

Binge Drinking in the Preconception Period and the Risk of Unintended Pregnancy: Implications for Women and Their Children

Timothy S. Naimi, MD, MPH*; Leslie E. Lipscomb, MPH‡; Robert D. Brewer, MD, MSPH*; and Brenda Colley Gilbert, PhD, MSPH‡

ABSTRACT. *Objective.* To assess the relationship between unintended pregnancy resulting in a live birth and binge drinking (having 5 or more alcoholic beverages on 1 occasion) in the 3 months before pregnancy (the preconception period) and to characterize women who are of childbearing age and binge drink.

Methods. A case-control study was conducted of women with pregnancies that resulted in a live birth, comparing those with unintended pregnancies with those with intended pregnancies. Data analyzed were from the 15 states that participated in the Pregnancy Risk Assessment Monitoring System from 1996–1999.

Results. Of 72 907 respondents, 45% of pregnancies were unintended. Compared with women with intended pregnancy, women with unintended pregnancy were more likely to be young and black and to report preconception binge drinking (16.3% vs 11.9%; odds ratio [OR]: 1.43; 95% confidence interval [CI]: 1.13–1.54). After adjusting for potential confounders, preconception binge drinking was associated with unintended pregnancy for white women (adjusted OR: 1.63; 95% CI: 1.47–1.80) but not for black women (adjusted OR: 0.96, 95% CI: 0.77–1.20). Overall, 14% of women reported preconception binge drinking. Women who binge drank in the preconception period were more likely to be white and unmarried; to smoke and be exposed to violence in the preconception period; and to consume alcohol, binge drink, and smoke during pregnancy.

Conclusions. Binge drinking in the preconception period was associated with unintended pregnancies resulting in a live birth among white women but not among black women. Preconception binge drinkers were more likely to engage in other risky behaviors, including drinking during pregnancy. Comprehensive interventions to reduce binge drinking may reduce unintended pregnancies, as well as other adverse maternal and pediatric health outcomes. *Pediatrics* 2003;111:1136–1141; *unintended pregnancy, unplanned pregnancies, alcohol, binge drinking.*

ABBREVIATIONS. PRAMS, Pregnancy Risk Assessment Monitoring System; OR, odds ratio; CI, confidence interval; AOR, adjusted odds ratio.

From the *Alcohol Team, Emerging Investigations and Analytic Methods Branch, Division of Adult and Community Health, and the ‡Division of Reproductive Health, National Centers for Chronic Disease Promotion and Health Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia.

Received for publication Oct 2, 2002; accepted Dec 4, 2002.

Reprint requests to (T.S.N.) CDC/DACH/Alcohol Team, 4770 Buford Hwy, NE, MS K-67, Atlanta, GA 30341. E-mail: tbn7@cdc.gov

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Approximately half of the infants born in the United States each year are the result of an unintended pregnancy.^{1,2} Unintended pregnancy, defined as a pregnancy that is either mistimed (sooner than desired) or unwanted (not desired at all), is associated with inadequate prenatal care, maternal infections, obstetric complications, low birth weight infants, poor child development, and subsequent child abuse.^{2–4} Unintended pregnancies may also limit educational and career opportunities for young mothers.²

Binge drinking, defined as the consumption of 5 or more drinks on 1 occasion, is an increasingly common pattern of alcohol abuse that is associated with adverse health outcomes for both women and their children.⁵ Maternal consequences of binge drinking include unintentional injuries, exposure to domestic violence, unprotected and unplanned sexual intercourse, abortion, and sexually transmitted diseases.^{6–12} For fetuses and children, adverse health effects that are associated with alcohol-exposed pregnancies include miscarriage, premature delivery, low birth weight, sudden infant death syndrome, neurodevelopmental disorders (eg, fetal alcohol syndrome, attention-deficit/hyperactivity disorder), and subsequent child abuse.^{12–22} Even intermittent fetal exposure to high levels of alcohol (as would be expected with maternal binge drinking) can have important neurologic consequences.^{23–26}

Because the relationship between unintended pregnancy and binge drinking in the period before conception has not been well described, we used the Pregnancy Risk Assessment Monitoring System (PRAMS) to assess this relationship and to characterize women who reported preconception binge drinking.

METHODS

To assess the association between binge drinking and unintended pregnancy, we conducted a case-control study using data from PRAMS. PRAMS survey methods have been described in previous reports.^{27–29} In brief, PRAMS is a population-based mail and telephone survey of women who have delivered a live-born infant. Women are contacted from 2 to 6 months after delivery. Respondents are asked about pregnancy intention and about alcohol consumption, including binge drinking, during the 3 months before pregnancy and during the last trimester of pregnancy.

Our main outcome of interest was whether the pregnancy was unintended. Pregnancy intention was determined by asking, "Thinking back to just before you got pregnant, how did you feel about becoming pregnant?" Unintended pregnancies were defined as pregnancies in which the mother responded either that

she wanted to be pregnant later (ie, the pregnancy was mistimed) or that she did not want to get pregnant at any time (ie, the pregnancy was unwanted).

The exposed population consisted of women who reported at least 1 occasion of binge drinking in the preconception period. The unexposed population consisted of women who did not binge drink during this period, including women who drank alcohol but did not binge drink and women who drank no alcohol. Binge drinking was defined as the consumption of 5 or more alcoholic beverages on 1 occasion. For assessing binge drinking, respondents were asked, "How many times did you drink 5 or more alcoholic drinks at 1 sitting" in both the preconception period and during the last trimester of pregnancy? The preconception period was defined as "the 3 months before you got pregnant."

We restricted our study to the 15 states that participated in PRAMS from 1996–1999 and that achieved weighted response rates of 70% or higher (4 states were excluded as a result of lower response rates). The weighted response rate indicates the proportion of women sampled who completed a survey, adjusted for survey design (including factors such as nonresponse and non-coverage). The states included in the analysis were Alabama, Alaska, Arkansas, Colorado, Florida, Georgia, Illinois, Louisiana, Maine, New York, North Carolina, Oklahoma, South Carolina, Washington, and West Virginia. Women who did not provide information about pregnancy intention or binge drinking were excluded from the study. In addition, we restricted our study to white and black women because of the small number of respondents from other racial backgrounds. We combined ethnic categories for both whites and blacks because Hispanic and non-Hispanic women within each race category were similar with respect to age and educational level and had similar risk factors for unintended pregnancy and preconception binge drinking in univariate and multivariate analyses.

We used unconditional logistic regression to control for confounders and to assess effect modification. Potential confounders and effect modifiers were identified by literature review and by examining data from stratified analysis. Potential confounders were limited to variables relevant to the time of conception or the preconception period. These variables included age, education, marital status, parity, birth control use at conception, health insurance status, receipt of Medicaid, binge drinking, smoking, and exposure to physical violence. Birth control use at conception was

determined by asking, "When you got pregnant with your new infant, were you or your husband or partner using any kind of birth control?" Smoking was defined as the consumption of 1 or more cigarettes daily; and exposure to violence was based on a history of being pushed, slapped, kicked, or hit. We considered age and race for effect modification. SAS and SUDAAN³⁰ were used to conduct the analysis.

RESULTS

Of the 86 041 women who completed the survey in the 15 states, 72 907 (85%) provided information about pregnancy intention and alcohol consumption and were eligible for analysis. Of the eligible study population, the median age was 26 years, 80% were white (of white respondents, 8% were of Hispanic ethnicity), 47% had education beyond high school, 70% were married, and 42% had given birth to 1 child.

Overall, 45% of women's pregnancies were unintended. Compared with those whose pregnancies were intended, women with unintended pregnancy were more likely to be young, nonwhite, less educated, and unmarried (Table 1). In the preconception period, those with unintended pregnancies were more likely to lack health insurance, receive Medicaid, smoke, and be exposed to physical violence. Women with unintended pregnancies were also more likely to have delayed pregnancy recognition (recognition 5 or more weeks from conception) and delayed prenatal care (care initiated after the first trimester) compared with women with intended pregnancies.

Overall, 14% of respondents reported binge drinking in the preconception period. When compared with women who did not binge drink in the precon-

TABLE 1. Percentage of Respondents With Selected Characteristics, by Pregnancy Intention Status, PRAMS, 1996–1999

Characteristic*	Unintended Pregnancy† (n = 32 494)	Intended Pregnancy† (n = 40 413)
Demographic factors		
Age 13–20 y*	29.8	8.9
White race*‡	67.6	88.8
≤ High school education*	64.4	43.1
Unmarried*	51.6	16.3
First birth	41.5	42.6
Preconception risk factors		
Preconception binge drinking*	16.3	11.9
No preconception health insurance*	51.7	25.5
Preconception medicaid*	17.7	6.2
Preconception smoking*	29.8	20.4
Preconception violence exposure*	10.0	4.2
Contraceptive use at conception*	41.3	9.8
Pregnancy risk factors		
Pregnancy confirmation >5 wk*	57.7	39.0
Prenatal care begun after first trimester*	33.5	13.3
Drinking during pregnancy*	4.7	5.3
Binge drinking during pregnancy*	0.7	0.3
Smoking during pregnancy*	17.0	10.9

* Significant statistical difference ($P \leq .05$) between the percentages of a selected characteristic among women with unintended pregnancies compared with women with intended pregnancies.

† Unintended pregnancies were those in which the mother reported that she wanted to get pregnant later than she did (mistimed) or that she never wanted to get pregnant at all (unwanted).

‡ Only white and black respondents were included in the analysis because of the small number of respondents from other racial backgrounds. We combined ethnic categories (Hispanic and non-Hispanic) because Hispanic and non-Hispanic individuals within each race category had similar demographic characteristics and similar risk factors for unintended pregnancy and for preconception binge drinking in univariate and multivariate analysis.

ception period, binge drinkers were slightly older and more likely to be white, to be unmarried, and to have had only 1 child (Table 2). During the preconception period, binge drinkers were more likely to have smoked cigarettes and to have been exposed to physical violence than nonbinge drinkers. During pregnancy, preconception binge drinkers were more likely to report risky behaviors such as drinking alcohol (13% vs 4%), binge drinking (3% vs 0%), and smoking (27% vs 11%) compared with nonbinge drinkers.

Women with unintended pregnancies were significantly more likely to report binge drinking in the preconception period compared with women with intended pregnancies (16.3% vs 11.9%; odds ratio [OR]: 1.43; 95% confidence interval [CI]: 1.13–1.54; Table 1). Among women who consumed alcohol in the preconception period, the proportion of women with unintended pregnancies increased with the number of preconception binge drinking episodes (χ^2 test for trend = 494.3, $P < .001$; Fig 1). For example, 60% of pregnancies were unintended among women who reported 4 or more binge episodes in the preconception period, compared with 40% among women who reported no binge drinking episodes (OR: 2.3; 95% CI: 2.12–2.57).

After potential confounders were adjusted for, women with unintended pregnancies were still more likely to report binge drinking in the preconception period compared with those whose pregnancies were intended. However, this relationship varied significantly by race ($P < .001$ for the race-binge drinking interaction term). Specifically, white respondents with unintended pregnancies were more

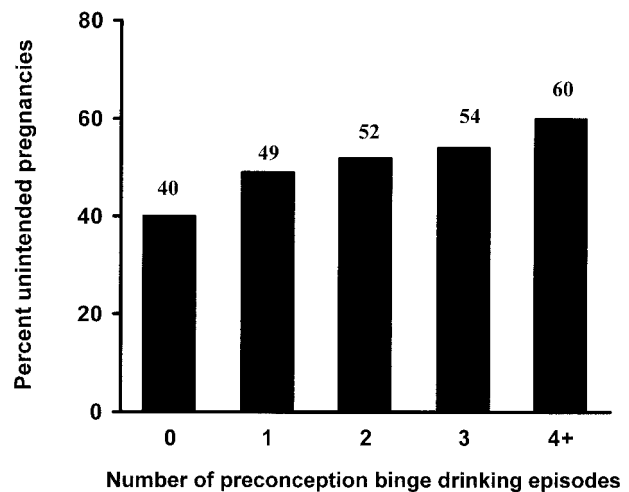


Fig 1. The proportion of pregnancies that were unintended, by number of binge drinking episodes in the preconception period, among women who reported any alcohol consumption during this period. Unintended pregnancies include those in which the mother reported that she wanted to get pregnant later than she did (mistimed) or that she never wanted to get pregnant (unwanted). Binge drinking is defined as the consumption of 5 or more alcoholic beverages on 1 occasion. The preconception period is defined as the 3 months before pregnancy.

likely to report preconception binge drinking compared with those whose pregnancies were intended (20.3% vs 12.7%; adjusted OR [AOR]: 1.63; 95% CI: 1.47–1.80); however, among black respondents, there was no such association (7.8% vs 7%; AOR: 0.96; 95% CI: 0.77–1.20; Table 3). Preconception smoking and physical abuse were also significant risk factors for

TABLE 2. Percentage of Respondents With Selected Characteristics, by Preconception Binge Drinking Status, PRAMS, 1996–1999

Characteristic*	Binge Drinkers† (n = 10 054)	Nonbinge Drinkers‡ (n = 62 853)
Demographic Factors		
Age 13–20 y*	15.4	18.3
White race*‡	88.9	78.2
≤High school education	52.2	52.1
Unmarried*	37.3	30.5
First birth*	49.3	41.0
Preconception risk factors		
No preconception health insurance	38.1	36.5
Preconception Medicaid*	9.3	11.4
Preconception smoking*	50.2	20.4
Preconception violence exposure*	10.4	6.1
Contraceptive use at conception	23.9	23.2
Pregnancy risk factors		
Pregnancy confirmation >5 wk	48.1	46.8
Prenatal care after first trimester	21.5	22.1
Drinking during pregnancy*	13.1	3.7
Binge drinking during pregnancy*	2.9	0.1
Smoking during pregnancy*	26.6	11.4

* Significant statistical difference ($P \leq .05$) between the percentages of a selected characteristic among preconception binge drinkers compared with those who did not binge drink during this period.

† Binge drinkers were those who reported drinking 5 or more alcoholic beverages on at least 1 occasion in the 3 months before getting pregnant. Nonbinge drinkers were those who denied such activity, including those who drank no alcohol.

‡ Only white and black respondents were included in the analysis because of the small number of respondents from other racial backgrounds. We combined ethnic categories (Hispanic and non-Hispanic) because Hispanic and non-Hispanic individuals within each race category had similar demographic characteristics and similar risk factors for unintended pregnancy and preconception binge drinking in univariate and multivariate analysis.

TABLE 3. AOR* for Preconception Binge Drinking,† According to Pregnancy Intention‡ and Race§ Status, PRAMS, 1996–1999

Race	Unintended Pregnancy (<i>n</i> = 29 683)		Intended Pregnancy (<i>n</i> = 36 901)		AOR	95% Confidence Interval	<i>P</i> Value
	<i>n</i>	% Binge Drinking	<i>n</i>	% Binge Drinking			
White	18 836	20.3	31 364	12.7	1.63	1.47–1.80	.000
Black	10 847	7.8	5537	7.0	0.96	0.77–1.20	.734

* The ORs were adjusted using unconditional logistic regression to control for age (<21 or 21+), education (≤high school or >high school), marital status (married or unmarried), parity (first birth or 2+ births), preconception health insurance, preconception Medicaid, birth control use at conception, preconception smoking, and preconception physical abuse. This analysis excluded respondents who had missing information on any of the aforementioned variables. The percentage of binge drinkers reported in the table are based on unadjusted analysis.

† Preconception binge drinking is defined as the consumption of 5 or more alcoholic beverages during the 3 months before conception. The percentage of binge drinkers reported in the table are based on unadjusted analysis.

‡ Unintended pregnancies were those in which the mother reported that she wanted to get pregnant later than she did (mistimed) or that she never wanted to get pregnant at all (unwanted).

§ Only white and black respondents were included in the analysis because of the small number of respondents from other racial backgrounds. We combined ethnic categories (Hispanic and non-Hispanic) because Hispanic and non-Hispanic individuals within each race category had similar demographic characteristics and similar risk factors for unintended pregnancy and preconception binge drinking in univariate and multivariate analysis.

unintended pregnancy among white respondents but not among black respondents (Table 4).

DISCUSSION

The results of this study indicate that women with unintended pregnancies were more likely to have engaged in binge drinking in the preconception period compared with women whose pregnancies were intended. The strength of this association increased with the number of binge drinking episodes. After potential confounding factors were adjusted for, white women with unintended pregnancy had 1.6 times the odds of binge drinking in the preconception period compared with those with intended pregnancy; in contrast, binge drinking was not more

common among black women with unintended pregnancies.

Our finding that binge drinking is a risk factor for subsequent unintended pregnancy is not surprising in light of previous research linking alcohol abuse to unprotected sex, unplanned sex, sexually transmitted diseases, sexual assaults, and abortion.^{6–12} However, it was surprising to find that the relationship between unintended pregnancy and preconception binge drinking varied by race. Other studies have also shown race-specific differences in unintended pregnancy.^{31–33} In addition, our identification of other factors—including smoking and exposure to physical violence—that were associated with unintended pregnancy among white respondents but not

TABLE 4. AORs for Unintended Pregnancy, by Respondent Race, PRAMS, 1996–1999

Characteristic*	White Respondents†‡ (<i>n</i> = 54 442)	Black Respondents†‡ (<i>n</i> = 17 740)
	AOR (CI)	AOR (CI)
Demographic factors		
Age 13–20 y	2.55 (2.26–2.87)*	2.13 (1.80–2.51)*
≤ High school education	1.04 (0.95–1.14)	1.02 (0.90–1.17)
Unmarried	2.52 (2.27–2.80)*	2.86 (2.51–3.27)*
2+ Births	1.46 (1.34–1.58)*	1.45 (1.27–1.65)*
Preconception risk factors		
No previous health insurance	1.47 (1.33–1.62)*	1.40 (1.24–1.58)*
Preconception Medicaid	1.00 (0.85–1.19)	1.12 (0.96–1.31)
Birth control at conception	7.01 (6.38–7.70)*	3.20 (2.79–3.66)*
Preconception binge drinking	1.63 (1.47–1.80)*	0.96 (0.77–1.20)
Preconception smoking	1.46 (1.34–1.59)*	0.95 (0.78–1.16)
Preconception violence exposure	1.48 (1.25–1.75)*	0.94 (0.76–1.16)

* Unintended pregnancies were those in which the mother reported that she wanted to get pregnant later than she did (mistimed) or that she never wanted to get pregnant at all (unwanted).

† Significant statistical difference ($P \leq .05$) between those with intended pregnancies versus those with unintended pregnancies. ORs were adjusted for all factors listed above. Referent groups for listed characteristics were age, ≥21; education, > high school; marital status, married; parity, 1 birth; health insurance, having previous health insurance; preconception Medicaid, none; birth control at conception, none; preconception binge drinking, none; preconception smoking, none; preconception violence exposure, none.

‡ The race-preconception binge drinking interaction term had a $P < .001$, indicating effect modification. Therefore, we presented separate AORs for the risk of unintended pregnancy for white and black respondents. Only white and black respondents were included in the analysis because of the small number of respondents from other racial backgrounds. We combined ethnic categories (Hispanic and non-Hispanic) because Hispanic and non-Hispanic individuals within each race category had similar demographic characteristics and similar risk factors for unintended pregnancy and preconception binge drinking in univariate and multivariate analysis.

black respondents emphasizes that the determinants of unintended pregnancy are likely to be differentially distributed by race, probably as a result of a variety of social, cultural, and economic factors. Furthermore, a larger proportion of unintended pregnancies among black women were unwanted (versus mistimed) compared with white women, and risk factors for unwanted and mistimed pregnancies are somewhat different.^{34,35} Finally, an individual's interpretation of pregnancy intention seems to be affected by a variety of social and cultural influences, which could, in turn, affect respondents' reporting of pregnancy intention and binge drinking in PRAMS and other surveys.³⁶

In addition to the increased risk of unintended pregnancy, our findings indicate that preconception binge drinkers were more likely than nonbinge drinkers to expose their fetuses to established risk factors for adverse pregnancy outcomes. For example, binge drinkers may unknowingly expose their fetuses to high concentrations of alcohol during the period after conception but before pregnancy confirmation, which occurred at a median gestational age of 5 weeks in this study and in another study.³⁷ In addition, we found that preconception binge drinkers were more likely than nonbinge drinkers to consume alcohol, binge drink, and smoke after their pregnancy was established.

Given that approximately 40% of unintended pregnancies end in abortion and that PRAMS does not collect information about pregnancies that end in abortion or miscarriage, it is likely that our findings underestimate the association between all unintended pregnancies and preconception binge drinking. Although data are lacking about binge drinking among women who undergo abortion, studies show that women who undergo abortion have high rates of alcohol use and other drug abuse both before and after abortion.^{9,38} Furthermore, women who undergo abortion are predominantly young white adults,³⁹ and national, population-based studies indicate that these women typically have high rates of binge drinking.⁵

This study was subject to several other limitations. First, patient recall may have been inaccurate, because women were asked to report on events and feelings that occurred up to 15 months before PRAMS administration. In addition, some topics in the survey, such as binge drinking and pregnancy intention, are sensitive. If self-reporting of binge drinking and pregnancy intention are influenced by one another, then this could distort the observed relationship between preconception binge drinking and unintended pregnancy. Furthermore, PRAMS does not collect information about several other factors that likely confound the relationship between binge drinking and unintended pregnancy, such as use of illegal drugs and number of sexual partners. Finally, because this was a nonrandomized study, there may have been other confounding factors that could have affected the observed relationship between unintended pregnancy and preconception binge drinking.

Pediatricians and other primary care providers

should be aware that binge drinking is relatively common among their female patients of childbearing age⁵ and that these patients are at increased risk for unintended pregnancy and other adverse health outcomes associated with binge drinking. Physician advice and counseling has been shown to reduce alcohol abuse, and all adolescent and adult women should be screened for alcohol problems in accordance with recommendations outlined by the US Preventive Services Task Force and the American Academy of Pediatrics.^{40,41} Screening coupled with brief intervention strategies have proved effective in decreasing alcohol abuse and binge drinking in primary care settings in general^{42–44} and among women of childbearing age in particular.⁴⁵ Besides these clinical measures, other effective ways to combat binge drinking include increased alcohol taxes, enforcement of the minimum drinking age, and community-based efforts that rely on a combination of regulatory and legal interventions.^{46,47}

This study and others demonstrate that risk factors for unintended pregnancy are complex and involve many social and behavioral factors in addition to binge drinking. However, many of these same maternal risk factors, including binge drinking, put children at increased risk for subsequent physical and emotional harm.^{48–50} Therefore, effectively addressing binge drinking and other risk factors in community and clinical settings might not only reduce rates of unintended pregnancy but could also improve the overall health and well-being of mothers and their children.

ACKNOWLEDGMENTS

We thank Lilia Guerra, Amy Hyde, Clifford Loo, Jill McDonald, Chetna Mehrotra, Jeff Sacks, and Nedra Whitehead.

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