Racial and Regional Differences in Age at Menopause in the United States: Findings from the Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study

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Abstract

Objectives—To examine regional and Black-White differences in mean age at self-reported menopause among community-dwelling women in the US.

Study Design—Cross-sectional survey conducted in the context of the REasons for Geographic And Racial Differences in Stroke and Myocardial Infarction study.

Results—We studied 22,484 menopausal women. After controlling for covariates, Southern women reported menopause 10.8 months earlier than Northeastern women, 8.4 months earlier than Midwestern women, and 6.0 months earlier than Western women (p<0.05 for all). No difference was observed in menopausal age between Black and White women after controlling for covariates (p=0.69).

Conclusions—Women in the South report earlier menopause than those in other regions, but the cause remains unclear. Our study's large sample size and adjustment for multiple confounders lends weight to our finding of no racial difference in age at menopause. More study is needed of the implications of these findings with regard to vascular health.

Keywords

menopause; race; region

Introduction

Menopause occurs most often between the ages of 50 and 52, with 95% of women having final menstrual period between ages 44 and 56[1-2]. Early menopause has been associated

with higher all-cause mortality and an increased incidence in cardiovascular disease (CVD) risk factors, both significant public-health concerns[3-5]. Several factors have been associated with age at menopause. Women who smoke stop menstruating 1-2 years earlier than comparable non-smokers[6-8]. Women who use oral contraceptives, who have higher socio-economic status and higher parity have later menopause[9]. Mother's age at menopause is also an important predictor of daughter's age at menopause[10]. Data regarding racial differences in age at menopause have been mixed with several small studies reporting that menopause occurs approximately six months earlier in Black women when compared to age-matched White women[7], while other larger studies have reported no racial difference[8].

Though CVD has been associated with an earlier age at menopause[5], the reasons for this association are not known. The Southeastern US is a region described to have higher stroke and coronary heart disease mortality than elsewhere in the country[11-12]. Whether women living in these higher CVD mortality regions also have lower age at menopause has not been reported. This type of analysis is complicated by the clustering of Blacks in the Southeast.

In this paper, we examined the relationship of age at menopause with race and geographic region in the US. We hypothesized that menopause occurs earlier in the South compared to other regions in the US, consistent with the high CVD mortality there. Furthermore, we sought to determine if any observed regional differences could be explained by race or other factors thought to affect age at menopause.

Materials and Methods

The REasons for Geographic And Racial Differences in Stroke (REGARDS) Study is a national, community-based study of over 43,000 Black and White men and women aged 45 years and older, designed to examine underlying mechanisms leading to regional and racial differences in stroke[13]. An ancillary study examines differences in acute coronary heart disease outcomes. In order to construct the cohort, individuals were consented and interviewed by computer-assisted telephone interview (CATI), and if they also agreed to an in-home examination, were entered into the cohort. This report includes the 22,484 women who completed the CATI survey regardless of having a home visit and reported having already undergone menopause at the time of the interview.

REGARDS recruitment took place from 2003-2007, and methods are detailed elsewhere[13]. Briefly, community-dwelling women interviewed for REGARDS resided in all regions in the continental US, both rural and urban areas, and 48.9% (N=10,998) were White and 51.1% (N=11,486) were Black. Race was self-reported, and our cohort includes only two racial groups - Blacks and Whites. The use of "racial differences" in this manuscript refers only to these two racial groups.

The Southern region had a larger number of participants than other regions due to statistical power required to test regional differences in stroke incidence and mortality in the larger study[13]. The CATI survey included questions on medical history, including reproductive history. To assess for menopausal status, participants were asked, "Have you gone through the change of life?" and "How old were you at the time of your last natural menstrual period?" To identify those with surgical menopause, participants were asked, "Have you ever had a hysterectomy, that is, surgery to remove your uterus or womb?" and "Have you ever had an ovary removed?" If they answered "yes" to the latter, participants were asked, "How many ovaries were removed?" Women who underwent an iatrogenic early menopause were identified if they answered positively to the following question: "Have you had any condition or treatment that caused your menstrual periods to permanently stop, other than the surgeries we just discussed or natural menopause?" Other surgical procedures involving

the fallopian tubes and uterus, such as tubal ligation, endometrial ablation, and myomectomy were not included in the reproductive history portion of the interview. Women with a history of hormone use, both for contraceptive and replacement purposes, were included in the analysis.

We divided the study sample into "naturally" and "surgically" menopausal women. Naturally-menopausal women were defined as those reporting that their last menstrual period was 12 months or more prior to their CATI interview. Women who stopped menstruating 12 months prior to having hysterectomy and/or oophorectomy were also considered naturally-menopausal. Surgically menopausal women included those who reported a history of hysterectomy or removal of both ovaries. The relatively small number of women reporting unilateral oophorectomy without hysterectomy (3%) was included in the "natural" menopause group in the analysis since loss of one ovary was not expected to confer a large difference in age at menopause. Participants were excluded if they reported still having regular menstrual periods at the time of initial CATI interview or reported their last period within 12 months of the initial CATI interview. Participants who reported undergoing menopause either naturally or surgically, but did not identify a specific age, were included in separate analyses.

Univariate analyses of variance were used to test associations between self-reported age at menopause and race (Black and White) and region among women in the natural and surgical menopause groups. The self-reported age at menopause was defined as the age in years reported by study participants at which their last menstrual period occurred. For the surgical menopause analysis, the age at menopause was defined as the self-reported age in years when the participants underwent the earliest surgical procedure that met the surgical criteria stated previously. Regions were defined by four geographical regions utilized by the U.S. Census Bureau: South, Northeast, Midwest and West (Figure 1)[14]. A sub-analysis of the South region was performed to evaluate differences in age at menopause among areas of increased stroke mortality, the Stroke Belt and Stroke Buckle[12]. The Stroke Buckle includes the coastal plain region of North and South Carolina and Georgia, and the Stroke Belt includes remainder of North and South Carolina and Georgia, and the states of Tennessee, Alabama, Mississippi, Louisiana, and Arkansas.

We used multiple linear regression to examine racial and regional differences in age at menopause, and pair-wise comparisons were performed in both racial and regional analyses to adjust for variables known to be associated with menopausal age: chronological age, parity, smoking history, and socioeconomic status. All variables were examined simultaneously. Annual income and education were utilized as surrogates for socioeconomic status. History of CVD was also included as a covariate given an association with earlier menopause as previously discussed. The CVD variable included self-reported history of myocardial infarction, stroke, transient ischemic event (TIA), carotid endarterectomy, coronary intervention, repair of aortic aneurysm, and/or peripheral arterial intervention. Physical activity was entered as a covariate in the analysis because a European study recently illustrated an association between earlier menopause and both decreased physical activity and higher body mass index (BMI)[15]. Extent of physical activity was assessed by the CATI interview with the following question: "How many times per week do you engage in intense physical activity, enough to work up a sweat." Measured BMI was entered as a covariate in a separate analysis for those participants that underwent an in-home visit (7,167 women or 68.5%) to elucidate if this might explain differences observed in age at menopause. Less than 0.5% of all data points were missing after interviewing REGARDS respondents, with the exception of annual income and physical activity, where 16.9% and 1.6% of respondents respectively did not provide an answer. For income those with missing data were included in the analysis and coded as missing.

Results

Sample characteristics

Women in the natural (n=10,440) and surgical menopause (n=9,944) groups differed somewhat with respect to age, parity, and smoking history (Table 1). A greater proportion of women in the surgical menopause group was Black and resided in the South. In addition, women in the surgical menopause group tended to have lower education and lower annual income. Women with surgical menopause had a proportionately greater prevalence of self-reported CVD.

Women who reported being menopausal but did not report an age at menopause (n=1,361) did not differ from those in the natural menopause group with respect to parity and region of residence (Table 1). They tended to be older, with 67% (N=912) older than 64 years, and slightly more were White (57.4% vs. 52.5%). This group also contained fewer smokers, reported CVD more frequently, had lower annual income, and had less formal education when compared to the naturally-menopausal group. Similarly, the group with surgical menopause that did not report a menopausal age tended to be older, had lower annual income and less formal education; however, the majority of this group was Black (72.8%) (Table 1).

Multiple linear regression analyses for age at menopause

The unadjusted mean age at natural menopause in this cohort was 49.0 years, with a median age of 50.0 years. In the univariate analyses, Black women reported becoming naturally menopausal 4.8 months earlier than White women (p=0.003) (Table 2). However, age at natural menopause did not differ between Blacks and Whites after controlling for age, parity, smoking, region, income, education, physical activity, and history of CVD (p=0.69) (Table 3).

Naturally-menopausal women in the South region underwent menopause 12 months earlier than women in the Northeast, 8.4 months earlier than in the Midwest, and 10.8 months earlier than women in the West (p=<0.0001, 0.0002, and <0.0001 respectively) (Table 2). Statistical significance persisted after controlling for the covariates mentioned above (Table 3). Within the South region, naturally-menopausal women in the Stroke Belt and Stroke Buckle did not undergo menopause significantly earlier than other women residing in the South (data not shown).

In the adjusted analyses, current smokers reported entering menopause 1.6 years earlier than never-smokers (p<0.0001), while past smokers reported entering menopause 4.8 months earlier (p=0.005) (Table 3).

Accounting for other factors, older age at the time of interview was not associated with reported age at natural menopause. Women aged 55-64, 65-74, and ≥ 75 years reported menopause at 48.5, 48.9 and 48.9 years, respectively. However, the mean reported menopausal age among women less than 55 years old was 45.9 years, which was significantly younger than the three other groups (p<0.001) (Table 3).

After controlling for covariates, women with two or more children reported a mean age at menopause 1 year later than those with no children (p<0.0001) and 3.6 months later than those with one child, although the latter did not reach statistical significance (p=0.33) (Table 3).

Annual income less than $20,000 was associated with menopause 3.63, 8.4, and 6.0 months earlier than incomes of $20,000-34,999; $35,000-74,999; and greater than $75,000. These

differences were statistically significant (p=0.04, 0.00054, and 0.03, respectively). The three higher-income groups did not differ in age at menopause. Women in the cohort were divided into four groups with respect to educational level: did not complete high school; graduated high school; completed some college; and graduated college. Menopause occurred later in women with more education, with a maximum difference of 1.2 years between women who did not complete high school compared with those who graduated college (Table 3).

Self-reported history of cardiovascular disease (CVD) was associated with an earlier reported menopause by 3.6 months (p=0.04). Weekly intense physical activity was associated with a later menopause, 4.8 months later for activity 1-3 times per week and 3.6 months later for activity greater than 3 times per week (p=0.0007 and 0.01 respectively) (Table 3).

Comment

In this study, we report that women in the South reported menopause significantly earlier than those in the Northeast, Midwest, and West even after controlling for covariates including race, parity, smoking, socioeconomic status, amount of weekly physical activity, and history of CVD. However, women in regions other than the South did not have a significant difference in age at menopause when compared to each other. To our knowledge this is the first report of a regional difference in age at menopause in the United States. The low p-value associated with the findings suggests that the findings are unlikely to be due to chance, although we acknowledge that multiple tests were conducted as part of the analyses. These findings are significant due to the association between early menopause and both increased cardiovascular disease and mortality[4,16]. The regional finding may also guide patient counseling regarding timing of menopause for women residing in the South.

The reason for the observed regional difference is not clear. It is possible that a higher burden of cardiovascular disease in the area could be contributory and that our crude adjustment using history of CVD did not fully account for this burden. The Framingham Heart Study illustrated an inverse relationship between age at menopause and stroke risk, which lends support to an association between vascular compromise and earlier menopause[17]. Decreased ovarian perfusion, which may be reflective of poorer ovarian vascular health, has been implicated in earlier menopause[18]; however, it is unclear at this time if a decrease in perfusion may be the cause or effect of menopause.

The overall reported mean age at natural menopause in our cohort was 49.0 years, which is earlier than the previously reported age of approximately 51.4 years[4,19-21]. Cooper et al. utilized a cohort of university students in Minnesota beginning in the 1930s. The study participants likely differed from our cohort with respect to socioeconomic status given college education, as only 27.3% of women in our study graduated from college. In addition, lifestyle factors such as diet, exercise, and smoking may be dissimilar between the two cohorts given the different time periods: recruitment in 1930s versus 2000s. Brambilla et al. recruited women residing in Massachusetts in the 1980s, while our cohort includes women from across the United States.

The Study of Women's Health Across the Nation (SWAN) reported a median age at natural menopause of 51.4 years in a cohort of 2,247 women[8]. SWAN included community-dwelling women residing in 7 US states, none of which were in the South, with similar covariates to our study. Our cohort included Southern women, those in rural areas, and a greater proportion of Black women (47.6% versus 26.8%)[8]. The lower socioeconomics in the South and rural areas as well as among Black women may contribute to the lower median age at menopause in our cohort.

It is unclear whether selection bias can account for the lower mean age in menopause in our cohort. A large proportion of the overall cohort underwent surgical menopause, which is likely a function of the large proportion of women residing in the South, where hysterectomy occurs more frequently than other regions. Abnormal menses is a common reason for hysterectomy and symptom of impending menopause[22]. It is conceivable that some of the women in the surgical group were experiencing such symptoms, and excluding these women would increase the mean age at menopause of our naturally-menopausal sample rather than decrease it. In addition, our cohort included 987 women (9.9%) aged 45-55 who identified themselves as menopausal, which would be expected to decrease the overall mean age at menopause. These women were evenly distributed among geographical regions and racial groups. However, Black women reported early natural menopause (prior to age 45) more often than White women. Regional and racial differences in overall age at menopause persisted when women aged 45-55 years were excluded from the cohort in a sub-analysis (data not shown).

It is possible that the menopausal age is declining in American women. Dratva and colleagues recently reported that obesity was associated with earlier menopause in European women[15]. With increasing obesity in America, and particularly with obesity rates of nearly 30% in the Southern region, the age of natural menopause may be trending downward in regions with the greatest obesity. We obtained measured BMI values for 7,167 REGARDS women. In this subanalysis, after adjusting for other covariates, BMI did not predict age at menopause in our cohort, nor did it explain the regional differences we observed (data not shown). Though missing BMI data was the same across natural and surgical menopause groups, conclusions regarding BMI and menopausal age are difficult to make since 31.5% of participants did not undergo a home visit with BMI measurement. Dratva also reported that low physical activity decreased the age of natural menopause[15]; we had similar findings in our cohort with respect to weekly physical activity. Future prospective studies are needed to elucidate if the menopausal age has declined in American women.

We found a small difference in the mean age at menopause between Black and White women in this cohort which disappeared after adjusting for covariates including history of CVD. These findings are consistent with those in the SWAN study[8]. Two smaller studies of less than 1500 women, previously reported a 6-month difference in menopausal age between the two groups[7,23]. Both of these studies controlled for covariates considered in our study, except region and history of CVD, but had significantly smaller proportions of Black women in the samples. One study included women all residing in the same state, while the other utilized a national cohort, but did not control for region[7,23]. In our large cohort, no difference in age at menopause was seen between Black and White women after adjusting for region and other covariates. Black women reported hysterectomy more often than White women in our cohort, findings that are consistent with previous studies[23]. It is unlikely that this result would skew the mean menopausal age for naturally-menopausal Black women, since studies reporting a positive race difference in age at natural menopause found the same relationship between race and hysterectomy as we observed[7]. In addition, a selection bias would conceivably increase the age at menopause rather than decrease it since menstrual irregularities are one of the most common reasons for hysterectomy and can be a sign of impending menopause as previously stated[22]. The SWAN study, which did not find a racial difference in age at menopause, also identified a racial disparity in hysterectomy, with Black women undergoing surgery more commonly than White women[8]. The reasons for this disparity remain unclear; while Black women have a significantly higher incidence of uterine fibroids[24], a recent study found excess risk for hysterectomy even after controlling for this confounder[25]. Studies have also shown that in addition to undergoing hysterectomy more frequently than White women, Black women tend to have hysterectomies at an earlier age than their White counterparts[24].

We studied self-reported age at menopause, which might be prone to bias. However, recall of age at menopause has been shown to be fairly reproducible and has a 70-80% overall validity within one year compared with actual age at menopause based on recorded age at menopause at the time of occurrence[26-27]. The mean age of self-reported menopause may be slightly earlier than that determined in a prospective manner, since women tend to recall their age rounded to the lowest whole year. However, this phenomenon should not decrease the average age more than one year and should be consistent across geographical regions and racial groups. As expected, the validity of the timing of menopause declines with time since menopause and with lower educational levels[23]. In our cohort, greater than 85% of the naturally-postmenopausal women graduated from high school, and only 18.5% were ≥ 75 years old at the time of initial interview. Therefore, the validity of the self-reported age of menopause of the women in our study is likely to be adequate. Regardless, any misclassification would bias our findings to the null hypothesis, leading to underestimation of associations.

Current smokers reported menopause an average of 1.6 years earlier than never-smokers. Higher parity (≥ 2 children) was associated with menopause 1 year later than in nulliparous women, however having one child did not increase the age at menopause significantly. The association between higher parity and later menopause and current smoking and earlier menopause are consistent with those found in previous studies[6-9]. The strengths of this study include a large sample size, inclusion of women from rural areas in the United States, and inclusion of a large number of Black women. To our knowledge it is the first epidemiological study to report regional differences in the age at menopause in the US. This finding is important given the association between early menopause and health concerns such as osteoporosis and CVD. The study was limited by utilizing self-reported age at menopause and lack of minority groups other than Blacks. We also did not have available environmental or genetic factors that could further elucidate the mechanisms leading to earlier menopause in the South.

In conclusion, in this cohort of 10,440 naturally menopausal women, those residing in the South reported earlier menopause by 6-11 months compared to other regions after adjusting for covariates. Age at menopause did not differ significantly in Black and White women, however. Further work is needed to determine whether menopausal age may in some way be associated with the excess cardiovascular mortality risk in the South.

Acknowledgments

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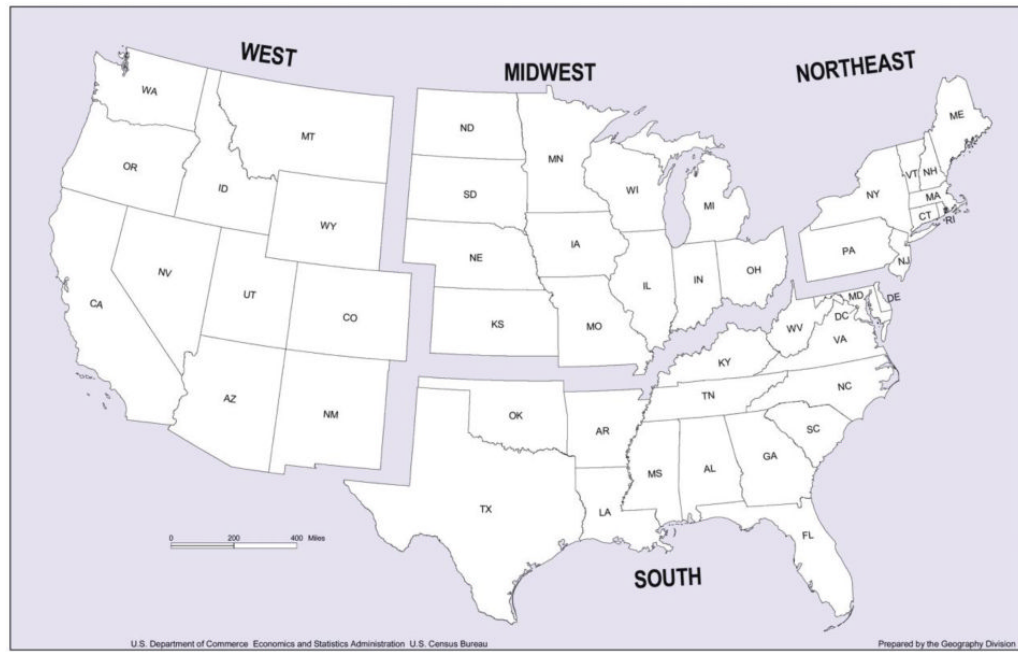
Figure 1.
Geographical regions of the Continental United States: United States Census Bureau.

Table 1

Total number of female REGARDS interview respondents with natural menopause, surgical menopause, and menopausal age not reported.

	Natural (N = 10,440) n (%)	Surgical (N = 9944) n (%)	P-value compared to Natural	Not reported age at Natural (N =1,361) n (%)	P-value compared to Natural	Not reported age at Surgical (N =739) n (%)	P-value compared to Surgical
Region							
South	6750 (64.7)	7307 (73.5)	<0.0001	899 (66.1)	0.35	555 (75.2)	0.48
Northeast	945 (9.1)	517 (5.2)		106 (7.8)		37 (5.0)	
Midwest	1555 (14.9)	1279 (12.9)		193 (14.2)		96 (13.0)	
West	1185 (11.4)	833 (8.4)		162 (11.9)		50 (6.8)	
Race							
White	5479 (52.5)	4738 (47.7)	<0.0001	781 (57.4)	<0.0001	201 (27.2)	<0.0001
Black	4961 (47.5)	5206 (52.4)		580 (42.6)		538 (72.8)	
Age							
<55	987 (9.5)	1144 (11.5)	<0.0001	55 (4.0)	<0.0001	20 (2.7)	<0.0001
55-64	4334 (41.5)	3959 (39.8)		394 (29.0)		164 (22.2)	
65-74	3184 (30.5)	3230 (32.5)		466 (34.2)		287 (38.8)	
≥75	1935 (18.5)	1611 (16.2)		446 (32.8)		268 (36.3)	
Parity							
0	1261 (12.1)	1032 (10.4)	0.0004	171 (12.7)	0.28	93 (12.7)	0.09
1	1441 (13.8)	1441 (14.5)		206 (15.2)		94 (12.8)	
≥ 2	7710 (74.1)	7456 (75.1)		975 (72.1)		546 (74.5)	
Annual income							
< $20,000	2538 (24.3)	2523 (25.4)	.003	342 (25.1)	<0.0001	251 (34.0)	<0.0001
$20,000-34,999	2594 (24.9)	2596 (26.1)		273 (20.1)		155 (21.0)	
$35,000-74,999	2628 (25.2)	2415 (24.3)		196 (14.4)		91 (12.3)	
≥$75,000	1076 (10.3)	896 (9.0)		95 (7.0)		11 (1.5)	
Refused	1604 (15.4)	1514 (15.2)		455 (33.4)		231 (31.3)	
Education level							
< HS	1503 (14.4)	1724 (17.4)	<0.0001	320 (23.6)	<0.0001	217 (29.4)	<0.0001

	Natural (N = 10,440) n (%)	Surgical (N = 9944) n (%)	P-value compared to Natural	Not reported age at Natural (N =1,361) n (%)	P-value compared to Natural	Not reported age atSurgical (N =739) n (%)	P-value compared to Surgical
Graduated HS	2881 (27.6)	3020 (30.4)		379 (27.9)		229 (31.1)	
Some college[a]	2793 (26.8)	2802 (28.2)		314 (23.1)		145 (19.7)	
Graduated college	3248 (31.2)	2387 (24.0)		346 (25.5)		146 (19.8)	
Self-reported history of CVD[b]							
No	8607 (82.4)	7844 (78.9)	<0.0001	1083 (79.6)	0.009	541 (73.2)	0.0003
Yes	1833 (17.6)	2100 (21.1)		278 (20.4)		198 (26.8)	
Physical activity per week							
none	4058 (39.5)	4084 (41.6)	0.0003	644 (48.9)	<0.0001	368 (51.3)	<0.0001
1-3	3570 (34.7)	3415 (34.8)		386 (29.3)		220 (30.7)	
≥4	2658 (25.8)	2312 (23.6)		288 (21.9)		129 (18.0)	
Smoking							
Never	5407 (52.0)	5302 (53.5)	0.09	761 (56.5)	0.002	423 (58.1)	0.01
Current	1622 (15.6)	1476 (14.9)		170 (12.6)		83 (11.4)	
Past	3365 (32.4)	3128 (31.6)		415 (30.8)		222 (30.5)	

[a] Indicates some college, trade school or technical classes taken

[b] Reported personal history of myocardial infarction, stroke, TIA, carotid endarterectomy, coronary intervention, repair of aortic aneurysm and/or peripheral artery intervention

Table 2

Unadjusted mean age at menopause for REGARDS interview respondents with natural and surgical menopause.

	Natural (n = 10,440)			Surgical (n = 9,944)		
	Age	**STD**	**p-value**	**Age**[c]	**STD**	**p-value**
Region						
South	48.7	6.5	--	39.5	8.7	--
Northeast	49.7	5.8	<0.0001	40.7	8.4	0.002
Midwest	49.4	6.1	0.0002	40.4	8.8	0.0002
West	49.6	6.1	<0.0001	41.0	8.4	<0.0001
Race						
White	49.2	5.9	--	39.5	8.7	--
Black	48.8	6.8	0.003	40.0	8.7	0.004
Age						
<55	46.4	5.4	--	38.2	7.6	--
55-64	49.1	6.1	<0.0001	38.7	8.4	0.13
65-74	49.4	6.7	<0.0001	40.3	8.6	<0.0001
≥75	49.3	6.6	<0.0001	42.5	9.5	<0.0001
Parity						
0	48.3	6.5	--	38.7	9.0	--
1	48.4	6.5	0.79	38.8	8.7	0.86
≥ 2	49.2	6.3	<0.0001	40.1	8.6	<0.0001
Annual income						
< $20,000	48.4	7.1	--	39.3	9.3	--
$20,000-34,999	49.1	6.3	<0.0001	39.6	8.4	0.20
$35,000-74,999	49.4	5.8	<0.0001	39.7	8.1	0.08
≥$75,000	49.3	5.4	<0.0001	40.1	8.2	0.02
Refused	49.0	6.7	0.0010	40.6	9.1	<0.0001
Education level						
< HS	48.1	7.5	--	39.3	9.5	--

	Natural (n = 10,440)			Surgical (n = 9,944)		
Graduated HS	48.9	6.5	<0.0001	39.4	8.8	0.83
Some college[a]	49.0	6.4	<0.0001	39.6	8.5	0.33
Graduated college	49.6	5.6	<0.0001	40.8	8.0	<0.0001
Self-reported history of CVD[b]						
No	49.1	6.2	--	40.0	8.5	--
Yes	48.6	6.9	0.003	39.0	9.1	<0.0001
Physical activity per week						
none	48.7	6.6	--	39.8	8.8	--
1-3	49.3	6.1	<0.0001	39.8	8.6	0.96
≥4	49.2	6.2	0.002	39.7	8.6	0.56
Smoking						
Never	49.4	6.3	--	40.6	8.7	--
Current	47.4	6.5	<0.0001	37.3	8.4	<0.0001
Past	49.1	6.3	0.02	39.6	8.6	<0.0001

[a] Indicates some college, trade school or technical classes taken

[b] Reported personal history of myocardial infarction, stroke, TIA, carotid endarterectomy, coronary intervention, repair of aortic aneurysm and/or peripheral artery intervention

[c] Age equal to age at hysterectomy and/or oophorectomy

Table 3

Adjusted mean age at menopause for REGARDS interview respondents with natural menopause.

	Age (years) (n= 10,198[c])	
Region	**Age**	**p-value**
South	47.5	--
Northeast	48.4	<0.0001
Midwest	48.2	0.0001
West	48.0	0.02
Race		
White	48.1	--
Black	48.0	0.69
Age		
<55	45.9	--
55-64	48.5	<0.0001
65-74	48.9	<0.0001
≥75	48.9	<0.0001
Parity		
0	47.6	--
1	47.9	0.33
≥ 2	48.6	<0.0001
Annual income		
< $20,000	47.7	--
$20,000-34,999	48.0	0.04
$35,000-74,999	48.4	0.0005
≥$75,000	48.2	0.03
Refused	47.9	0.23
Education level		
< HS	47.4	--
Graduated HS	48.1	0.0007
Some college[a]	48.2	0.0002
Graduated college	48.6	<0.0001
Self-reported history of CVD[b]		
No	48.2	--
Yes	47.9	0.04
Physical activity per week		
none	47.8	--
1-3	48.2	0.0007
≥4	48.1	0.01

	Age (years) (n= 10,198[c])	
Smoking		
Never	48.7	--
Current	47.1	<0.0001
Past	48.3	0.005

[a] Indicates some college, trade school or technical classes taken

[b] Reported personal history of myocardial infarction, stroke, TIA, carotid endarterectomy, coronary intervention, repair of aortic aneurysm and/or peripheral artery intervention

[c] Indicates total participants with complete data for all covariates considered in analysis