Bleeding patterns during the menopausal transition in the multi-ethnic Study of Women's Health Across the Nation (SWAN): A prospective cohort study

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Abstract

Objective—Prior studies describing menses duration and heaviness of flow during the menopausal transition (MT) have been short in duration and limited to white women. We estimated the frequency of and risk factors for prolonged bleeding, spotting, and heavy bleeding during the MT in an ethnically diverse population.

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Design—Prospective community–based cohort study.

Setting—United States: Southeastern Michigan, Northern California, and Los Angeles, California.

Population—1320 midlife women who participated in the Study of Women's Health Across the Nation (SWAN) Menstrual Calendar Substudy. Participants included African-American, white, Chinese, and Japanese women.

Methods—Women completed daily menstrual calendars from 1996–2006, and provided information on hormone therapy, smoking and physical activity. Annual measures included height and weight. Kaplan-Meier survival analysis and multivariable regression were used to analyze the data.

Main Outcome Measures—Menses of 10+ days, spotting of 6+ days, heavy bleeding of 3+ days.

Results—At least three occurrences of menses 10+ days was reported by 77.7% (95%CI: 56.7, 93.2), of 6+ days of spotting by 66.8% (95%CI: 55.2, 78.0) and of 3+ days of heavy bleeding by 34.5% (95%CI: 30.2, 39.2) of women. Menses of 10+ days, 6+ days of spotting, and 3+ days of heavy bleeding were associated with MT stage, uterine fibroids, hormone use, and ethnicity. BMI was associated with 3+ days of heavy bleeding.

Conclusions—These data provide clinicians and women with important information about the expected frequency of prolonged and heavy bleeding and spotting during the menopausal transition that may facilitate clinical decision making.

Keywords

Menstruation; Menopause; Menopausal Transition; Abnormal Uterine Bleeding

Introduction

Gynecologic disorders, including abnormal uterine bleeding (AUB) are a major cause of inpatient hospital admissions in the United States (US), accounting for 14% of all hospitalizations among women aged 45–54 years old from 1998 through 2005 [1]. The annual direct cost of treating AUB is estimated to be 1 billion US dollars [2]. While the burden of AUB is substantial, consensus has only recently been reached on proper terminology and definitions, as proposed by the International Federation of Gynecology and Obstetrics (FIGO) Menstrual Disorders Working Group defined normal [3–6].

The FIGO system classifies bleeding into nine categories based on underlying structural and non-structural features. [5] Suggested definitions for normal menstrual bleeding in the mid-reproductive years included duration of menstrual flow between 4.5 and 8 days [3, 6] Previous recommendations defined prolonged menstrual bleeding as 10 or more days [7] or menses exceeding 14 days [8].

Chronic AUB, defined as abnormal volume, regularity or timing for a period of 6 months, associated with ovulatory dysfunction (AUB-O) may occur with some frequency in the late reproductive years and the menopausal transition as a consequence of increased frequency

of ovulation and altered patterns of progesterone production. [5, 6, 9–12] However, data on the bleeding experience of women at the end of reproductive life is limited although the greater variability in menstrual bleeding patterns after age 40 is well recognized [13–15]. Hallberg's et al.'s classic study of menses volume demonstrated that 50 year-old women have a higher median menstrual blood flow than younger women. [16] Two European studies, of one year duration, have reported the cumulative incidence of 10+ days of bleeding to be 14.7% [17] and the period prevalence to be 36–49% [18] while the cumulative incidence of heavy periods was 53% [18]. Prior perimenopausal studies of menses,[17–20] which included mostly white participants, were short in duration and unable to characterize bleeding during the whole MT.

This paper describes the distribution of menses duration and heaviness of flow (number of heavy days, number of spotting days) during the MT based on data from prospectively collected menstrual diaries in a large, multi-ethnic cohort of women. It also assesses the association of race/ethnicity and body mass index (BMI) with these menstrual bleeding characteristics.

Methods

This study used data from The Study of Women's health Across the Nation (SWAN), a prospective cohort study of midlife women living in the United States. It was restricted to three SWAN sites that conducted a menstrual calendar substudy: Northern California, Los Angeles, and Southeastern Michigan. The design of SWAN's cohort study has been previously described [21]. Eligibility included age 42–52 years, self-designation as a member of the specified racial/ethnic groups, having an intact uterus and, in the three months prior to screening, having had at least one menstrual period and not currently using exogenous hormones affecting ovarian function, i.e. hormone therapy (HT) or hormonal contraceptives. Each site recruited white women and women from one minority group (African Americans in southeastern Michigan, Japanese in Los Angeles, and Chinese in northern California); a total of 1498 women were enrolled into the cohort at the three study sites. Institutional Review Boards at each study site approved the study protocol and all participants provided written informed consent.

The SWAN cohort study began in 1996; baseline and annual follow-up visits consisted of interviewer- and self-administered questionnaires and height and weight measurements.

A self-administered daily menstrual calendar began in 1996 and continued through 2006. Heaviness of flow was recorded using the following pre-specified categories: spotting (bleeding not requiring the use of a sanitary product or not filling a regular-sized sanitary product); light to moderate bleeding (sanitary protection was required but only needed change a few times a day or every 3–4 hours); or very heavy bleeding (needing to change sanitary product every 1–2 hours for more than 4 hours during the day) [22]. Each month women answered questions about hormone use, gynecologic procedures, cigarette use and physical exercise. Women completed monthly calendars for 2 years after their final menstrual period (FMP).

Menstrual cycle length was calculated using bleeding definitions recommended by the WHO [23, 24] as adapted for perimenopausal women by the ReSTAGE Collaboration [25–27] which include the requirement of a bleed free interval of at least 3 days. A menstrual cycle consisted of a bleeding episode and subsequent bleed-free interval of at least 3 days. A bleeding episode (menses) was defined as at least one day of bleeding or spotting. A bleeding episode could contain two consecutive bleed-free days between bleeding days. The duration of bleeding, total number of spotting days recorded, and total number of heavy days recorded were determined for each bleeding episode. We defined the cutoff for prolonged menses (10+ days), spotting (6+ days) and heavy bleeding (3+ days) by the upper 5th percentile of their respective distributions. We also used two additional definitions of prolonged menses: the FIGO definition of menses exceeding 8 days [3, 6] and the definition based on data from the World Health Organization (WHO) of menses exceeding 2 weeks (15+ days) [8].

Onset of the early MT and late MT were defined from the calendar data using the STRAW +10 definitions [9–12]. Early MT was defined by the persistent difference of at least 7 days in the length of consecutive menstrual cycles. Persistence was defined as recurrence within 10 cycles of the first variable length cycle. Menstrual cycles before the onset of the early MT were defined as premenopausal. Late MT was defined as the first occurrence of a menstrual cycle length of at least 60 days. The FMP was defined as the first day of a menses followed by at least 12 months of amenorrhea. If neither the onset of the early MT nor the onset of the late MT was observed for a woman, then all of her menstrual cycles were defined as of unknown stage.

Menstrual cycles were coded as treated cycles for all cycles during which women reported hormone use. For months with missing hormone information, menstrual cycles were coded as not treated if the menstrual cycle occurred before the first report of hormone therapy use, if the woman reported no hormone therapy use in the calendar year of the missing information or if a woman never reported hormone therapy use.

Race/ethnicity was self-defined as African American, Chinese, Japanese or white. Highest education (high school graduate/GED or less than high school versus at least some college) and marital status (single, married/partnered, or separated, widowed, or divorced) were assessed at baseline. Economic strain was assessed at baseline with the question "how hard is it to pay for basics?" and categorized as very hard, somewhat hard, or not hard. For each menstrual cycle, weight was linearly interpolated between the prior and subsequent annual visits and BMI was categorized as normal weight (24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), or obese (30.0 kg/m^2). The 47 women with BMI < 18.5 were included in the normal weight category. Results do not differ when they are excluded.

A woman was considered diabetic if she self-reported diabetes, was taking medication for diabetes, or had an annual visit (baseline, visit 1, and visit 3–7) fasting serum glucose level of 126 mg/dl (7 mmol/L). Uterine fibroids were based on self-reported diagnosis. Current cigarette use (yes/no) was defined by whether the woman reported having smoked at least one cigarette a day or a total of 30 cigarettes in the last month. Baseline smoking status was assessed by interview at the start of the study. Average hours of physical activity per week

were calculated based on the average number of times per week and the average number of minutes per episode of moderate to vigorous physical activity reported.

Statistical Analyses

Of the 1498 women enrolled at the three SWAN sites, 1320 (88.2 %) were eligible, defined as having at least one menstrual cycle recorded in the menstrual calendar without hormone use, and were included in this analysis. Menstrual cycles during hormone use and during a one month wash-out period were excluded (n=4266), as were menstrual cycles during pregnancy or where pregnancy was suspected (n=30), and menstrual cycles with missing covariate information (n=4266). Post-hysterectomy or post-FMP bleeding events were also excluded. Statistical analyses were performed using SAS 9.2 (SAS Institute Inc., Cary, NC). To determine the number of women who had menstrual events, cumulative percents and associated 95% confidence intervals were calculated using Kaplan-Meier methods for survival probabilities in order to account for differential duration of observation and right-censoring. Time to bleeding event was calculated from the start of the MT stage until the first, second, or third occurrence of a bleeding event for that MT stage. For women without an event, time was calculated from start of the MT stage until the last menses recorded during that stage. For the all stages analysis, time to bleeding event was calculated from the start of the study until the first, second, or third occurrence of a bleeding event regardless of stage. For women without an event, time was calculated from study start until the last menses recorded in the menstrual calendar study.

Since the distribution of menses duration during the MT is right-skewed, the median is more informative about central tendency than the mean. We used quantile regression [28] to examine factors associated with the median duration of menses. Quantile regression models evaluate factors associated with the percentile (or quantile) of interest. Quantile regression coefficients are interpreted similarly to linear regression coefficients from a linear regression. For example, the coefficients of a categorical predictor represent the difference in menses duration in days for the 50th percentile between one category and the reference group, adjusted for all other covariates in the model. Bootstrap sampling with 500 repetitions based on samples of women was conducted to construct 95% confidence intervals (CI). The multivariable model included MT stage, ethnicity, and BMI as well as covariates associated in the crude analysis (at p<0.20) with menses duration.

Generalized estimating equation (GEE) methods with an first order autoregressive (AR1) working correlation structure, selected by using the quasi-likelihood information criterion (QIC), were used to model the association between menses of 10+ days duration, heavy bleeding of 3+ days, or 6+ days of spotting and covariates. Multivariable models included MT stage, ethnicity, and BMI as well as covariates associated in the crude analysis (at p<0.20). In order to examine the association with study site, multivariable models were run among white women with study site as a variable instead of race/ethnicity.

Results

Women who were excluded were more likely to be from southeastern Michigan, African-American, report low educational attainment and economic strain, be overweight/obese, be a current smoker, and be less likely to be married than were included women (Table 1).

Of the 1320 eligible women, 963 (73.0%) had onset of the early MT identified and 815 (61.7%) had onset of late MT identified. Four hundred and thirty one (32.7%) women had their FMP identified in the menstrual calendars. Additionally, 19 (1.4%) had a hysterectomy, 233 (17.7%) began using hormones and had no further untreated menstrual cycles observed, and 637 (48.3%) withdrew from the study before their FMP was identified.

The 1320 women contributed from one to 166 cycles (median = 29) for a total of 51,606 menstrual cycles. Menses duration ranged from 1 to 132 days with a mean of 5.9 days and a median of 6 days (Table S1). Menses exceeding 8 days was observed in 5287 (10.2%), menses, of 10+ days was observed in 3,401 (6.6%), and menses of 15+ days in 838 (1.6%) menstrual cycles. The range of spotting days was 0 to 82 days, with a mean of 2.6 days and a median of 2 days. Spotting of 6+ days occurred in 3,181 (6.2%) menstrual cycles, and in 1991 (58.5%) cycles with menses of 10+ days. The range of heavy days during menses was 0 to 19 days, with a mean of 0.7 days and a median of 0 days. Heavy bleeding of 3+ days occurred in 2,746 (5.3%) of menstrual cycles but in 561 (16.5%) cycles with menses of 10+ days. Heavy bleeding of 3+ days occurred in 218 (6.9%) of the menstrual cycles with 6+ spotting days, with almost all (n=215) occurring in menses of 10+ days.

Cumulative Percent of Prolonged Menses, Prolonged Spotting, and Heavy Bleeding

In the 10.5 years of observation, the cumulative percent of women with at least 1, 2, or 3 occurrences of menses of 10+ days was 91.0%, 87.5%, and 77.7% (Table S2). During the early MT, with a median duration of 3.0 years (interquartile range (IQR) = 1.3–5.3 years), the cumulative percent of women with at least 3 occurrences of menses of 10+ days was 51.6%. During the late MT, with a median duration of 2.6 years (IQR=1.8–3.9), the cumulative percent of women with at least 3 episodes of menses of 10+ days was 54.6%. The median time between 10+ day bleeding episodes was 125 days (IQR= 54 to 301 days). Among women experiencing such episodes, 27.5% experienced three episodes within a 6-month period. Median time between 8+ day bleeding episodes was 88 days (IQR= 35 to 197 days), with 39.0% of women with such episodes, experiencing three 8+ day bleeding episodes within a 6-month period.

During the study, 66.8% of women had at least 3 occurrences of 6+ days of spotting, with 51.2% of women recording at least 3 such occurrences during the early MT and 75.2% during the late MT. The median time between 6 or more day spotting episodes was 148 days (IQR= 60 to 266 days). Among women experiencing three or more episodes of spotting, 23.6% recorded three episodes within a 6-month time window. The cumulative percent of women with at least 3 occurrences of menses with three or more days of heavy bleeding was 34.5%, while 30.7% and 34.7% having at least 3 such occurrences during the early MT and the late MT, respectively. The median time between heavy bleeding episodes was 99 days

(IQR= 31 to 231 days), with 39.8% of women who recorded three or more episodes of heavy bleeding experiencing them within a 6-month time window.

Multivariable Quantile and Logistic Regression

Based on the multivariable quantile regression, women who were diagnosed with uterine fibroids had a 1.00 (95%CI: 0.17, 1.83) day longer median menses duration than women who were not diagnosed with uterine fibroids. Median menses duration was not associated with MT stage, ethnicity, education, economic strain, diabetes, BMI, physical activity, current smoking, or reported hormone use during the study.

In multivariable logistic regression models, being in the MT was associated with menses duration of 10+ days, 6+ days of spotting, and 3+ heavy bleeding days (Table 2.) Compared to premenopausal cycles, women were more likely to report menses of 10+ days, 6+ days of spotting, or 3+ days of heavy bleeding in both the early and late MT, with the odds slightly higher in the late than early MT. Women with uterine fibroids were more likely to report each of these three types of bleeding episodes than women not diagnosed with uterine fibroids; however, the 95% confidence interval for heavy menstrual bleeding included the null (1.00). Women who reported using hormones during the study were also more likely to report each of the three bleeding types than women who did not.

African-American women were less likely to report menses of 10+ days or 6+ days of spotting compared to white women. Japanese women were less likely to report 3+ days of heavy bleeding than white women. Women for whom it was very or somewhat hard to pay for basics were more likely to record 3+ days of heavy bleeding than other women. Overweight women and obese women were more likely to experience 3+ days of heavy bleeding than normal weight women. Current smokers were more likely to record 3+ days of heavy bleeding than non-smokers.

Education, economic strain, diabetes, BMI, physical activity, or current smoking were not associated with menses of 10+ days or 6+ days of spotting. In the unadjusted analyses, both diabetes and thyroid conditions were associated with 3+ days of heavy bleeding, but the relationships did not persist after adjustment. Education and physical activity were not associated with 3+ days of heavy bleeding. Among white women, study site was not associated with menses of 10+ days, 6+ days of spotting, or 3+ days of heavy bleeding.

Discussion

Main Findings

This study is one of the first to examine the frequency of prolonged menses and heavy bleeding during the MT and to evaluate race/ethnicity, BMI and other factors in relation to these menstrual events. Three out of four of these mid-life women experienced at least three occurrences of menses of 10+ days. Slightly more than one quarter of these women experienced three such bleeding episodes within a 6-month time window. Menses with spotting of 6 + days occurred in over half the episodes of menses of 10+ days. Menses with heavy bleeding of 3+ days were less common, yet one in three women recorded three or

more occurrences during their MT, approximately 40% of whom experienced three heavy bleeding episodes with a 6-month time window.

Strengths and Limitations

Study limitations included left-censoring, which may have biased our results. The mean age of women eligible for this study was 45.7 years and, for some women, the onset of the MT occurred prior to enrollment into the study. Women who did not have a menstrual cycle in the last three months were ineligible to enroll into the SWAN cohort study, therefore women who were near the end of the MT, who experience surgical amenorrhea, or who already experienced their FMP were excluded. Nonetheless, these data provide one of the first evaluations of the frequency of long and heavy menses during the menopausal transition. In the population from which our cohort study was enrolled, African-American women were more likely to have had a hysterectomy [29]. Information on uterine fibroids was obtained by self-report and may be underreported.

Given that these data are drawn from a population-based study that did not include medical record linkage, a further limitation of this study is that information on other conditions that may affect uterine bleeding such as polyps or adenomyosis was not available. Thus we could not differentiate pathological from non-pathological bleeding. As we cannot correlate these bleeding patterns with the likelihood of specific pathology or subsequent cancer rates, these data are informative about expected frequency of prolonged and heavy bleeding during the menopausal transition, but definitive inferences about threshold indications for clinical evaluation are not possible.

Interpretation

This study is the only multi-ethnic study of menstrual bleeding patterns during the menopausal transition and it is based on a large sample of prospectively collected menstrual calendar data recorded for up to ten years. We found that menses of 10+ days were more likely to occur during the early and late MT than in late reproductive life. In contrast, the median duration of menses was not associated with reproductive stage, suggesting that it is not the average menses length but rather the likelihood of prolonged bleeding which changes during the MT. Our results are consistent with prior studies and provide more comprehensive quantitative data. The Melbourne Women's Midlife Health Project did not find a change in mean heaviness of flow from the first to second year of their study. [20] The Massachusetts Women's Health Study found a higher percentage of menses exceeding eight days in perimenopausal women than premenopausal women. [19]

The International Federation of Gynecology and Obstetrics (FIGO) Menstrual Disorders Working Group suggested the normal limits for the duration of menstrual flow in the mid-reproductive years to be between 4.5 and 8 days [3, 6] with prolonged menstrual bleeding defined as bleeding exceeding 8 days. Previous recommendations defined prolonged menstrual bleeding as 10 or more days [7] or menses exceeding 14 days [8]. We found that prolonged menses of 10+ days to be common occurrences during the menopausal transition.

Only one other calendar study, among postmenarcheal girls, has examined ethnic differences in menstrual bleeding in the United States. Mean duration of bleeding was a half-day less

among African-American girls as compared to white girls, but African-American girls were more likely to report heavy bleeding [30]. In our SWAN Menstrual Calendar Study, menses of 10+ days were less likely in African-American women as compared to white women but African-American women were more likely to experience three or more days of heavy bleeding, although the latter association was attenuated in the multivariable analysis.

BMI was associated with heaviness of flow but not menses duration in this analysis. A similar result was seen in a Danish study which observed obese women were more likely to report menstrual flooding but not prolonged menstrual bleeding [18]. In the SWAN Daily Hormone Study, obesity was also associated with 3 or more days of heavy bleeding [31]. The Michigan Bone Health and Metabolism Study did not find an association between menses duration and BMI in women aged 25–50 [32]. However, several studies of adolescent and young adult women report an association between low BMI and longer menses[30, 33, 34] or high BMI and short menses[30, 35–37]. The associations we found with obesity may be due to the differences seen in hormone profiles among obese women during the MT. In the SWAN Daily Hormone Study (DHS), obese women were shown to have longer follicular phases, thus longer duration of estrogen stimulation, but shorter luteal phases. Obese women in the SWAN DHS had lower luteinizing hormone (LH), and progesterone metabolites as well as lower follicle-stimulating hormone (FSH) levels [38], as was also found in the longitudinal SWAN cohort [39].

Ever being on hormones during the study was positively associated with all three bleeding events, consistent with the fact that hormones are used to treat alterations in uterine bleeding [40]. Uterine fibroids were also positively associated with all three bleeding events. In our study, women self-reported a physician diagnosis of uterine fibroids. Typically, women are only diagnosed with uterine fibroids when they present with a specific complaint and are evaluated. However, it is estimated that 50% of women with uterine fibroids are asymptomatic [41]. Thus this association may only reflect identified uterine fibroids that cause more symptoms.

Conclusion

We found that the large majority of women in SWAN, over 50% of whom were not white, reported menses duration of 10+ days, spotting of 6+ days, and/or 3+ days of heavy bleeding during the MT. The likelihood of experiencing these menstrual bleeding events varied by race/ethnicity, BMI, and reported uterine fibroids. These data confirm that two types of bleeding, longer menses with more days of spotting and heavier menses, occur in most women during the MT. These data provide clinicians and women with important normative data regarding the expected frequency of these bleeding changes during the menopausal transition, data that may facilitate decision making in clinical practice. Such information, particularly when coupled with the emerging information about duration of the stages of the menopausal transition [25, 27, 42], will be of great value to women in this life-stage who wish to be active participants in their own health care. Such normative data can greatly alleviate concerns about midlife changes in ones bleeding patterns and facilitate coping with what, in most cases, maybe be a time-limited experience. Further research on the correlation between

such bleeding and documented pathology is warranted to better support recommendations for watchful waiting versus clinical intervention [43].

Additional studies to better define "normal" bleeding patterns in women ages 40–55 should be encouraged. As one of the only papers on menstrual bleeding patterns during the menopausal transition, this paper provides important information for women trying to assess changes in their menstrual experience during the menopausal transition.

Acknowledgments

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Table 1

Baseline Demographics of Women who were included and excluded, Study of Women's Health Across the Nation (SWAN) Menstrual Calendar Substudy

	Included n=1320	Excluded n=178	
	n (%)	n (%)	P value
Study Site			
Southeastern Michigan	430 (32.6)	113 (63.5)	
Northern California	432 (32.7)	27 (15.2)	<0.001
Los Angeles	458 (34.7)	38 (21.3)	
Race/ethnicity			
African-American	236 (17.9)	89 (50.0)	
Chinese	232 (17.6)	18 (10.1)	<0.001
Japanese	262 (19.8)	19 (10.7)	
White	590 (44.7)	52 (29.2)	
Education[a]			
Less than High School	66 (5.0)	14 (8.6)	
High School Grad	219 (16.6)	35 (21.6)	
Some College/Vocation	455 (34.5)	60 (37.1)	0.01
College Graduate	296 (22.4)	35 (21.6)	
Post College	284 (21.5)	18 (11.1)	
Marital Status[b]			
Single	172 (13.0)	22 (12.6)	
Married	911 (69.1)	103 (58.9)	
Separated	44 (3.3)	10 (5.7)	0.02
Widowed	24 (1.8)	6 (3.4)	
Divorced	168 (12.7)	34 (19.4)	
How Hard Is It To Pay For Basics[c]			
Very Hard	91 (6.9)	15 (8.8)	
Somewhat Hard	349 (26.4)	63 (36.8)	0.01
Not Hard	880 (66.7)	93 (54.4)	
Body Mass Index, kg/m^2 [d]			
Normal (24.9)	759 (58.4)	67 (38.3)	
Overweight (25.0–29.9)	251 (19.3)	54 (30.9)	<0.001
Obese(30.0)	290 (22.3)	54 (30.9)	
Baseline Smoking Status[e]			
Never	836 (64.1)	104 (59.8)	
Past	277 (21.2)	31 (17.8)	0.03
Current	191 (14.7)	39 (22.4)	
Ever Taken Hormones Prior to Study [f]	154 (11.7)	17 (9.7)	0.43
Ever Diabetes During Study [g]	211 (16.0)	33 (18.5)	0.39

	Included n=1320	Excluded n=178	
	n (%)	n (%)	P value
Ever Fibroids During Study [g]	417 (31.6)	47 (26.4)	0.17
Age at Screener years, Mean (STD)	45.7 (2.7)	46.3 (3.0)	0.02

Study was conducted in 3 SWAN sites: Los Angeles, Northern California, Southeastern Michigan

[a]16 excluded have missing information

[b]1 included and 3 excluded have missing information

[c]7 excluded have missing information

[d]20 included and 3 excluded had missing information

[e]16 included and 4 excluded had missing information

[f]Does not include oral contraceptive pills.

[g]Diagnosed during the first 10 annual visits.

Table 2

Adjusted Logistic Regression Models for Potentially Abnormal Uterine Bleeding[3-6], The Study of Women's Health Across the NationMenstrual Calendar Substudy

	Menses 10+ Days[a] Adjusted Odds Ratios (95% Confidence Interval)	Spotting 6+ Days[b] Adjusted Odds Ratios (95% Confidence Interval)	Heavy Bleeding 3+ Days[c] Adjusted Odds Ratios (95% Confidence Interval)
Menopausal Transition Stage			
Pre-transition	Referent	Referent	Referent
Early transition	3.15 (2.47, 4.02)	2.66 (1.98, 3.57)	1.38 (1.10, 1.73)
Late transition	4.30 (3.26, 5.68)	3.95 (2.83, 5.52)	1.75 (1.31, 2.34)
Unknown	1.46 (0.82, 2.59)	0.94 (0.50, 1.77)	1.41 (0.90, 2.22)
Race/Ethnicity			
African-American	0.64 (0.46, 0.89)	0.52 (0.37, 0.73)	1.26 (0.87, 1.84)
Chinese	0.97 (0.72, 1.32)	1.23 (0.90, 1.69)	1.04 (0.71, 1.51)
Japanese	0.80 (0.60, 1.07)	1.01 (0.76, 1.34)	0.59 (0.39, 0.88)
White	Referent	Referent	Referent
Very or Somewhat Hard to Pay for Basics	n/a	1.24 (0.96, 1.60)	1.57 (1.17, 2.11)
Uterine Fibroids	1.52 (1.22, 1.88)	1.28 (1.04, 1.58)	1.34 (0.97, 1.85)
Body Mass Index, kg/m²			
Normal weight (24.9)	Referent	Referent	Referent
Overweight (25.0–29.9)	0.94 (0.73, 1.20)	0.88 (0.70, 1.11)	1.40 (1.02, 1.91)
Obese (30)	0.91 (0.69, 1.19)	0.80 (0.58, 1.10)	2.24 (1.63, 3.08)
Current Smoker	n/a	n/a	1.63 (1.16, 2.28)
Ever Hormone Use During Study	1.59 (1.27, 2.00)	1.32 (1.06, 1.64)	1.62 (1.21, 2.16)

[a]Multivariable model contains menopausal transition stage, race/ethnicity, uterine fibroids, BMI, ever hormone use, and adjusted for repeated measures

[b]Multivariable model contained menopausal transition stage, race/ethnicity, hard to pay for basics, uterine fibroids, BMI, ever hormone use, and adjusted for repeated measures

[c]Multivariable model contains menopausal transition stage, race/ethnicity, hard to pay for basics, uterine fibroids, BMI, current smoker, ever hormone use, and adjusted for repeated measures