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Toward prevention of alcohol exposed pregnancies: characteristics that relate to ineffective contraception and risky drinking

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Abstract

Alcohol-exposed pregnancy is a leading cause of preventable birth defects in the United States. This paper describes the motivational patterns that relate to risky drinking and ineffective contraception, two behaviors that can result in alcohol-exposed pregnancy. As part of an intervention study aimed at reducing alcohol-exposed pregnancy 124 women were recruited and reported demographic characteristics, readiness to change, stages of change, drinking, contraception, and sexual behavior history. Our results showed the following. *Drinking:* A significant positive correlation was found between the number of drinks consumed in 90 days and the Importance to reduce drinking ($r = .23$, $p = .008$). A significant negative correlation between number of drinks and confidence to reduce drinking ($r = -.39$, $p = .000$) was found as well. Significant differences were found in the total number of drinks consumed in 90 days between the five stages of change ($F = (4,118)$, 3.12 , $p = .01$). Women in Preparation reported drinking a significantly higher number of drinks than women in other stages of change. *Contraception:* There were significant negative correlations between ineffective contraception and Importance ($r = -.38$, $p = .00$), confidence ($r = -.20$, $p = .02$) and Readiness ($r = -.43$, $p = .00$) to use contraception effectively. Significant differences in contraception ineffectiveness were found for women in different stages of change ($F = (4,115)$ 8.58 , $p = .000$). Women in Precontemplation reported significantly higher levels of contraception ineffectiveness compared to women in other stages of change. Results show a clear relationship between higher alcohol consumption and higher levels of motivation to reduce drinking. In contrast, higher levels of ineffective contraception were related to lower levels of motivation to use contraception effectively. This suggests risky drinking may be better targeted with brief skills building interventions and ineffective contraception may require interventions that enhance problem awareness and motivation.

Keywords

Alcohol exposed pregnancy; Binge drinking; Contraception; Self-efficacy; Stages of change

Introduction

The problem of alcohol exposed pregnancies

Prenatal alcohol exposure is a leading cause of preventable birth defects in the United States (Jacobson and Jacobson 1994). Alcohol-exposed pregnancy has been associated with a spectrum of chronic negative health outcomes including learning, emotional regulation, and physical disorders known as fetal alcohol spectrum disorders (FASD; Stratton et al. 1996; Sokol et al. 2003; Jones and Smith 1973). At the most severe end of the FASD spectrum, fetal alcohol syndrome (FAS) is characterized by distinct facial features, growth abnormalities, and neurocognitive deficits that are life-long (Stratton et al. 1996; Jones and Smith 1973). While approximately two of every thousand live births in the United States result in FAS, scientists estimate at least four times more births result in less severe, yet chronic and disabling, developmental and physical abnormalities along the spectrum, sometimes characterized as alcohol-related neurobehavioral disorder or alcohol-related birth defects (Sokol et al. 2003; Mattson et al. 1997; May and Gossage 2001).

The extent of prenatal alcohol exposure

There is no known safe level of fetal alcohol exposure (Lundsberg et al. 1997; Shaw and Lammer 1999; Sood et al. 2001) yet an estimated 15–50% of fetuses are exposed to alcohol in utero (Ebrahim et al. 1999, 1998; Floyd et al. 1999a, b). For 50% of women, pregnancy goes unrecognized until the sixth week, which includes a critical time for early brain development (Floyd et al. 1999a, b). While most women do abstain from alcohol following pregnancy recognition, more than half of pregnant women's recognition comes after the fetal brain has begun to develop. Additionally, epidemiological estimates suggest that approximately 10.1% of women continue to drink even after pregnancy is recognized, while 1.9% engage in heavy drinking and binge drinking after pregnancy recognition (Tsai et al. 2007). Overall, an estimated 15% of pregnant women report drinking alcohol while pregnant, either before or after pregnancy recognition (Ebrahim et al. 1999).

Risky drinking among women of child bearing age

One of the nation's health objectives is to reduce drinking by women of child-bearing age, thus reducing risk for alcohol-exposed pregnancy (US Department of Health and Human Services 2000). Women of child bearing age who drink at levels defined as "risky" by the National Institute on Alcohol Abuse and Alcoholism (greater than seven standard-sized drinks per week and/or three or more standard drinks per occasion) (National Institute on Alcohol Abuse and Alcoholism 2005) are at a higher risk for alcohol-related health problems, including alcohol-exposed pregnancy if they are at risk for pregnancy. Recent estimates of women's drinking behavior suggest approximately 50% of non-pregnant women drink alcohol (Ebrahim et al. 1999) while an estimated 13% engage in binge drinking (Tsai et al. 2007). Larger proportions of binge drinkers with higher quantity of consumption were found among women of younger ages (18–24 years) or current smokers (Tsai et al. 2007). A study examining responses to the 2000 National Alcohol Survey found that 7% of women of childbearing age drank more than seven drinks weekly and consumed five or more drinks in one occasion in the past month (Nayak and Kaskutas 2004).

Ineffective contraception

Risky drinking alone is a necessary but insufficient risk factor for alcohol-exposed pregnancy. The other necessary component is pregnancy. Risk for alcohol-exposed pregnancy is elevated among women who drink and are at risk for pregnancy, especially if they are not planning or intending to become pregnant. Women are at risk for pregnancy if they are sexually active with a man, use no contraceptive method, use only ineffective contraceptive methods, use putatively

effective methods erroneously, or use effective methods intermittently. Unplanned pregnancy rates are high; an estimated 50% of women aged 15 to 44 in the United States have experienced at least one unplanned pregnancy and half of all pregnancies are unintended (Henshaw 1998). More than 50% of unplanned pregnancies occur to the 7% of women who do not use any contraception method at all but do not desire pregnancy and another half occur to women who use contraception ineffectively or intermittently (Brown and Eisenberg 1995; Trussell and Vaughan 1999).

Preventing alcohol exposed pregnancies

Helping women increase contraception effectiveness and reduce risky drinking has the potential to reduce the frequency of alcohol-exposed pregnancy by preventing unplanned pregnancies and fetal exposure to alcohol should pregnancies occur. A few interventions have been found to reduce alcohol-exposed pregnancy risk among community and college women. One randomized controlled trial sought to reduce women's risk for alcohol-exposed pregnancy by targeting reductions in risky drinking. Women who received a 15 min, physician-delivered educational intervention with a contract significantly reduced their weekly alcohol use and episodes of binge drinking; these women were also almost two times more likely to reduce their drinking by 20% by the follow-up point. The largest decreases in alcohol consumption occurred among women in the experimental group who became pregnant during the follow-up period, thus reducing alcohol-exposed pregnancy risk among these women (Manwell et al. 2000).

Two other randomized controlled studies were designed to reduce alcohol-exposed pregnancy risk by targeting both behaviors: risky drinking and ineffective contraception (Floyd et al. 2007; Ingersoll et al. 2005). These two studies tested the efficacy of brief counseling interventions based on motivational interviewing (MI) and the stages of change (Floyd et al. 2007; Ingersoll et al. 2005). Community women who were randomly assigned to receive four MI counseling sessions significantly reduced their risk for alcohol-exposed pregnancy when compared to women assigned to an information only control condition (Floyd et al. 2007). Similarly, college women were significantly less likely to drink at risky levels and use ineffective contraception if assigned to a one-session MI plus feedback intervention versus an information control condition (Ingersoll et al. 2005).

Very few studies have focused their attention on the characteristics of women that place them at risk for alcohol-exposed pregnancy. College drinkers were more likely to be at risk for an alcohol-exposed pregnancy if they were binge drinkers and used barrier rather than hormonal contraception, and if their partner initiated contraception (Ingersoll et al. 2008). Another study used an epidemiologic survey to characterize the alcohol-exposed pregnancy risk of community women not seeking treatment. In that study, women with a history of recent drug use, smoking, inpatient alcohol or drug abuse treatment, inpatient mental health treatment, multiple sex partners, and recent physical abuse were more likely to be at risk (Project CHOICES Research Group 2002). These studies have identified a few historical and behavioral characteristics of women at risk among groups of women not previously known to be at risk for alcohol-exposed pregnancy. If additional salient characteristics can be identified among women at risk, interventions could be customized for maximum effect. Thus, this paper aims to describe the socio-demographic, behavioral and motivational characteristics related to risky drinking and ineffective contraception among women found to be at risk for alcohol-exposed pregnancy in order to identify specific therapeutic targets that may further the development of effective interventions.

Methods

Participants

The data used for this investigation came from the baseline assessment of an ongoing randomized control trial, “Project EARLY”, developed to test the efficacy of a one-session motivational interviewing-based intervention to reduce alcohol-exposed pregnancy risk among women of child bearing age (18–44). *Alcohol-exposed pregnancy risk* was defined as having sexual intercourse with a man while using contraception ineffectively (no use at all, incorrect or inconsistent use of an effective method or use of an ineffective method) and drinking at risky levels, defined as consuming on average more than 7 standard drinks per week or more than three drinks on one occasion (binge drinking). *Examples* of ineffective contraception use are: missing two birth control pills in any month without using an effective backup method, not putting the condom in place before the insertion of the penis into the vagina or not using a new condom with each penetration. The use of an ineffective method refers to the use of any method that results in 20 or more pregnancies in a year per 100 women (e.g.: the rhythm method, withdrawal, use of spermicides alone etc.)

Inclusion criteria were: (1) 18-44-year-old fertile women; (2) not pregnant or planning pregnancy in the next 6 months; (3) had vaginal intercourse with a man during the previous 90 days with ineffective contraception (see alcohol-exposed pregnancy risk definition above); (4) engaged in risky drinking during the previous 90 days (see alcohol-exposed pregnancy risk definition above) and (5) willing to be followed for 6 months.

Exclusion criteria were: (1) Untreated Major Depressive Disorder according to DSM-IV-TR criteria (Caldwell 2002); (2) Untreated Opioid Dependence according to DSM-IV-TR criteria (Caldwell 2002). Women with these conditions, if untreated, were excluded in this preliminary efficacy trial to avoid the inclusion of a population that was likely to have treatment needs that were beyond the scope of the study intervention. Such women were referred to care in the community.

Baseline measures

Women reported demographic characteristics, drinking history, sexual behavior history, contraception history, perceived pregnancy risk, and health behavior history on forms created for the study. To assess daily drinking, vaginal intercourse, contraception method used and effectiveness of method used, a Timeline Follow Back calendar-based interview tested previously in Project CHOICES (Floyd et al. 2007) was used. The Timeline Follow Back approach has been extensively evaluated with clinical and non clinical populations (Sobell and Sobell 2003) and has been shown to be a generally reliable and valid method for collecting data on drinking (Sobell and Sobell 1992).

Participants were asked to rate how important, confident and ready they were to make a change in their drinking and to use contraception effectively on a visual analogue scale that ranged from 0 = “Not at all important/confident/ready” to 10 = “very important/confident/ready” (Importance, confidence and Readiness Ruler) for drinking and contraception (Rollnick 1998). The ruler is a simple visual analog scale that was originally developed for measuring motivational levels in smoking cessation (Biener and Abrams 1991), and has subsequently been used in different settings such as alcohol (Carey et al. 2002), needle exchange (Blumenthal et al. 2001) and safe sex studies. A recent study (LaBrie et al. 2005b) found that scores on Alcohol and Safer Sex Change Rulers correlated with scores on the Readiness to Change Questionnaire ($r = .77$ for alcohol; $r = .77$ for safer sex). In both domains, the rulers were able to predict behavioral intention just as well as the Readiness to Change Questionnaire,

suggesting that the rulers had good concurrent criterion validity. The ruler also demonstrated good discriminant validity.

Participants answered questions from an algorithm about their stages of change for drinking and contraception behavior. Stages of change (precontemplation, contemplation, preparation, action and maintenance) were categorized according the trans-theoretical model of change (TTM, Prochaska and DiClemente 1982; Civic 2000). More specifically, women who were not considering change within the next 6 months were classified into *precontemplation*. Participants who intended to change within the next 6 months were classified into *contemplation*. Those who were preparing to change within the next month were classified into *preparation*. Participants who had already changed their behavior and consistently adhered to behavior change within the previous 6-months were classified as being in the *action* stage. Those who had maintained behavior change for more than 6 months were classified as being in the *maintenance* stage.

Procedures

Women were recruited for the study through newspaper and online advertisement and flyers posted in two cities in Virginia. Women who responded to the advertisement were then pre-screened by phone to determine eligibility for the study. A research therapist administered the 75 minute assessment to eligible and consenting women.

Analyses

Descriptive statistics characterized the sample demographics, along with drinking, intercourse and contraceptive behavior. Pearson correlations were used to identify relationships between numerical variables such as total number of drinks, total number of binges, contraception effectiveness, age, years of education and importance, confidence and readiness to change. Independent sample *t*-test and ANOVAs were used to compare differences in total number of drinks, total number of binges and contraception effectiveness across 2 or more conditions. MANOVAs were conducted to assess if there were differences between different levels of an independent variable (Alcohol stages of change, Contraception stages of change) on a linear combination of three dependent variables (Importance, confidence and Readiness). All statistical tests were two-sided, with a *p* value of 0.05 or less considered to indicate statistical significance. All analyses were performed using SPSS 16.0 for Windows.

Results

Half of the women were African American ($n = 64$, 51.6%), and single ($n = 77$, 62.1%) and nearly one half were employed either full time or part time ($n = 57$, 46%). The mean age of participants was 28 years ($SD = 7.65$), with a mean of 14 yrs of education ($SD = 1.88$) (See Table 1).

Characteristics that relate to risky drinking

Participants drank a mean of 4 drinks per drinking day and reported 14 binges and 150 drinks over a 90 day period. The mean age of their first drink was 15 years. Participants reported mean scores of 5.1 for Importance, 5.0 for Readiness and 7.6 for confidence to reduce their drinking (on a 0–10 scale; see Table 1). Most women placed themselves in the Precontemplation Stage of Change ($n = 51$, 42%), followed then by women in Preparation ($n = 33$, 27%), Contemplation ($n = 25$, 21%), Action ($n = 9$, 7%) and Maintenance ($n = 4$, 3%). There was a significant positive correlation between age and number of drinks ($r = .20$, $p = .03$) but no significant correlation between age and number of binges, or education with number of drinks or number of binges.

There were significant differences in number of drinks between different occupational statuses. Women who were employed part time drank significantly more than others, including students, full time workers, self-employed workers or unemployed women ($F(5,116) = 4.31, p = .00$). The number of drinks and binges did not significantly differ across different ethnicities.

Drinking was related to importance and confidence ratings. Women who drank more reported that it was *more important* to reduce their drinking; more drinks in 90 days was positively related to higher importance (Importance, confidence and Readiness Ruler) ($r = .23, p = .008$) to reduce drinking. In contrast, women who drank more were *less confident* in their ability to reduce their drinking; a greater number of drinks was related to lower confidence (Importance, confidence and Readiness Ruler) ($r = -.39, p = .0001$).

Drinking differed across women classified in the five stages of change. Significant differences were found in the total number of drinks consumed in 90 days (Timeline Follow Back) between the 5 different stages of change ($F(4,118) = 3.12, p = .01$). Women in the Preparation stage of change reported drinking a significantly higher number of drinks compared to women in other stages of change. Post hoc analyses performed with Fisher least significant difference test (LSD) showed that women in Preparation drank significantly more (258 drinks) in 90 days than women in the Precontemplation (93 drinks) and Action (71 drinks) stages of change, as shown in Fig. 1.

A MANOVA was conducted to assess if there were differences between the five stages of change (independent variable) in Importance, confidence and Readiness (dependent variables). A MANOVA was chosen because the dependent variables were conceptually related and were correlated with one another at a low to moderate level (r ranged from .23 to .56). The assumption of independence of observation and homogeneity of variance/covariance were checked and met. A significant difference was found between the five stages of change (Wilks' $\Lambda = .444, F(115,304) = 9.107, p = .00$). Examination of the coefficients distinguishing stages of change groups indicated that Importance and Readiness contributed most to distinguishing these groups. In particular, both Importance ($\beta = 38.74, p = .006$, multivariate $\eta^2 = .06$) and Readiness ($\beta = 41.51, p = .006$, multivariate $\eta^2 = .06$) contributed significantly toward discriminating the Preparation group from the other stages of change groups, but no other variables (Importance, confidence or Readiness) significantly contributed to distinguishing the other stages of change groups from each other. Follow-up univariate ANOVAs indicated that both Importance and Readiness, when examined alone, were significantly different for subjects in different stages of change, ($F(4,117) = 32.93, p = .000$ and $F(4,117) = 15.54, p = .000$), respectively.

Characteristics that relate to ineffective contraception

Women had their first intercourse on average at age 16 and used contraception for the first time on average at age 17. Within the 90 days prior to baseline assessment women had intercourse with an average of 1.6 men and used contraception ineffectively on 75% of the days they had intercourse (contraception effectiveness was calculated by dividing the number of days women had intercourse and used contraception effectively by the number of days they had intercourse and then multiplying the result by 100). Additionally, women who used no contraception at all reported that they believed they had a 68% risk of becoming pregnant within 1 year (see "perceived pregnancy risk" in Table 1). Further, women's motivation to use contraception effectively was assessed. Participants reported a mean score of 7.5 for Importance, 7.5 for Readiness and 7.0 for confidence in the ability to use contraception effectively (see Table 1).

Regarding effective contraception use, most women were in the Preparation stages of change ($n = 48, 39\%$), followed then by women in Contemplation ($n = 37, 30\%$), Precontemplation ($n = 16, 15\%$), Maintenance ($n = 13, 11\%$) and Action ($n = 8, 7\%$). About half of the women

reported using male condoms (50.8%, $n = 63$), while 18.5% ($n = 23$) used the pill, 16.1% ($n = 20$) did not use any form of contraception at all and 8.1% ($n = 10$) used withdrawal. The rest used depo-provera injections (1.6%, $n = 2$), rhythm (1.6%, $n = 2$), mixed methods (more than one method used but none considered as the main method) (1.6%, $n = 2$), the vaginal hormonal ring (.8%, $n = 1$) or spermicidal foam (.8%, $n = 1$). It is important to recall that while 84% of the sample reported using some kind of contraception, they were ineffective users, either using it intermittently or incorrectly such that they were at risk for pregnancy.

Most women (80.7%, $n = 101$) reported more than one reason for not using contraception effectively. The majority of women (52%, $n = 65$) reported that they “trust their partner or were having intercourse with their main partner” as one of the reasons for not using contraception effectively and 52% ($n = 65$) reported that they did not use contraception effectively because of the “heat of the moment”. 36 women (29%) reported that they would “enjoy sex less if they used methods to prevent pregnancies”, 35 (28%) reported “not being concerned, in a hurry or did not care”, 34 (27.4%) reported “being worried about side effects” and 32 (25.8%) reported “being under the influence of alcohol or drugs” as reasons for having intercourse and failing to use effective contraception.

Contraception ineffectiveness was not related to demographic characteristics such as age, education, or employment and was also unrelated to the reported number of sexual partners, perceived pregnancy risk, or contraception method used. There was a significant negative correlation between ineffective contraception and Importance, confidence and Readiness, the more ineffective contraception the lower the scores on Importance ($r = -.38$, $p = .001$), confidence ($r = -.20$, $p = .02$) and Readiness ($r = -.43$, $p = .001$).

There were significant differences in contraception ineffectiveness as reported on the Timeline Follow Back between the 5 stages of change ($F = (4,115) 8.58$, $p = .000$). Post hoc analyses (LSD) showed that women in Precontemplation reported significantly higher levels of contraception ineffectiveness (.92) when compared to women in all other five stages of change (see Fig. 2). Women in Precontemplation ($m = 3.27$, $SD = 2.4$) also reported significantly ($F (4,69) = 2.49$, $p = .05$) higher number of unplanned pregnancies compared to women in other stages of change such as Contemplation ($m = 1.96$, $SD = 1.39$), Preparation ($m = 1.88$, $SD = 1.67$), and Action ($m = .75$, $SD = .50$).

To assess whether there were differences across stages of change in Importance, confidence and Readiness a MANOVA was inappropriate because in this case, the 3 dependent variables were highly correlated with one another. 3 independent univariate ANOVAs were therefore performed. Levels of “Importance” ($F = (4,118) 16.03$, $p = .00$), “Confidence” ($F = (4,118) 2.67$, $p = .04$) and “Readiness” ($F = (4,118) 19.14$, $p = .00$) to use contraception effectively were significantly different between the 5 stages of change.

Post hoc analyses (LSD) showed that the Importance scores were significantly lower for women in Precontemplation (4.0) compared to women in Contemplation (7.2), Preparation (8.3), Action (9.1) and Maintenance (9.6). Readiness scores (3.1) were also significantly lower for women in Precontemplation compared to women in all the other 4 stages of change (Contemplation (6.8), Preparation (7.7), Action (8.8), Maintenance (9.5)). Confidence levels were significantly lower in women in Precontemplation (6.4), Contemplation (7.0) and Preparation (7.6) when compared to women in the Maintenance stages of change (9.3), as shown in Fig. 2.

Women in Precontemplation had also had, on average, more than three unplanned pregnancies, which was significantly higher than the number reported by women in other stages of change (between 0.75 for women in the Action and 1.96 for women in Contemplation).

Relationship between risky drinking and ineffective contraception

There were no significant differences in contraception effectiveness between light, moderate and heavy drinkers. Even when negative correlations between number of drinks consumed in 90 days or number of binge episodes in 90 days and contraception effectiveness were found, these correlations were not significant.

Discussion

Among women at risk for an alcohol-exposed pregnancy, there was a clear relationship between higher alcohol consumption and higher motivation to reduce drinking. With risky contraception behavior, however, we observed a contrasting trend in which higher levels of ineffective contraception were related to lower levels of motivation to use contraception effectively. This was true despite women's self-rating as more ready to change contraception than to change drinking.

Thus for drinking, while women perceive greater importance to reduce drinking increased with the number of drinks consumed, they report lower confidence to reduce drinking when the number of drinks increased. In addition, women in the Preparation stage of change who were planning to reduce their drinking reported the highest levels of alcohol consumption and the greater levels of importance to reduce their drinking. Also, importance and readiness were the two main factors that characterized and distinguished the women in Precontemplation from the women in all other stages of change.

Overall, women who report the highest levels of alcohol consumption also reported that changing their drinking was important, and were planning to change. An explanation for this finding may be that women who drink a considerable amount of alcohol are also more likely to experience alcohol related problems (Shealy et al. 2007) that may in turn increase women's awareness of problem drinking and motivation to change.

Our results suggest that women who report heavy drinking are likely to consider making changes in their alcohol use. These women who seem to be already motivated to change their drinking may benefit from specific behavioral interventions aimed at developing coping skills and detailed action plans to help them reduce their drinking and move forward in readiness from Preparation to Action. Since confidence in the ability to reduce drinking was found to decrease with the increasing number of drinks consumed, skill building interventions may also increase women's self-efficacy and confidence, elements that, together with motivation, have been proposed as being important predictors of successful change (Adamson et al. 2008). Interventions, whether behavioral or pharmacological that decrease drinking even for a trial period could foster confidence.

In contrast, the relationship between ineffective contraception and motivation showed that women who were the least effective in their contraception use were in fact the ones with the lowest motivation, whether represented by importance, confidence and readiness or their stage of change. Many were pre contemplators, who reported that they were not considering making any change in their contraception behavior, often despite having experienced several unplanned pregnancies. In these women the riskier the contraception habit the lower the motivation to change. This further implies that interventions that use "scare tactics" about ineffective contraception are unlikely to help women translate awareness into behavioral change.

Our findings further suggest that for women at risk for alcohol-exposed pregnancy, contraception may be a complicated target for behavioral change, one that is not yet clearly understood. Exploring women's attitudes and beliefs about contraception may help shed light on contraception risk behavior and its intractability. Previous studies have highlighted how

intention (a similar construct to readiness) (Basen-Engquist and Parcel 1992; Heinrich 1993), self-efficacy (a similar construct to confidence) (Heinrich 1993), attitude and perception about contraception (Basen-Engquist and Parcel 1992; Heinrich 1993) are important predictors of women's contraception effectiveness. Chambers et al. (2003), drawing from the Conflict Model of Decision Making, stress the importance of decisional making patterns, decisional self-esteem and degree of conflict involved in the decisional making process to understand safer sexual decision making.

Although we did not conduct a systematic assessment of women's attitudes and beliefs, we found that most women in our sample reported not using contraception effectively because they trusted their partner, or they were having intercourse with their main partner, or because of the "heat of the moment". Other authors (Prince and Bernard 1998; Boldero et al. 1992) also underlined how decisions about contraception use are often made in a hurry, in the heat of the moment, under the influence of sexual arousal and/or under the influence of alcohol (Apostolopoulos et al. 2002; Ingersoll et al. 2005; LaBrie et al. 2005a). This specific situational context may not facilitate a thorough or logical decisional process and increase unsafe contraception use. Other studies (Prince and Bernard 1998; Civic 2000) reported that women may rely on the trust in their partner or on the monogamous status of the relationship to prevent STD or HIV. Women in our study may have applied the same logic to the prevention of pregnancies without realizing that being in a monogamous and trustworthy relationship does not eliminate the risk of becoming pregnant. Some women may feel that introducing the use of contraception with their steady partners may be perceived as a lack of trust in the partner's fidelity or in the partner's ability to use withdrawal and may therefore be experienced by women as a source of intra and interpersonal conflict that may influence their decision making process. de Visser and Smith (2001) found that inconsistent use of condoms could be improved if women discussed condom use with their partner and if they had higher self-efficacy at the time of having intercourse. Future research should examine this subgroup at risk for alcohol-exposed pregnancy to better understand how women's personal beliefs toward contraception fit in and coexist with their beliefs about their relationship with their partners. Finally, women's beliefs and desires about pregnancy could be further explored to determine if women who were least likely to use contraception and least likely to change that behavior may feel less concerned about unplanned pregnancy or even be open to pregnancy, despite their reports that they were not planning to become pregnant at study entry.

It was somewhat surprising that no differences were found between light, moderate and heavy drinkers with respect to effective contraception, given that some studies have found that risky drinking is related to higher rates of ineffective or absent contraception and condom use. One might hypothesize that heavier drinkers would be less effective users of contraception because their level of intoxication may inhibit use of barrier methods such as condoms. Further, among this sample, we also found no differences in effectiveness rates for women who use condoms versus the pill. This contrasts with national data favoring the pill and other hormonal methods over barrier methods for effectiveness. Additional studies could examine the relationship among condom users only, which may show different results. Based on the pattern of findings in this study, we are speculating that women who are at risk for alcohol-exposed pregnancy presenting both risky drinking and contraception differ from women with only one risk (either poor contraception or binge drinking) and may be further different from lower risk women in ways that could influence their responsiveness to intervention. Therefore, strategies such as increasing problem recognition, improving women's attitudes, beliefs and decision making processes, and enhancing motivation to change may be necessary components in intervening with women who use ineffective contraception, but our understanding of these elements remains preliminary.

There are limitations to this study, including reliance on recall and self-report. Most of the questions required women to reflect on their drinking and contraception behavior that occurred over the previous 3 months, and there might have been distortions due to social concerns or the vagaries of memory. However, various reviews suggest that retrospective self-reports show adequate reliability and validity when data are collected in situations to minimize bias (e.g. assured confidentiality, voluntary and alcohol free participants). (Poikolainen et al. 2002; Midakin 1982). Because we used these procedures in this study, we believe these data are likely to be comparable to those of other published studies in terms of bias. Finally, due to the limited size and high risk status of the sample, caution should be used in extending these findings to the general population.

In conclusion, drinking while at risk for pregnancy combine to create alcohol-exposed pregnancy risk, while reducing drinking and improving contraception are ways to prevent alcohol-exposed pregnancy. When targeting drinking, interventions can capitalize on the fact that the riskier the behavior, the higher the women's motivation to change. For contraception, on the other hand, the riskier the behavior, the lower the motivation to change. Thus, while risky drinking may be amenable to brief skill and confidence building interventions, ineffective contraception may require interventions that enhance problem awareness and motivation, along with the resolution of other complicating factors that have yet to be elucidated.

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Fig. 1.

Importance, confidence, readiness and number of drinks in 90 days by stage of change for drinking. Motivational level (0 = lowest levels of importance, confidence and readiness; 100 = maximum levels of importance, confidence and readiness)

Fig. 2. Importance, confidence, readiness and ineffective contraception by stage of change for contraception. 0-100 scale. 0 = lowest levels of importance, confidence, readiness and ineffectiveness (most effective use of contraception); 100 = maximum levels of importance, confidence, readiness and ineffectiveness (least effective use of contraception)

Table 1 Sociodemographic, drinking, contraception and intercourse baseline characteristics ($n = 124$)

Participants characteristics	Frequency	%
Ethnicity		
African American/black	64	51.6
White	44	35.5
Other	8	6.9
Marital status		
Single	77	62.1
Living with partner	22	17.7
Married	14	11.3
Separated, divorced	11	8.8
Employment		
Employed full time	36	29.9
Employed part-time	18	14.5
Self employed	3	2.4
Student	41	33
Unemployed	24	19.4
	Mean	SD
Age	28.23	7.66
Education	13.88	1.89
Drinking characteristics		
Age first drink	15.48	2.967
Number of drinks/90 days	150.60	235.70
Total number of drinking days	32.56	22.03
Number of drinks per drinking days	4.20	4.06
Average number drinks per week	12.54	19.64
Total number of binges	13.76	17.76
Importance alcohol (range = 0–10) ^a	5.07	3.48
Confidence alcohol (range = 0–10) ^a	7.59	2.46
Readiness alcohol (range = 0–10) ^a	5.05	3.40
Contraception and intercourse characteristics		
Age first intercourse	16.29	2.34
Age first use of contraception	16.70	2.39
Number of males had intercourse with	1.57	.86
Pregnancy perceived risk	68.44	24.21
Contraception effectiveness	.65	.31
Importance (range = 0–10) ^a	7.55	2.79
Confidence (range = 0–10) ^a	7.47	2.79
Readiness (range = 0–10) ^a	6.99	2.91

^a0 = lowest levels of importance, confidence and readiness; 10 = maximum levels of importance, confidence and readiness