines on the definitions were provided by a team of three physicians including a gynecologist based on a review of product information and ACOG guidelines prior to the study. Questions were designed to determine whether each method reported by the woman met the criteria for effective use, meaning that use was likely to prevent pregnancy limited only by the inherent effectiveness of the method, following the methodology of the Project CHOICES Research Group (2002). For example, for women reporting the use of condoms,

they answered yes/no to the follow-up question “in the last 90 days did your partner put a condom on before every time you had vaginal intercourse?” Similarly, for those women reporting the use of the birth control pill, they responded yes/no to the follow-up question, “in the last 90 days, did you miss more than 2 pills in a row in a month when you had sex?” Women using methods other than condoms who reported ineffective use of their primary methods also reported whether or not they used condoms as a back-up method. Effective condom use for STI prevention was defined as proper use of condoms for every sexual encounter whether alone or with other contraceptive methods.

The study was approved by the university’s Institutional Review Board. The survey was administered over an 18-month period from 2002 to 2003 at a Southeastern Urban University with an enrollment of 26,770 students. At the time of the survey, the university’s data showed that approximately 50% of all students reported drinking alcohol, while 39% reported binge drinking in the past month (VCU Office of Health Promotion, 2003). Participants were drawn from the subpopulation of 15,711 female undergraduates. A paper version of the survey was completed anonymously and voluntarily by women attending student health clinic appointments or at a recruitment booth at a variety of campus locations. Surveys were also collected via telephone screening when a woman called to be screened for a health education study in response to seeing advertisements on flyers, campus bus posters or in local free newspapers. Advertisements for the intervention study stated that researchers were looking for participants for a health education study who were 18–24 years of age, were current university students, were able to get pregnant, and who drank alcohol. No mention of contraception, condoms or binge drinking was included in the advertisements. Survey respondents were not compensated for participation.

Analytical methods

Descriptive statistics characterized the frequency of risky drinking, ineffective contraception, and ineffective condom use. Demographic, behavioral, and knowledge differences between women with ineffective contraception or ineffective condom use were examined through separate univariate analyses. Significantly related variables were considered as candidate explanatory variables for the development of predictive equations of ineffective contraception and ineffective condom use. Variables that were significantly related to each risk were entered into the model unless their conceptual overlap with another variable was too great. Contraception methods were divided for analyses into barrier or hormonal methods. Barrier methods included condoms, diaphragms, and cervical caps, while hormonal methods included birth control pills, hormone injections (depo provera or lunelle) and later in the study, when they became available, the birth control patch and birth control vaginal ring. Because binge drinking, number of binges, and number of weekly drinks, (components of risk drinking) were all related to the outcomes of interest, as was the summary variable of risk drinking, we chose to examine risk drinking as a predictive variable for parsimony. Risk drinking was the single drinking predictive variable entered into the explanatory models, which were generated using logistic regression (SAS Version 9.1, Proc Logistic). For most analyses, we used data from all available participants. The sample size for some analyses was reduced due to the branching nature of some questions, which resulted in no data in some fields. No correction for alpha spending was utilized

because multivariate model development would identify only variables that were strong independent explanatory factors while controlling for other variables.

Results

Table I display the demographic, drinking, sexual activity, and risk status of the full sample. Survey respondents were 2012 university women of ages 18–24, with an average age of 20.4 (SD 1.7, range 18–24). Nearly all (99.8%) were full-time students who were unmarried (94.1%). Most respondents were White (1339, 67%) or Black (483, 24%). Most surveys were administered by telephone from women calling in to be screened for a health education study (1339, 67%), with other surveys returned from students who voluntarily completed it while waiting for an appointment at the student health center (618, 31%) or from project booths at special events (54, 3%).

The typical respondent was a 20-year-old, single college sophomore attending college full-time who drank one to seven drinks per week, drank five to eight drinks per occasion at least once in the past 90 days, and was considered a risky drinker based on her binge behavior. She was sexually active, using some form of contraception, most often a hormonal method, with a primary goal of pregnancy prevention that she initiated with others' input. She was not taking a multivitamin pill daily.

Drinking behaviors

Of the 2012 women, most (1273, 64%) reported drinking one to seven drinks per week on average, but a substantial number reported an average of eight or more drinks per week (457, 23%). A minority abstained from alcohol (274, 14%), possibly an artifact of recruitment material seeking women who “drink alcohol.” The majority (1271, 63.2%) had at least one binge (five or more standard drinks per occasion) in the past 90 days, which might represent a higher rate than in the university as a whole, but which is not directly comparable to the university data due to differing time frames (30 days in the university data *versus* 90 days in this study). The women reported an average of 5.5 (SD = 9.3) occasions on which they consumed five or more standard drinks over the past 90 days. The number of binge episodes in the past 3 months ranged from 0 to 80. Thus, the majority ($n = 1296$, 64%) of the sample was drinking at risk levels, either due to reporting at least one occasion when they drank five or more standard drinks ($n = 1271$), reporting five or more as their highest number of drinks per occasion over the past 90 days ($n = 987$) or reporting drinking eight or more standard drinks per week on average ($n = 457$).

Sexual activity and related risks

Among the full sample of 2012 women, the majority ($n = 1603$, 79.7%) reported they had vaginal intercourse with a male partner in the past 90 days. An additional 41 women reported using contraception or condoms to prevent pregnancy or STIs but reported no current sexual activity. In general, analyses included all women reporting contraception or condom use even if they reported no current sexual activity.

Ineffective contraception—Only four women among the sample reported that they had been informed by a doctor that they were infertile. Very few ($n = 4$, 0.2%) were currently pregnant, and few ($n = 9$, 0.5%) were attempting to become pregnant. Infertile and pregnant women, and those attempting pregnancy, were not included in later analyses of effectiveness of contraception or condom use. Most women ($n = 1528$, 75%), reported using a method of contraception, including some who were not currently sexually active (Table II). The average age of first contraception was 17 (SD 1.8, minimum age 11, maximum age 23).

Women reported all methods they had used in the past 90 days, and many used multiple methods. Condoms were the most common, used by 973 women (48.4%), followed by birth control pills, used by 961 women (47.8%), but more than half the women in these groups were using both pills and condoms. Table II depicts the methods used and the proportions of women using them effectively for pregnancy prevention and for STI protection and includes the full sample, including women who reported no current sexual activity. Despite the nearly universal use of contraception, including methods typically considered efficacious, 268 sexually active women (18.3%) were using their method ineffectively, placing them potentially at risk for pregnancy.

Ineffective condom use—While nearly all sexually active women were using some form of contraception, only those using condoms were considered likely to be protected from STI exposure. Of those using condoms, 11% were using them ineffectively, potentially placing the women at risk for STI exposure, depending on her partner's status.

Paired risks: Problem drinking with ineffective contraception or ineffective condom use

Risk drinking was more common among sexually active women than nonsexually active women. A significant association was found between sexual activity and risky drinking (binge, frequent or both); 1075 (73% of 1472) sexually active women were risky drinkers, compared to 217 (62% of 350) of nonsexually active peers, $\chi^2_{(2df)}=18.96, p < 0.0001$. Based on their categorization as risk drinkers and ineffective users of contraception, 261 (13%) of the total sample of college women had paired risks of problem drinking and ineffective contraception over the past 90 days. Significantly, more women in the full sample (618, 30.7%) had paired risks of problem drinking and ineffective condom use over the past 90 days.

Ineffective contraception versus effective contraception—Nine variables distinguished women with ineffective contraception from those without ineffective contraception in univariate analyses. Table III presents the results of the univariate analysis of 1644 women with complete data on contraception use. Those of nonwhite race, with higher average drinks per week, recent binge drinking, a greater highest number of drinks per occasion, more binges in 90 days, and categorization as a risk drinker had higher rates of ineffective contraception. The type of contraception differentiated the groups, with pill users showing a higher rate of effective contraception than condom users. Women whose health professional made the decision to use contraception had a lower rate of ineffective contraception, and those who made the decision with others also had lower pregnancy risk.

Lastly, greater age at first contraception (17 vs. 16.7) was related to a higher rate of effective contraception.

Explaining ineffective contraception—The following variables were used to generate a model for ineffective contraception: race (dichotomized as white vs. women of color), average drinks per week (more than eight vs. fewer than eight), binge drinking (yes/no), number of binge episodes, method of contraception (barrier, hormonal, or both, with “hormonal” as the reference level), who made the contraception decision (coded as a 6-level variable with “self” as the reference level), and age of first contraception.

The results of the logistic regression analysis of pregnancy risk are presented in Table IV. The model was significant (likelihood ratio $\chi^2 = 150.81$, $p < 0.0001$), and the variables in the model produced an R^2 of 0.10. The odds of ineffective contraception were increased by risk drinking (OR 1.73, CI 1.24–2.42), the use of barrier contraception (OR 2.9, CI 2.1–4.1), and reliance on a partner’s decision to use contraception (OR 3.8, CI 1.47–9.8), but were decreased by being white vs. a woman of color (OR 0.51, CI 0.37–0.69), the use of barrier with hormonal contraception (OR 0.48, CI 0.32–0.73), and higher age at first contraception (OR 0.90, CI 0.82–0.98).

Ineffective condom use vs. effective condom use—Because condoms can be effective for both contraception and STI prevention, and condom use is at least partially under the control of a male partner, condom use was considered separately from other contraceptive methods. Eleven explanatory variables distinguished women with absent or ineffective condom use ($n = 878$) from those with effective use ($n = 1134$) in univariate analyses. Table V presents these differences. Women with ineffective condom use were 3 months older than their peers at lower risk. Recruitment source differentiated the groups, with a higher proportion of those screened by telephone for a health study vs. waiting room or passerby respondents reporting ineffective condom use. Average drinks per week differentiated the groups, with each increase in drinking corresponding to an increased proportion of women with ineffective condom use. Similarly, binge drinking and the highest number of drinks per occasion were related to ineffective condom use in a nearly linear fashion. Women with ineffective condom use reported a higher number of binges in the past 90 days than their condom-using peers (7 vs. 5). The type of contraception was obviously related to STI protection, with a lower proportion of women who used hormonal and other methods using condoms effectively for STI prevention. Ineffective condom use was evidenced by the majority of those whose parent, partner or self alone had decided to use contraception, and by fewer women who reported, they and their partner, they and others, or their health professional had made the decision to use contraception. The reason for condom use (among those using condoms) also differentiated the groups, with more women who stated that they used condoms to avoid STIs using them ineffectively than their peers who were using condoms for pregnancy prevention or for avoidance of both STIs and pregnancy.

Explaining ineffective condom use—The following variables entered the model for ineffective condom use and were coded in the same manner as above: age, risk drinking, and decision about contraception. Method of contraception was not included in the model due to its conceptual overlap with the response variable. The recruitment source and reason for

using condoms (coded as a 3-level variable with both STI and pregnancy prevention as the reference level) were entered as potential explanatory variables.

The results of the logistic regression analysis of ineffective condom use are presented in Table VI. The model was significant (likelihood ratio $\chi^2 = 33.12, p < 0.0001$), and the variables in the model produced an R^2 of 0.04. Ineffective condom use was increased by reliance on a partner's decision to use condoms (OR 2.64, CI 0.91–7.68), the use of condoms for STI prevention only (OR 2.73, CI 1.48–5.03), and by risk drinking (OR 1.90, CI 1.29–2.8). Neither age nor recruitment source were independent predictors of ineffective condom use.

Discussion

Risk drinking in this sample of college women was high, but consistent with epidemiologic studies of college drinking. The unique finding of this study was that the rates of binge drinking combined with ineffective contraception or ineffective condom use among college women were surprisingly high, with 44% of women reporting both risk level drinking and ineffective condom use, and 13% reporting both risk level drinking and ineffective contraception that could have possibly led to unplanned pregnancy. Sexually active women had higher rates of risk-level drinking than their nonsexually active peers, consistent with the literature on emerging adults suggesting that a constellation of health risk behaviors co-occur during this time period. Risk drinking contributed strongly and in the expected direction to explanatory models of both ineffective contraception and ineffective condom use in college women. The prevalence of ineffective use of contraceptives and condoms was concerning, especially given that the majority of sexually active women reported using some contraception and may be assuming that they are preventing pregnancy or STIs. These data imply that a sizable minority of college women are vulnerable to negative outcomes from drinking, including increased risk of unprotected intercourse that could lead to pregnancy or acquisition of an STI.

Two demographic characteristics, race and age, were associated with ineffective contraception, but not ineffective condom use. Ineffective contraception was increased among women of color compared to white women. The reason for this is unclear. Potential explanations that should be explored include differential access to contraception, differential perception/occurrence of side effects, and partner variables. Age was a protective factor, although its impact on the odds of ineffective contraception was small.

Factors other than drinking added to risks, and these may be amenable to intervention. Barrier methods of contraception nearly tripled the risk of ineffective contraception. The use of condoms is variable across intercourse events; this is consistent with the finding that most women seeking abortions report inconsistent or incorrect condom use as a reason for their unintended pregnancies (Jones, Darroch, & Henshaw, 2002). Nearly, half of unintended pregnancies occur in women who are using contraception, but who are using it ineffectively (Harlap, Kost, & Forrest, 1991). Barrier methods may be easier to forgo or forget in any specific instance, and are likely to be used less consistently as long as the sexual relationship exists. (Macaluso, Demand, Artz, & Hook, 2000). Barrier methods may be especially

vulnerable to nonuse during episodes of intoxication. Sexually active men and women reported that when they were under the influence of drugs or alcohol, they were less tolerant to the pleasure reduction of condoms; their awareness of danger was reduced, and women were less effective in overcoming men's reluctance to use condoms (Nadeau, Truchon, & Biron, 2000).

Women reporting both barrier and hormonal methods of contraception were at lower risk for ineffective contraception than those using only hormonal methods. A possible explanation for this is that women who are willing to use two methods are more concerned about STI or pregnancy risks and more tolerant of side effects in an effort to protect themselves, which may result in better adherence to correct and consistent usage guidelines compared to women who rely on just one method.

Some women relied on their partner to introduce a contraceptive method and this nearly quadrupled the risk of ineffective contraception and more than doubled the risk of ineffective condom use. Qualitative research is needed to better understand the reasons women and their partners make contraceptive choices, especially early in their sexual histories. We speculate that some women may not be strongly motivated to avoid pregnancy or may not be ready to accept the need to prepare for sexual intercourse by initiating contraception for her own health. It is possible that a woman who does not initiate contraception herself may be more prone to magical thinking about her chances of getting pregnant or a STI: if she does not address the issue, it will not happen to her. One could speculate that she may also be reluctant to initiate contraception because doing so would signify that she intended to have intercourse when she may not have felt ready or may not have believed that she should engage in sexual behavior. Without prior experience with contraception, she may be reluctant to seek it on her own, deferring to or relying on her partner.

It is possible that when a partner introduces the issue of contraception, he proposes or uses condoms because that is the method he can control. In that case, a woman may not seek hormonal contraception specifically for birth control, assuming that she is adequately protected by barrier methods. In fact, when used correctly, barrier methods provide a high rate of pregnancy and STI prevention, but in our study, more women reported using these methods incorrectly and inconsistently. Teaching women the correct use of condoms or encouraging college women to decide autonomously to use contraception may be beneficial. If a woman makes the decision to use contraception, she takes on the responsibility and acknowledges the need for contraception, thus potentially initiating and enhancing her own motivation to maintain this behavior. In addition, she is likely to choose a method she can control, primarily the hormonal methods that are more effective for pregnancy prevention in real-life use. Hormonal methods, especially those that are used weekly such as the contraceptive patch, monthly such as the vaginal contraceptive ring or quarterly such as contraceptive injections, may be less subject to problematic compliance or forgetting (Archer, Cullings, Creasy, & Fisher, 2004) and reasons for liking long-acting contraception included "not having to remember anything" (Novak, de la Loge, Abetz, & van der Meulena, 2003). Women below age 35, without serious complicating medical conditions,

such as many college women, are usually eligible for the use of hormonal methods of contraception if they do not smoke.

Risk drinking increased the odds of ineffective contraception 1.7 times. One possible explanation for this finding is that women who binge forget to use their method of contraception, whether it is using a condom in the moment or taking a pill at a scheduled time. It is also possible that a third variable, such as a proclivity to risk taking and experimentation during emerging adulthood, underlies a relationship between binge drinking and ineffective contraception.

The factors related to ineffective condom use were similar to those related to ineffective contraception, with some important distinctions. The only way to prevent STIs are through abstinence, sex with only one, uninfected partner, or by using condoms, yet those whose primary reason for using condoms was for STI prevention had more than doubled odds of ineffective condom use. A likely reason is that many women indicated that they used condoms intermittently or only on the first intercourse with a new partner or only with a nonprimary partner. Health education messages should emphasize the need for not only using condoms, but using them correctly for every episode of sexual intercourse with every sexual partner. College women's concern about STIs seems to be time limited. For STI protection, consistent, accurate condom use is a necessity. It may help women to maintain condom use if they intend to prevent pregnancy as well as preventing STIs.

Women reported similar patterns of risk behaviors, whether they responded to anonymous surveys or phoned in to be screened personally for a health study. While some literature has demonstrated increased reporting of socially disapproved behaviors with anonymous methods, we did not find differences in the rates of reported contraceptive use or drinking behaviors among college women. Self-report methods, whether via anonymous survey or phone screener, appear to yield similar response patterns in this population.

Limitations of this study included the setting, which included only one university, and using a self-report, anonymous survey format (completed in this manner by one-third of respondents) that resulted in some unusable data. Although a wide cross-section of students completed the survey, the sample is one of convenience. Students who called to be screened for a study (two-thirds of respondents) responded to advertisements soliciting volunteers to be screened for a health education study and it is possible that a selection bias existed in the sample, with respondents being higher risk individuals than the typical student. We chose to use the anonymous survey to maximize the likelihood of truthful responding, accepting the likelihood that some surveys would be incomplete or markings would be unclear, rendering them unusable. Although we found that risk drinking significantly affected contraception effectiveness and consistent condom use, we were not able to conduct finer analyses of paired risks. Additionally, because we used five drinks per occasion to define a binge, our rate of binge drinking for women may be a slight underestimate, given that some women may have met the current definition of binge drinking, four per occasion, without endorsing five per occasion. Studies are needed to examine event-level data that could elucidate the specific nature of the relationship between risk drinking and both ineffective contraception and condom use. Lastly, our study only examined women's behaviors. Little is known about

college men and whether their drinking patterns affect their use of contraception or STI prevention methods.

In addition to ongoing efforts to reduce problem drinking, colleges should promote effective contraception and condom use among sexually active women. Colleges and universities should consider coordinating their programs to reduce drinking with programs for reproductive health. Counseling or prevention messages could emphasize that being sexually active comes with risks and responsibilities, and risk drinking appears to increase the risks. For those women who choose to be sexually active, colleges should encourage the use of long-acting hormonal methods for contraception and retain condoms for STI prevention, emphasizing the need, not just for contraception but for effective contraception and STI prevention for every intercourse event. These services could be incorporated into residence hall or orientation programming rather than offered only through student health clinics, and could be added to information distributed about university health screening requirements by many student health services. Preventing unintended pregnancy and STI exposure are urgent health care priorities, especially for the majority of college women who binge drink.

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Table IDemographic and risk characteristics of university women ($n = 2012$).

Characteristic	<i>N</i>	Percentage
Race ^a		
White	1339	66.5
Black	483	24.0
Asian	145	7.2
Pacific islander	21	1.0
Other ^b	24	1.2
Recruitment source		
Passerby or clinic waiting room	672	33.4
Telephone screener for health study	1339	66.6
Drinks per week		
0	274	13.7
1–7	1273	63.5
8 or more	457	22.8
Highest number of standard drinks per day		
0	131	6.5
1–4	462	23.0
5–8	682	33.9
9–11	196	9.7
12 or more	109	5.4
Reports a binge in the past 90 days ^c		
No	741	36.8
Yes	1271	63.2
Risky drinker		
No	716	35.6
Yes	1296	64.4
Had vaginal sex in the past 90 days		
No	402	20
Yes	1603	79.7
Using a contraceptive method		
No	484	24.1
Yes	1528	75.9
If using condoms, why?		
Prevention of STIs	52	7.1
Pregnancy prevention	213	29.1
Both	468	63.8
Contraception		
Effective (includes deliberate abstinence)	1644	81.7
Ineffective	368	18.3
Condom use		

Characteristic	<i>N</i>	Percentage
Effective	1134	56.4
Ineffective	878	43.6
Paired risk drinking and ineffective contraception		
No	1751	87
Yes	261	13.0
Paired risk drinking and ineffective condom use		
No	1394	69.3
Yes	618	30.7

Notes:

^aSelf-reported ethnicity was 96.7% non Latina, and 3.3% Latina.

^bOther included those women characterizing their race as biracial ($n = 13$) or who provided race or ethnicity information that could not be characterized.

^cBinge was defined as having five or more standard drinks per occasion.

Table II

Frequency of contraception and condom use and their effectiveness for pregnancy or STI prevention among 2012 college women.

Method	N	Percentage	Pregnancy prevention		STI prevention	
			Number of effective users (any effective method)	Percentage effective users	Number of effective users (condom use)	Percentage effective users
Condoms only	435	21.6	290	67	283	66
Condoms with other	63	3.1	52	82	52	82
Pills only	486	24.2	426	88	7 ^a	78
Pills with condoms ^b	475	23.6	425	89	401	84
Other	69	3.4	46	67	0	0
None ^c	484	24.1	1	0.2	1	0.2

Notes:

^a Includes women who missed pills but used condoms as a backup method.

^b Includes women who report using both birth control pills and condoms as joint primary methods.

^c Includes four women reporting infertility, four women who were pregnant, and nine women seeking pregnancy.

Table III

Differences between 1644 college women with effective and ineffective contraception.

Variable	Effective contraceptive use		Ineffective contraceptive use		χ^2 or <i>t</i> -test
	N or mean	Percentage or SD	N or mean	Percentage or SD	
Race					
	White women	85	194	15	26.15***
	Women of color	75.8	174	24.2	
Mean drinks/week	0	84.7	42	15.3	19.96***
	1-7	83.6	209	16.4	
	8 or more	74.6	116	25.4	
Recent binge drinking	No binges in 90 days	84.9	112	15.1	7.91**
	1 or more binges	79.9	256	20.1	
Most drinks	None	85.5	19	14.5	17.56**
	1-4	85.1	69	14.9	
	5-8	81.1	129	18.9	
	9-11	74.5	50	25.5	
	12 or more	73.4	29	26.6	
No. of binges in 90 days	No	85.1	107	14.9	3.47***
	Yes	79.9	261	20.1	8.33**
Type contraception	Condoms only	65.5	150	34.5	134.96***
	Condoms with other	87.3	8	12.7	
	Pills only	88.1	58	11.9	
	Pills with condoms	92.0	38	8.0	
	Other	66.7	23	33.3	
Who made contraception decision?	Self	81.8	157	18.2	34.21***
	Self and partner	77.7	124	22.3	
	Self and others	87.5	45	12.5	
	Health professional	86.8	11	13.3	
	Parent	84.5	13	15.5	
	Partner	50.0	13	50.0	

Variable	Levels	Effective contraceptive use		Ineffective contraceptive use		χ^2 or <i>t</i> -test
		N or mean	Percentage or SD	N or mean	Percentage or SD	
Age first contraception		17.08	1.81	16.7	1.75	3.47***

Notes:

* Risk drinker was a woman who reported that in the last 90 days she had at least one binge episode or whose mean drinks per week were eight or more.

** $p < 0.01$ and

*** $p < 0.0001$.

Table IV
 Summary of logistic regression analysis of ineffective contraception among college women.

Variable	β	SE	OR	95% CI	Wald χ^2
Race white vs. woman of color	-0.34	0.08	0.51	0.37-0.69	18.72****
Risk drinking yes vs. no	0.27	0.09	1.73	1.24-2.42	10.29***
Barrier vs. hormonal contraception	0.96	0.10	2.93	2.1-4.1	89.58****
Barrier and hormonal contraception vs. hormonal	-0.84	0.12	0.48	0.32-0.73	46.63****
Partner vs. self decision to use contraception	1.15	0.41	3.80	1.47-9.8	8.03***
Age of first use of contraception	-0.11	0.04	0.90	0.82-0.98	6.54**

Note:

** $p < 0.01$,

*** $p < 0.005$ and

**** $p < 0.0001$.

Table V

Differences between women with absent or ineffective vs. effective condom use.

Variable	Levels	Effective condom use n = 1134		Ineffective condom use n = 878		χ^2 or t-test
		N or mean	Percentage or SD	N or mean	Percentage or SD	
Age		20.3	1.73	20.6	1.7	3.57***
Recruitment source	Passerby/waiting room	406	60.4%	266	39.6	7.59*
Mean drinks/week	Screeners	727	54.29	612	45.7	
	0	177	64.6%	97	35.4	19.23***
Recent binge drinking	1-7	729	57.3	544	42.7	
	8 or more	222	48.6	235	51.4	
Most drinks per occasion	None in 90 days	469	63.3%	272	36.7	22.9***
	1 or more binges	665	52.3	606	47.7	
No. of binges in past 90 days	None	89	67.9%	42	32.1	28.07***
	1-4	287	62.1	175	37.9	
Risk drinker ^d	5-8	357	52.4	325	47.7	
	9-11	93	47.5	103	52.6	
Type contraception	12 or more	53	48.6	56	51.4	
	No	5.37	9.49	6.76	10.22	2.68**
Who made contraception decision?	Yes	456	63.7%	260	36.3	24.25***
	Condoms only	678	52.3	618	47.7	
Health professional	Condoms with other	283	65.1%	152	34.9	985.51***
	Pills only	52	82.5	11	17.5	
Self and partner	Pills with condoms	7	1.4	479	98.6	
	Other	401	84.4	74	15.6	
Self and others	Self	0	0	69	100	
	Self and partner	420	48.6	444	51.4	86.82***
Health professional	Self and others	319	57.4	237	42.6	
	Health professional	274	75.9	87	24.1	
		51	61.5	32	38.6	

Variable	Levels	Effective condom use <i>n</i> = 1134		Ineffective condom use <i>n</i> = 878		χ^2 or <i>t</i> -test
		<i>N</i> or mean	Percentage or SD	<i>N</i> or mean	Percentage or SD	
Reason you use condoms	Parent	36	42.9	48	57.7	
	Partner	11	42.3	15	57.7	
	Avoid STIs	30	53.6	26	46.4	172.24***
	Avoid pregnancy	156	71.2	63	28.8	
	Avoid STIs and pregnancy	401	76.8	121	23.2	
Reason you use contraception	Avoid STIs	1	50	1	50	129.34***
	Avoid pregnancy	192	36.0	342	64.0	
	Avoid STIs and pregnancy	118	72.8	44	27.2	

Notes:

^a Risk drinker was a woman who reported that in the last 90 days she had at least one binge episode or whose mean drinks per week were eight or more.

* *p* < 0.05,

** *p* < 0.01 and

*** *p* < 0.0001.

Table VI

Summary of logistic regression analysis of ineffective condom use among college women.

Variable	β	SE	Odds ratio	95% Confidence interval	Wald χ^2
Partner decided to initiate condoms vs. self	0.96	0.46	2.64	0.91–7.68	4.33*
Using condoms for STI prevention vs. STI and pregnancy prevention	0.58	0.20	2.73	1.48–5.03	8.05***
Eisk drinking yes vs. no	0.32	0.10	1.90	1.29–2.8	10.65***

Note:

* $p < 0.05$ and

*** $p < 0.005$.