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VARIATION AND PREDICTORS OF VAGINAL DOUCHING BEHAVIOR

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Abstract

Introduction—Vaginal douching is a widespread practice among American women. Little research has been done examining variation in the practice or identifying risk factors.

Methods—We collected data on douching, as well as hypothesized predictors of vaginal douching, as part of a cohort study on preterm birth. African-American women residing in Baltimore City, Maryland, were enrolled if they received prenatal care or delivered at The Johns Hopkins Medical Institution. Interview data were collected on 872 women between March 2001 and July 2004, with a response rate of 68%. Logistic regression analysis was selected to identify factors associated with douching in the 6 months prior to pregnancy.

Results—Almost two thirds of women reported ever douching and more than two thirds of those women reported douching in the 6 months prior to pregnancy. Variation was seen in the practice of douching with regard to frequency as well as technique. After adjusting for several confounders, prenatal enrollment (odds ratio [OR], 1.80; 95% confidence interval [CI], 1.29, 2.53), more unmet needs for time for “nonessentials” (OR, 1.83; 95% CI, 1.27, 2.63), smoking in the year prior to the birth (OR, 1.78; 95% CI, 1.22, 2.60), and age > 19 years (OR, 2.60; 95% CI, 1.36, 4.97) were significant predictors of douching in the 6 months prior to pregnancy.

Discussion—We identified considerable heterogeneity in the practice of vaginal douching in a cohort of low income African-American women.

Conclusions—Future studies should incorporate measures of the predictors of douching and detailed exposure information to determine the independent contribution of vaginal douching to health outcomes.

Introduction

Vaginal douching is widely practiced among American women and may be hazardous to their health (Martino & Vermund, 2002). Based on the 1995 U.S. National Survey of Family Growth,

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approximately 27% of women currently practice vaginal douching (Abma, Chandra, Mosher, Peterson, & Piccinino, 1997). Although the prevalence has declined, douching remains a common practice among black women (55%) as well as among all racial and ethnic groups of women with less than a high school education (53%) (Abma et al., 1997). Therefore, the prevalence remains high among the most vulnerable women. Recent studies suggest that douching is associated with a number of adverse reproductive health outcomes including reproductive tract infection and related conditions (Martino & Vermund, 2002). However, it should be noted that there have also been well-designed studies, including a randomized controlled trial, that have failed to find adverse effects of douching (Ness et al., 2005; Rothman, Funch, Alfredson, Brady, & Dreyer, 2003). In addition to effects on a woman's reproductive health, a few epidemiologic studies have linked douching to an increased risk of adverse birth outcomes, including preterm birth (Bruce et al., 2002; Fiscella, Franks, Kendrick, Meldrum, & Kieke, 2002) and low birth weight (Fiscella, Franks, Kendrick, & Bruce, 1998). The greater likelihood of vaginal douching among minority and low socioeconomic status populations has led our research team and others to hypothesize that differences in the prevalence of this exposure may contribute to persistent racial and socioeconomic disparities in birth outcomes.

The practice of vaginal douching has only recently been carefully studied. The few studies examining this practice more closely suggest that vaginal douching is more likely to be practiced by women who are unmarried, less educated, had less income, lived in the southern United States, and were of African-American descent (Aral, Mosher, & Cates, 1992; Fiscella et al., 1998). However, less work has been done in populations with high rates of douching, such as black or low-income women, to go beyond sociodemographic factors and identify variables within these groups that predict douching. Past studies exploring factors beyond race and income have primarily focused on sexual behavior recruiting women with sexually transmitted infections or through family planning clinics (Chacko, McGill, Johnson, Smith, & Nenney, 1989; Gresenguet, Kreiss, Chapko, Hillier, & Weiss, 1997; Horn, McQuillan, Ray, & Hook, 1990).

It is unclear whether douching would be expected to follow the pattern of a “negative” health behavior, such as smoking, or a “protective” health behavior, such as eating nutritiously. Although there appear to be adverse sequelae of douching, thereby suggesting douching is a “negative” behavior, there are no widespread public health efforts underway to educate the population about the dangers of this behavior. Therefore, women are unlikely to perceive this as a harmful behavior. In fact, women may perceive vaginal douching as a protective hygienic practice. Certainly, advertising by the industry seeks to reinforce such beliefs. Findings from recent qualitative as well as quantitative studies (Gazmarian, 2001; Lichtensterin & Nansel, 2000; Martino, Youngparioj, & Vermund, 2004; Ness et al., 2003) suggest that douching is often viewed as a healthy practice necessary for cleanliness. In our study, we had data on several variables that we hypothesized would relate to health behaviors including douching: locus of control, the extent to which needs are met by available resources, social support, cigarette smoking, time of study enrollment, and maternal age. If vaginal douching followed the pattern of a “protective” health behavior, we might expect that women with a higher locus of control and social support would be more likely to douche as well as older women and women who enrolled in our study prenatally (an indicator of early and consistent prenatal care.) If douching instead is a “negative” behavior, smokers, women with more unmet needs, and younger women might engage in this activity. Douching might, in fact, relate to factors at both ends of this spectrum.

Although studies have consistently identified socio-demographic correlates of douching, very little is known about the specific attributes of this practice, particularly in populations with high rates of douching. For example, different douching solutions may have very different health consequences. The proportion of women using commercial as compared to homemade

solutions varies; some studies report 50 – 60% using commercial solutions (Chacko et al., 1989; Funkhouser et al., 2002; Horn et al., 1990; Stock, Stock, & Hutto, 1973), whereas other studies have reported commercial solutions to be nearly universally used by women who douche (Ness et al., 2003; Oh, Merchant, & Brown, 2002). The duration of flow and the insertion point of the nozzle or tube are also factors that could affect the degree of exposure to the douching solution.

We had the opportunity to collect detailed data on vaginal douching practices as well as to examine a broad range of hypothesized predictors within a study examining how social factors predict risk of preterm birth in a low-income, African-American population. We report here on rates of vaginal douching and other feminine hygiene practices in the periods before and during pregnancy, and describe variability in douching practices among women who engage in this behavior. We then examine a number of social and behavioral factors that may relate to the likelihood of douching in the 6 months prior to pregnancy. Our goal is to identify variation in the practice of douching and the characteristics of the women who douche prior to pregnancy, so that future studies may more precisely assess douching exposure and determine the independent contribution of douching to adverse birth outcomes.

Methods

Data were collected as part of a study of the determinants of preterm birth. The study was reviewed and approved by institutional review boards of both The Johns Hopkins University School of Public Health and the University of Michigan School of Public Health. The sample eligibility was restricted to African-American women residing in Baltimore City (Maryland). We approached eligible women for enrollment if they were receiving prenatal care at 1 of 3 Johns Hopkins Medical Institutions clinics or delivered at Johns Hopkins Hospital with late or no prenatal care. Women enrolled prenatally were interviewed (in person) twice. The first interview, at 22–28 weeks' gestation, collected information regarding vaginal douching, sociodemographic factors, psychosocial factors, and most health behaviors. The second interview, a short postpartum interview, covered additional topics as well as behavior and exposures that may have changed in the final weeks of pregnancy. Women enrolled postpartum with late or no prenatal care were interviewed only once, during the postpartum hospitalization, to measure factors from all 3 trimesters of pregnancy. We collected interview data on a total of 872 women over a period of approximately 3 years (March 2001 through July 2004) with an overall response rate of 68%.

Measurement of feminine hygiene practices

We asked several questions on women's feminine hygiene practices (unpublished instrument [Misra & Gruskin, 1997] available from authors upon request) ensuring that we could characterize these practices, including vaginal douching, in detail as prior studies infrequently asked about douching behavior in depth or about hygiene practices other than douching. For all women, we asked about ever douching and if so, the age initiated. For women who reported douching, we asked whether and how often they douched in the 6 months prior to pregnancy and during pregnancy. Detailed information about douching practices (e.g., placement of nozzle/tube) was collected with regard to the most recent time period a woman reported douching. For type of douching product used, more >1 response was allowed. In addition to douching, we asked women about use of “sprays, towelettes, or wipes” and “powders on private areas after bathing.”

Measurement of predictors of vaginal douching

Data regarding race/ethnicity, age, education, employment, locus of control, extent to which needs were met by resources (Family Resources Scale [Dunst & Leet, 1987]), and smoking

were collected at the time of first (or only) interview. Because of the number of adolescents in our sample, we included age with our education variable. Information on sexual activity was collected in postpartum interviews (second interview for those recruited prenatally, only interview for those recruited postpartum).

Analysis

Using logistic regression, socioeconomic factors, psychosocial factors, sexual activity practices, and other health behaviors were examined as predictors of women reporting douching in the 6 months prior to pregnancy with women who never douched as the comparison group. Including those who douched but had quit >6 months prior to pregnancy or using those women only as the comparison group had little impact on the results of the regression analysis.

Missing data for most variables represented <5% of the sample; however, there were 2 variables related to sexual history of the participant (lifetime number of partners and age at first intercourse) that represented >20% missing. Missing values for these 2 variables were imputed using multiple imputation (Rubin, 1996; Schafer, 1997). The variables were continuous and log transformed for imputation and then back transformed and categorized for analysis. Age and self-reported prepregnancy weight were 2 deterministic variables that were complete and included in the imputation procedure. To our advantage, the subset of imputed variables was small and most data used for the model were complete. The data analyses for this paper were performed using SAS software (SAS Version 9.1 for Windows; SAS Institute Inc., Cary, NC).

Results

Table 1 describes the sociodemographic characteristics of our sample. All women were African American (black) as this was an eligibility criterion. A small proportion of women identified themselves as Hispanic in ethnicity. Overall, respondents were young and of lower socioeconomic status. Table 1 also describes the prevalence of feminine hygiene practices in the 6 months prior to and during pregnancy. Approximately one third of the respondents reported using feminine spray, wash, or towelettes to clean private areas in the 6 months prior to pregnancy with just 13% reporting this behavior during pregnancy. Use of powder on private areas after bathing was less frequent, both prior to and during pregnancy. Vaginal douching was the most common feminine hygiene practice with almost two thirds of the sample reporting ever douching. More than three quarters of those who ever douched began prior to 18 years of age. Many of these women ceased douching, as just 43% of all respondents reported douching in the 6 months prior to pregnancy. Pregnancy appears to have a major impact on douching behavior as just 5% of the total sample ($n = 43$) reported douching during their pregnancy. This includes women who douched in the 6 months prior and continued ($n = 37$) as well as women who had ceased prior to pregnancy and apparently returned to this practice during pregnancy ($n = 6$). Figure 1 illustrates the distribution of women in the sample according to the time periods examined: lifetime, recent, and during pregnancy.

Table 2 describes the variation in vaginal douching practices for women who douched in the 6 months prior to pregnancy, the period of focus in this paper. These data clearly show substantial variability in women's methods of douching. Although a sizeable percentage of women report not inserting the nozzle/tube ("placement at opening"), the majority of the women insert the nozzle/tube part of the way or all the way in. More than half of women report 1–5 minutes of exposure, with most of the remainder reporting <1 minute. The most frequently reported douching solution was vinegar and water followed by a scented douching solution. More than three quarters of women who douched in the 6 months prior to pregnancy reported douching at least once a month during that time period.

Possible predictors of vaginal douching in the 6 months prior to pregnancy were explored in logistic regression analyses summarized in Table 3. There were no statistically significant associations between douching and variables measuring maternal education, pregnancy locus of control, social support, age at first intercourse, or lifetime number of sexual partners. Variables strongly and significantly associated with douching in the bivariate analyses included older age, higher unmet needs score, smoking, and prenatal enrollment. Older maternal age (>19 years), more unmet needs for time for “nonessentials,” smoking in the year prior to pregnancy, and prenatal enrollment remained strongly associated with increased likelihood of douching in the 6 months prior to pregnancy after adjusting for several confounders. Many factors did not have independent associations with douching in the 6 months prior to pregnancy; however, these factors remained important confounders and were included in the final model.

In additional analyses, we examined the correlation of vaginal douching with other feminine hygiene practices. Among women who douched in the 6 months prior to pregnancy, almost 50% reported using feminine spray, wash, or towelettes to clean private areas compared to only 19.3% among women who did not douche in that same time period (odds ratio [OR], 3.28; 95% confidence interval [CI], 2.13, 5.06). Similarly, of women who douched in the 6 months prior to pregnancy, 15% reported using powder on private areas after bathing compared to only 5% among those who did not douche in that time period (OR, 4.00; 95% CI, 2.80, 5.71). Odds ratios for douching were also significantly elevated when use of sprays and powders during pregnancy were examined. These behaviors were not included in multivariate models as we conceptualize these behaviors as outcomes similar to and highly correlated with vaginal douching.

Discussion

In this study of low-income African-American mothers, vaginal douching was a very common practice to have ever initiated. Overall, approximately 64% of our cohort reported ever douching, somewhat higher but consistent with the rates seen for minority and less educated women in national data (Abma et al., 1997). Nearly one third of those who ever douched reported not douching in the 6 months prior to the index pregnancy with two thirds reporting that they did douche in this period (Figure 1). So although the prevalence of douching is much lower in the period shortly before pregnancy as compared to lifetime prevalence, the period prevalence was substantial. Because ours is not a longitudinal study, we do not know what women's early experiences were with douching. This could be a practice that women adopt early and spontaneously cease soon after or it could be that women's behavior is cyclical.

Two other studies of douching in pregnancy also examined periods of exposure and found similar results. In the Rochester, New York, case-control study of preterm birth and vaginal douching by Fiscella et al., the proportion who ever douched and those who douched in the six months prior to pregnancy were similar but slightly higher with 77% ever douching and 74% of those women reporting douching in the 6 months prior to pregnancy (Fiscella et al., 2002). In a postpartum study conducted at Kaiser Permanente medical center sites in Atlanta, Georgia, approximately 85% of the black respondents reported ever douching (Bruce et al., 2002). Results for the other periods combined data for black and white women. A smaller proportion of all women continued douching than in either our study (67%) or the Fiscella New York study (74%) (Fiscella et al., 2002) with only 47% still douching in the 6 months prior to pregnancy (Bruce et al., 2002). Douching during pregnancy was rare in all 3 studies, with <5% of our total cohort reporting douching during that period (11% of those who douched in the 6 months prior to pregnancy) compared with 5.7% of the African-American women in the New York study (10% of those in 6 months prior to pregnancy) (Fiscella et al., 2002) and 2% of all the women in the Atlanta study (Bruce et al., 2002).

With regard to potential adverse effects on pregnancy, the low rates of douching during pregnancy suggest that the attributable risk is likely negligible if the exposure only has a concurrent effect. However, if douching has lasting effects on the reproductive tract, the high rates in the 6 months prior to pregnancy are cause for concern. Furthermore, in our study, we asked women about the period 6 months prior to knowing she was pregnant. It is not uncommon in our population for knowledge of pregnancy to be somewhat later than the first missed period. Therefore, women may be continuing this behavior in early pregnancy.

Details of women's douching practices, such as frequency of douching, type of douching solution, and douching technique, may influence the effect of douching on health outcomes. However, prior studies examining these practices have made little effort to refine the assessment of exposure in studying its effect on adverse health outcomes. We discovered wide variability in the actual practice of douching. Approximately 10% of the subjects douching in the 6 months prior to pregnancy reported that they do not insert the nozzle into the vagina. No prior studies have described variability in nozzle placement. Essentially, if these questions are not asked in studies of douching, a nontrivial proportion of women will be misclassified as "exposed." The degree of exposure may also influence results, and our results provide evidence that the exposure is not homogeneous. More than one third of the women who reported ever douching used the product for <1 minute as compared to 55% who used it between 1 and 5 minutes. In a recent study of African-American nonpregnant women visiting gynecologic or family planning clinics in New York City, a similarly small proportion of women reported allowing the solution to flow >5 minutes, but a much higher proportion of women reported duration of flow in the middle range of 1–5 minutes (Zhang et al., 2004). We also saw heterogeneity with regard to how often women practice douching (Table 2).

Although we focused primarily on vaginal douching, as does most of the literature, other feminine hygiene practices may also be important to assess as they may have adverse effects on a woman's reproductive health. In our cohort, these other practices were not as common as douching but were certainly not rare. Approximately one third of women reported using feminine spray in the 6 months prior to pregnancy and 1 in 5 reported use of powder on private areas. Furthermore, women who engage in these behaviors were much more likely to have ever practiced vaginal douching. Given the significant yet incomplete overlap of feminine hygiene practices, future studies examining the possible sequelae of douching should consider potential for synergy as well as confounding in understanding the effects of each of these practices.

The epidemiology of vaginal douching with regard to the characterization of risk factors has been the subject of relatively few studies. Identifying those women most likely to douche is necessary if public health and clinical professionals are to develop effective interventions to change women's practices. Understanding the epidemiology of this practice is also critical for the proper evaluation of possible adverse health effects. Although douching itself is more frequent among populations of minority and low-income women, considered high risk based on the elevated rates of adverse health outcomes, there may be variability within these populations wherein douching is most often practiced by the lowest risk women.

In our cohort of African-American low-income women, older women (≥ 20 years of age) were significantly more likely to have douched in the 6 months prior to pregnancy. Although there was no effect of the full Family Resources Scale, which considered time and money needs being met for essential as well as nonessential areas, we found that women who had fewer needs met for "time for nonessentials" (e.g., time with their family, time to look nice, ample time to talk to friends) were significantly more likely to have douched in the 6 months prior to pregnancy. This is a factor we have previously reported to relate to pre-term birth risk (Misra, O'Campo, & Strobino, 1998). The meaning of this finding is unclear. It suggests that women whose resources are the most limited make different choices about feminine hygiene practices,

and that douching perhaps should be seen as a discretionary activity chosen by women in the context of other needs and demands in their lives. Consistent with how this product is marketed as well as regulated, women may perceive vaginal douches as cosmetic products that make them feel more attractive. This may be more important to women who are not having their needs met for time for themselves and their family as measured in the scale items relating to this factor.

We did not find lower socioeconomic status to be associated with vaginal douching. Although these results appear inconsistent with the few prior studies (Aral et al., 1992; Baird, Weinberg, Voigt, & Daling, 1996; Fiscella et al., 1998; Joesoef, Sumampouw, Linnan, Schmid, & Idajadi, 1996), we note that our cohort is overwhelmingly low income and prior studies examined populations with a broader socioeconomic distribution. Consistent with national data on race/ethnicity and education, the rate of ever douching in our cohort was substantial with almost two thirds of women reporting ever douching compared to national rates of 57% in African-American women and 55% among women with less than a high school education (Abma et al., 1997).

We found that women who enrolled in our study postpartum were much less likely to have douched in the 6 months prior to pregnancy. This is a group of women who received late, sporadic, or no prenatal care. If this variable is conceptualized solely as an indicator of socioeconomic status (SES), its effect is again contrary to previous studies. As noted, the compression of SES in our cohort may be 1 reason for our findings. However, the findings relating douching to earlier and more consistent prenatal care use also suggest that douching may be a behavior adopted by the women in our cohort who espouse “healthy behaviors.” Although douching may increase risks of infection and other adverse outcomes, knowledge of these risks does not appear to be widespread. Women in our cohort may view douching as an important preventive health practice. Without adjustment for these differences, any negative impact of douching may be underestimated or missed entirely.

Our results also do not support a relationship between any of the measured sexual behavior variables and vaginal douching. Although some past studies reported associations with these factors (Chacko et al., 1989; Gresenguet et al., 1997; Horn et al., 1990), these studies were not able to control for many confounding variables. As with the SES factors, the distribution of behaviors within our cohort may be different than in other studies. Regardless, these factors do not appear to be important predictors of douching within an African-American low-income cohort with high rates of vaginal douching. Knowledge of predictors in such cohorts, with high rates of douching as well as high rates of adverse reproductive and perinatal outcomes, is important as these are the populations in which interventions will likely be needed should douching be proven as a harmful rather than benign behavior.

Although our study has a number of strengths and broadens the study of the practice of douching and the risk factors for this behavior, there are also limitations that must be noted. First, although we asked about 2 time periods of importance to our larger study of perinatal outcomes, this was not a longitudinal study of douching. Therefore, we did not collect information on cycles of douching and lifetime duration. Also, we did not query women about why they ceased the practice of douching or why they began anew. The generalizability of our findings to nonpregnant women must also be evaluated. It may be that risk factors for douching in time periods not proximate to pregnancy will differ. However, based on the findings of this study of pregnant women, future research could examine a broader set of potential risk factors. Finally, predictors of douching practices within a cohort with a high rate of douching may be different from risk factors for populations with low baseline prevalence of this behavior.

Conclusion

The findings of this study represent an important contribution to the literature on feminine hygiene practices. No other published study has examined vaginal douching behavior with similar depth in relation to pregnancy. We have characterized patterns prior to and during pregnancy, a salient issue for those concerned with douching as a potentially hazardous exposure relating to birth outcomes. In addition, we identified significant heterogeneity in the practice of vaginal douching in a cohort of low-income African-American women. The risk factors we identified as predictors of douching in the 6 months prior to pregnancy offer a starting point for public health and clinical professionals who endeavor to change this behavior. However, these risk factors themselves are not necessarily ones that should be addressed, but rather may best be used to target women likely to be douching. Finally, studies of the effects of douching must incorporate measures of the predictors of douching and refine measurement of the exposure to determine the independent contribution of vaginal douching to health outcomes.

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Figure 1.
Douching habits of Study Participants

Table 1

Descriptive characteristics of the study sample

	Total sample (<i>n</i> = 872)
Age: mean $\pm$ SD (range)	23.22 $\pm$ 5.696 (12–43)
Race—self report: Black or African American	100% (872)
Ethnicity—self report:	
Hispanic	1.3% (11)
Recruitment	
Prenatal	55.6% (485)
Postnatal	44.4% (387)
Education	
≤ 12 years of school, <21 years old	36.2% (316)
≤ 12 years of school, ≥ 21 years old	53.8% (469)
>12 years of school	10.0% (87)
Employment	
Ever	85.6% (746)
Any time during pregnancy	51.8% (451)
Age at first intercourse (y)	
<12	2.8% (25)
12–14	34.9% (304)
15–17	43.7% (381)
≥ 18	9.9% (86)
Lifetime number of partners (<i>n</i>)	
1–3 men	27.4% (239)
4–10 men	49.7% (433)
≥ 11 or more	8.8% (77)
Vaginal douching	
Ever	64.3% (561)
During 6 months before pregnancy	38.6% (337)
During pregnancy	4.9% (43)
Age at first douche (y)	
<12	3.0% (17)
12–14	24.6% (138)
15–17	48.1% (270)
18–20	18.2% (102)
≥ 21	3.7% (21)
Feminine spray, wash, or towelettes to clean private areas	
During 6 months before pregnancy	34.1% (297)
During pregnancy	13.2% (115)
Talcum, baby, or deodorizing powder on private areas after bathing	
During 6 months before pregnancy	19.3% (168)
During pregnancy	12.7% (111)

Data are presented as % (*n*).

Table 2

Variation in vaginal douching practices during 6 months prior to pregnancy

	Percent (n)
Placement of nozzle/tube	
All of the way into vagina	40.9 (138)
Part of the way into vagina	48.1 (162)
At the opening of vagina	10.7 (36)
Missing	0.3 (1)
Duration of flow exposure (min)	
<1	37.4 (126)
1–5	56.4 (190)
5–10	5.9 (20)
Missing	0.3 (1)
Frequency of use (per month)	
<1	17.8 (60)
1–2	74.8 (252)
3–4	5.9 (20)
>4	1.5 (5)
Products used (multiple responses)	
Vinegar and water	90.8 (306)
Vinegar/water + cleansing agent	24.3 (82)
Medicated with other	9.8 (33)
Scented	30.0 (101)
Baking soda and water	2.1 (7)
Missing (no response)	1.5 (5)

n = 337.

Table 3

Predictors of vaginal douching in the 6 months prior to pregnancy

Variable	N = 642	Douched n = 337 n (%)	Did not Douch n = 305 n (%)	Unadjusted Logistic Regression		Adjusted Logistic Regression	
				Odds Ratio	95% CI	Odds Ratio	95% CI
Age (y)							
12–19	180	72 (21.4)	108 (35.4)	1.00	Reference	1.00	Reference
>19	462	265 (78.6)	197 (65.6)	2.02	(1.42, 2.87) ***	2.60	(1.36, 4.97) **
Family resources scale							
Time for nonessentials							
Above median (higher unmet needs)	284	177 (52.5)	107 (35.1)	2.03	(1.48, 2.79) ***	1.83	(1.27, 2.63) **
Below median (lower unmet needs)	352	158 (46.9)	194 (63.6)	1.00	Reference	1.00	Reference
Social support							
Above median	313	177 (52.5)	136 (44.6)	1.38	(1.01, 1.88) *	1.06	(0.74, 1.51)
Below median	329	160 (47.5)	169 (55.4)	1.00	Reference	1.00	Reference
Locus of control							
Above median	286	162 (48.1)	124 (40.7)	1.33	(0.97, 1.82)	1.30	(0.92, 1.82)
Below median	345	171 (50.7)	174 (57.1)	1.00	Reference	1.00	Reference
Highest grade completed and current age							
≤12 y of school, <21 years old	232	108 (32.0)	124 (40.6)	0.57	(0.32, 1.00)	1.29	(0.60, 2.78)
≤12 y of school, ≥21 years old	349	192 (57.0)	157 (51.5)	0.79	(0.46, 1.38)	0.79	(0.44, 1.43)
>12 y of school	61	37 (11.0)	24 (7.9)	1.00	Reference	1.00	Reference
Did you smoke in the last year?							
Yes	191	123 (36.5)	68 (22.3)	2.00	(1.41, 2.84) ***	1.78	(1.22, 2.60) **
No	451	214 (63.5)	237 (77.7)	1.00	Reference	1.00	Reference
Enrollment postpartum	293	128 (38.0)	165 (54.1)	1.00	Reference	1.00	Reference
Enrollment prenatal	349	209 (62.0)	140 (45.9)	1.92	(1.41, 2.64) ***	1.80	(1.29, 2.53) ***
Age at 1st intercourse [†]							
<12	17	9 (2.7)	8 (2.6)	1.74	(0.50, 5.99)	1.74	(0.52, 6.24)
12–14	223	114 (33.8)	109 (35.7)	1.01	(0.54, 1.91)	1.01	(0.58, 2.08)
15–17	285	148 (43.9)	137 (44.9)	0.99	(0.55, 1.79)	0.99	(0.58, 1.92)
≥18	64	35 (10.4)	29 (9.5)	1.00	Reference	1.00	Reference
Lifetime number of partners [†]							
1–3 men	190	90 (26.7)	100 (32.8)	1.00	Reference	1.00	Reference
4–10 men	315	169 (50.1)	146 (47.9)	1.00	(0.67, 1.51)	1.00	(0.65, 1.53)
≥11 men	49	30 (8.9)	19 (6.2)	0.95	(0.43, 2.11)	0.95	(0.40, 2.15)

* p-value < 0.05;

** p-value ≤ 0.01;

*** p-value ≤ 0.001

[†] Counts and frequencies based on distribution prior to imputation; odds ratios, and 95% confidence intervals based on imputed data.