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Health-Related Quality of Life in a Multiethnic Sample of Middle-Aged Women

Study of Women's Health Across the Nation (SWAN)

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BACKGROUND. Relatively little is known about the association between menopause and health-related quality of life (HRQL) across ethnic groups.

OBJECTIVES. To examine the association between HRQL and early perimenopause and ethnicity, adjusting for health, lifestyle, psychosocial, and sociodemographic factors.

RESEARCH DESIGN. Questionnaires were administered to pre- and early perimenopausal women.

SUBJECTS. We studied a cohort of 3302 black, Chinese, Hispanic, Japanese, and white women aged 42 to 52 years from the multisite Study of Women's Health Across the Nation (SWAN).

MEASURES. We measured HRQL, menstrual regularity, and a variety of covariates. HRQL was assessed with 5 subscales from the Short Form-36; impaired functioning was defined as being in the 25% most impaired on a subscale.

RESULTS. In unadjusted, but not adjusted, analyses, significantly more early perimenopausal women, as compared with premeno-

pausal women, were classified as having impaired functioning on each of the 5 subscales. For 4 of the subscales, the effect of menopausal status was explained by menopause-related symptoms. There were significant ethnic group differences across all 5 subscales in unadjusted analyses. Ethnicity was no longer significant for the Vitality or Role-Emotional subscales when adjusted for health variables or for the Role-Physical subscale when analyses were adjusted for socioeconomic status, health, lifestyle, or social circumstances. Ethnicity remained significant for the Bodily Pain and Social Functioning subscales, even in adjusted analyses.

CONCLUSIONS. Early perimenopause is not associated with impaired functioning when adjusted for symptoms. Significant ethnic differences in HRQL exist. Some, but not all, differences can be explained by differences in health, lifestyle, and social circumstances.

Key words: Health-related quality of life; ethnic groups; women; menopause (Med Care 2003;41:1262–1276)

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The Study of Women's health Across the Nation

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Health-related quality of life (HRQL) has emerged as an important outcome in assessing disease progression and evaluating the effectiveness of clinical trials. HRQL generally denotes aspects of life most likely to be affected by changes in health status¹ and is generally viewed as multidimensional and consisting of the following domains: physical health and functioning, emotional functioning, role limitations, and social functioning. The majority of research in this area has focused on understanding the impact of disease on HRQL and is conducted on specific population groups generally characterized by physical diseases and disabilities.² Less is known about HRQL in nonclinical populations and about HRQL across different ethnic groups.³ The conceptual framework developed by Wilson and Cleary⁴ provides a useful way to view HRQL. According to this model, HRQL can be influenced by biologic and physiological variables, symptoms, and functional status. Characteristics of the individual such as personality and psychologic status and characteristics of the environment such as stress, economic, and social supports can influence symptom and functional status as well as HRQL directly.

Interest in the association between menopause and HRQL has recently increased. Menopause and its associated symptoms are often thought to have a negative impact on quality of life.^{5,6} However, most studies of menopause have viewed quality of life rather narrowly by focusing largely on negative symptoms of menopause (ie, equating symptoms with quality of life) and/or have been patient- or clinic-based.^{5,7,8} Nonclinic samples of women have not generally demonstrated a significant impact of menopause on well-being or mood,^{9–12} although some studies report an increase in negative symptomatology during perimenopause.^{13–16}

A few studies have looked at broader quality-of-life outcomes among menopausal women.^{6,17–20} However, except for Ledéseret et al.,⁶ these studies focus only on overall life satisfaction or well-being and not specific HRQL domains. Using the Nottingham Health Profile (NHP), Ledéseret⁶ found that postmenopausal women scored significantly worse than premenopausal women on social isolation, pain, sleep, and energy domains of the NHP. However, after adjusting for age and symptoms, pre- and postmenopausal women did not significantly differ.

The Medical Outcomes Short-Form 36 (SF-36) is a commonly used measure to assess health status or HRQL. Although the SF-36 has been

translated into many languages and used in numerous countries, little data exist comparing domain scores across ethnic groups.³ Those studies that do make such comparisons tend to find better HRQL among Asians,^{21,22} even controlling for sociodemographic factors. Blacks and whites do not differ after adjusting for sociodemographic factors.²³ However, these studies are limited by small numbers in some ethnic groups and control for only a small number of variables.

Studies of varying age and nonpatient groups have examined cross-sectional predictors of HRQL domains. Particularly strong predictors of HRQL include socioeconomic status,¹⁸ depressive symptomatology,^{24,25} negative health behaviors,^{26,27} psychologic predispositions,⁴ and social circumstances such as adverse psychosocial work conditions²⁸ and social support and living arrangements.^{29–31} Because these variables can differ across ethnic groups,^{32–35} they could well explain ethnic differences in HRQL.

This article examines HRQL domains of the SF-36 among women participating in the multiethnic Study of Women's Health Across the Nation (SWAN). All women were either pre- or early perimenopausal. Because SWAN recruited women from the general population, we expected the majority of women to be healthy and SF-36 scores to be highly skewed toward good functioning.³⁶ We therefore focused on women who had impaired functioning, defined as being at the most impaired quartile of the SWAN distribution for each SF-36 domain.³⁶

The research objectives of the present study address the following questions: 1) Is early perimenopause associated with impaired HRQL? 2) Is ethnicity associated with impaired HRQL? 3) If ethnicity is associated with impaired HRQL, can this be explained by socioeconomic status indicators, disease burden, symptoms, lifestyle, or social circumstances? 4) If perimenopause is associated with impaired functioning, can this be explained by menopause-related symptoms? Based on the Wilson and Cleary model suggesting that symptoms are an important mediator between a physiological condition or state (ie, menopause) and HRQL, we hypothesize that early perimenopause is not associated with impaired HRQL when analyses adjust for menopause-related symptoms.

Methods

Study Population

SWAN is a community-based study comprised of 2 stages: 1) a 15-minute telephone or in-person survey conducted between November 1995 and October 1997 with 16,065 women in which eligibility for the longitudinal study was determined, and 2) a longitudinal investigation of 3302 women to track changes in women as they age and experience menopause.

During 1996 to 1997, 7 sites each enrolled at least 450 women into the longitudinal study. White women were enrolled at all sites. Black women were recruited in Boston, Detroit, Pittsburgh, and Chicago; Hispanics in Newark, NJ; Chinese in the San Francisco Bay region; and Japanese in Los Angeles. Sites used a variety of sampling frames and recruitment strategies to recruit a community-based sample of local women.³⁷ Eligibility requirements for the longitudinal study were: age 42 to 52, either white or site-determined other ethnicity, menses within the previous 3 months, having a uterus and at least one ovary, not pregnant, and no use of reproductive hormones or birth control pills within the previous 3 months.

Approximately 40% of the screened women were eligible for the longitudinal study. Of the eligible women, 51% were enrolled, a response rate comparable to similar multiethnic studies requiring the same level of commitment.^{38–41} This study reports on women who completed the survey and baseline interviews.

Procedures

Each site adhered to its Institutional Review Board's guidelines. The initial survey included a verbal consent for interview and women provided information on sociodemographics, medical and menstrual history, symptoms, and psychosocial factors.

Eligible women were seen within 3 months of the initial survey for their baseline assessment and a written informed consent was obtained. Assessments consisted of questions about medical, medication, and menstrual history; lifestyle; psychosocial factors; physical and psychologic symptoms; and HRQL. Questions were administered orally by trained staff or were part of a paper-and-pencil

form. Additional physiological and anthropometric data were collected but are not relevant to the current study. All study forms and materials were available in English, Cantonese, Japanese, and Spanish and bilingual staff was used as required.

Measures

Health-Related Quality of Life. The SF-36 was used to assess HRQL using the original coding algorithm in which raw scores are transformed to a 0 to 100 range.⁴¹ The SF-36 is a widely-used generic HRQL measure yielding 8 subscales, of which SWAN used the following 5: Bodily Pain, Role Limitations due to Physical Health, Role Limitations due to Emotional Problems, Social Functioning, and Vitality. We did not include the Physical Functioning, Mental Health, or Health Perceptions subscales in the SWAN protocol because these domains were covered by other study questionnaires, and we did not want to lengthen the protocol or have participants feeling that we were repeating questions. For the Cantonese, Spanish, and Japanese versions of the SF-36, there were no validated versions available in 1996 and translations were prepared for the study (initial translation, back translation, and revision).

Some of the subscales of the SF-36 are not normally distributed. The Role-Physical and Role-Emotional domains are particularly problematic. The Role-Physical scale has 5 possible scores (0, 25, 50, 75, and 100) and the Role-Emotional scale has 4 possible scores (0, 33, 67, and 100). Studies have found that these scores, along with the Social Functioning scale, are highly skewed^{24,27,36} with many respondents scoring 100. To address the ceiling effect, all scores needed to be dichotomized. Because we were particularly interested in predictors of impaired function, we followed the recommendations of Rose et al.,³⁶ and each outcome was dichotomized at the 25th percentile based on the women in our sample. This approach was particularly advisable because our distributions were highly skewed, and published norms for middle-aged women were based on smaller sample sizes than in SWAN and were based primarily on white women.⁴¹

Ethnicity. Ethnicity was self-defined by respondents in response to the open-ended question: "How would you describe your primary racial

TABLE 1. Descriptive Statistics for the 3193 Women in the Analysis Data Set*

(A) Continuous Variables							
	Mean	Standard Deviation	Minimum	25th Percentile	50th Percentile	75th Percentile	Maximum
Age	46.2	2.7	42.0	44.0	46.1	48.2	52.9
Activity	7.7	1.8	3.0	6.4	7.6	8.8	14.0
Stress	8.6	2.9	4.0	6.0	8.0	11.0	19.0
(B) Categorical Variables (Percentages Calculated among Women with Data for that Variable)							
Variable	Level		No.	Percentage among Those with Data			
Ethnic group	Black		907	28.4			
	White		1503	47.1			
	Chinese		247	7.7			
	Hispanic		259	8.1			
	Japanese		277	8.7			
Menopausal status	Premenopausal		1711	53.6			
	Early perimenopausal		1482	46.4			
Socioeconomic							
Financial strain	Very hard		288	9.0			
	Somewhat hard		972	30.5			
	Not hard		1923	60.4			
Education	≤High school/GED		785	24.7			
	Some college		1030	32.4			
	College or more		1360	42.8			
Sociodemographic							
Marital status	Married		2110	66.1			
	Never married		432	13.5			
	Divorced/widowed/ separated		648	20.3			
Health							
Sleep	Good		2525	79.4			
	Poor		655	20.6			
Arthritis	Never diagnosed		2553	80.3			
	Diagnosed, no meds		441	13.9			
	Diagnosed, meds		184	5.8			
Migraines	Never diagnosed		2660	83.7			
	Diagnosed, no meds		349	11.0			
	Diagnosed, meds		168	5.3			
Meds for a nervous condition	No		2867	90.1			
	Yes		316	9.9			
Leaking urine	0 days		2183	68.7			
	1–5 days		685	21.6			
	6–14 days		309	9.8			

(continues)

TABLE 1. (Continued)

(B) Categorical Variables (Percentages Calculated among Women with Data for that Variable)

Variable	Level	No.	Percentage among Those with Data
Night sweats	0 days	2242	70.6
	1–5 days	724	22.8
	6–14 days	211	6.6
Hot flashes	0 days	2322	73.0
	1–5 days	609	19.2
	6–14 days	248	7.8
Vaginal dryness	0 days	2555	80.6
	1–5 days	443	14.0
	6–14 days	172	5.4
Lifestyle			
Current smoker	No	2616	82.7
	Yes	547	17.3
Body mass index	BMI < 25	1274	40.1
	25 ≤ BMI < 30	842	26.5
	30 ≤ BMI	1062	33.4
Alcohol use	None	1510	49.9
	0 < alc < 37.145 kcal	759	25.1
	37.145 ≤ kcal	759	25.1
Social circumstances			
CESD	0–15	2416	75.8
	16–54	773	24.2
Very upsetting events	0	1544	49.9
	1	588	19.0
	2 or more	961	31.1
Social support	0–11	1040	32.6
	12–14	1142	35.8
	15–16	1006	31.6

*The percentage of missing data ranged from 0% (e.g., age, ethnic group, menopausal status) to 5% (alcohol consumption).

or ethnic group?" The responses were categorized as white, black, Chinese, Hispanic, or Japanese.

Menopausal Status. Menopausal status was categorized according to bleeding patterns: premenopausal (no decrease in predictability of menses onset in prior 12 months) or early perimenopausal (less predictable menses onset in the last 12 months). This is consistent with other epidemiologic studies that have distinguished between early and late stages of perimenopause^{42,43} and the recommendations of the recently held Stages of Reproductive Aging Workshop (STRAW).⁴⁴ By study design, all women had experienced menses within 3 months of the screening interview.

Socioeconomic Indicators. Socioeconomic indicators (SES) included educational attainment and difficulty paying for basics. Sociodemographic variables included age and marital status.

Health Variables. Health variables included sleep, medical conditions, and symptoms: 1) sleep was measured with one item asking about the quality of a typical night's sleep in the past 2 weeks (very sound/sound/average or restless/very restless) taken from the Women's Health Initiative⁴⁵; 2) conditions included past or current arthritis/osteoarthritis and migraines (possible responses were "not diagnosed," "diagnosed, not on medication," and "diagnosed, on medication"), or cur-

rently taking medications such as tranquilizers, sedatives, sleeping pills, or antidepressants; and 3) symptoms included leaking urine, vaginal dryness, night sweats, and hot flashes with frequency assessed in the past 2 weeks (never, 1–5 days, 6–14 days).

Lifestyle. Cigarette smoking was based on current smoking. Physical activity was assessed based on frequency, intensity, and duration of sports, active living, and household/child care activity engaged in during the past year.^{46,47} Body mass index (BMI), calculated from study measurements, was categorized according to National Heart, Lung, and Blood Institute categories.⁴⁸ Alcohol use was based on total consumption in kilocalories as determined from the food-frequency questionnaire.⁴⁹

Psychosocial Variables. Psychosocial variables included: 1) depressive symptoms assessed by the Center for Epidemiological Studies (CES-D) scale,⁵⁰ with a cutpoint of 16 or above^{51,52}; 2) perceived stress measured by the Perceived Stress Scale⁵³; 3) 34 stressful events (eg, job-related, money problems, divorce) in the past 12 months that were used to create a 3-level variable for events considered very upsetting by the woman: 0, 1, or 2 or more; and 4) social support based on summed ratings from the 4-item Medical Outcomes Study Social Support Survey.⁵⁴

Statistical Analysis

Women were excluded from analysis if they had missing data on menopausal status or were missing any of the 5 SF-36 scale results.

Logistic regression was used to assess the relationship between menopausal status and impaired function and ethnicity and impaired function on each SF-36 domain. Multivariable models were then built to evaluate the relationship between ethnicity and impaired function after adjustment for other potential predictors.

The multivariable models were constructed to determine the effects of specific categories of covariates on ethnic differences in SF-36 domains. Variables were first classified into 5 “sets” as described under “Measures: socioeconomic, socio-demographic, health, lifestyle, and social circumstances.” Each predictor set was entered into a stepwise logistic regression procedure for each of the 5 HRQL domains. Site and ethnicity were forced into all models, and menopausal status was

forced into the model with health variables. A *P* value of 0.15 was used as a cut-off in these analyses. Next, a model including the selected and forced variables was fit on women with data on all included predictors. If all, except forced, variables were significant at the 0.05 level, the model-building process stopped. Otherwise, the least-significant predictor was dropped. This process was iterated until all remaining variables, except for forced variables, were significant at the 0.05 level.

All analyses were performed using SAS version 8.1 (Cary, NC).

Results

Sample Characteristics

The SWAN cohort consists of 3302 women. Of these, 96 (2.9%) had missing menopausal status, and 13 (0.4%) were missing at least 1 of the 5 SF-36 outcomes. The analysis data set consists of the remaining 3193 women. Table 1 provides descriptive information about the characteristics of these women. The age range was 42 to 52 years (mean, 46.2 y), and 46% were early perimenopausal. Approximately 47% were white, 28% were black, 8% each were Chinese and Hispanic, and 9% were Japanese.

SF-36 Domains by Menopausal Status and Ethnicity

Table 2 provides descriptive data on the distribution of SF-36 scores for each domain for the overall sample and by menopausal status and ethnic group. Each SF-36 domain takes on values from 0 (poor) to 100 (good). Premenopausal women had better HRQL scores than did early perimenopausal women in all 5 domains. Japanese women consistently scored higher on all domains, whereas Hispanic women scored lower.

Tables 3 and 4 address the first and second research objectives to determine if menopausal status and ethnicity are associated with impaired functioning. Table 3 shows the percentage of women scoring at or below the 25th percentile and the domain score at which women were classified as having impaired functioning for each scale overall and by menopausal status and by ethnic group.

TABLE 2. Descriptive Statistics for Original SF-36 Scales, Overall, by Ethnic Group and by Menopausal Status*

	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Role-Physical					
Overall	74.9	36.8	50.0	100	100
Premenopausal	77.1	36.0	50.0	100	100
Early perimenopausal	72.4	37.5	50.0	100	100
Black	74.3	36.7	50.0	100	100
White	75.4	35.8	50.0	100	100
Chinese	78.0	34.8	50.0	100	100
Hispanic	64.2	45.0	0.0	100	100
Japanese	81.1	33.1	75.0	100	100
Bodily pain					
Overall	68.9	22.5	51.0	72.0	84.0
Premenopausal	70.6	22.4	52.0	74.0	84.0
Early perimenopausal	66.8	22.5	51.0	72.0	84.0
Black	66.9	23.7	51.0	72.0	84.0
White	70.6	20.4	61.0	74.0	84.0
Chinese	74.8	22.9	62.0	74.0	100
Hispanic	53.4	24.6	41.0	51.0	72.0
Japanese	74.9	20.2	62.0	74.0	84.0
Vitality					
Overall	54.8	20.5	40.0	60.0	70.0
Premenopausal	56.2	20.7	40.0	60.0	70.0
Early perimenopausal	53.1	20.2	40.0	55.0	70.0
Black	56.1	21.1	40.0	60.0	70.0
White	53.8	20.2	40.0	55.0	70.0
Chinese	58.2	17.6	45.0	60.0	70.0
Hispanic	48.7	22.9	30.0	50.0	60.0
Japanese	58.2	18.6	50.0	60.0	70.0
Role-Emotional					
Overall	76.9	36.0	66.7	100	100
Premenopausal	79.4	34.3	66.7	100	100
Early perimenopausal	74.1	37.6	33.3	100	100
Black	76.3	36.5	66.7	100	100
White	76.4	35.1	66.7	100	100
Chinese	82.9	30.6	66.7	100	100
Hispanic	70.5	44.3	0.0	100	100
Japanese	82.4	33.0	66.7	100	100
Social function					
Overall	80.0	22.4	62.5	87.5	100
Premenopausal	81.4	21.9	75.0	87.5	100
Early perimenopausal	78.4	22.8	62.5	87.5	100
Black	77.2	24.5	62.5	87.5	100
White	81.9	21.1	75.0	87.5	100
Chinese	81.0	19.4	75.0	87.5	100
Hispanic	72.5	25.3	50.0	75.0	100
Japanese	85.4	18.9	75.0	87.5	100

*The range for each scale is 0-100, where 0 is poor and 100 is good.

TABLE 3. Percentage of Women at or Below the 25th Percentile for SF-36 Scales, Overall, by Menopausal Status and by Ethnic Group

	Role-Physical ≤ 50	Bodily Pain ≤ 51	Vitality ≤ 40	Role-Emotional ≤ 66.7	Social Function ≤ 62.5
Overall	28.5%	25.7%	28.7%	34.2%	26.7%
Premenopausal	25.9%	23.6%	26.5%	31.4%	24.1%
Early perimenopausal	31.5%	28.2%	31.2%	37.4%	29.6%
Black	29.4%	30.1%	26.0%	35.0%	33.2%
White	28.1%	22.2%	30.3%	36.7%	22.6%
Chinese	26.7%	17.4%	21.1%	28.7%	21.9%
Hispanic	38.2%	52.5%	44.0%	32.0%	45.6%
Japanese	20.6%	13.0%	21.7%	25.3%	14.4%

Notes: Some scales do not have a large number of different possible values, causing a large number of ties. Therefore, dichotomizing each scale at the 25th percentile of the overall distribution does not leave exactly 25% of the analysis data set in the "poor" category.

To provide a sense of what impaired functioning means, we looked at the item response patterns for women classified in the lowest 25th percentile for each domain. Women who scored at or below the 25th percentile for Role-Physical answered "yes" to at least 2 of the 4 yes/no questions on whether their physical health affected various activities. For Role-Emotional, impaired women answered "yes" to any of the 3 yes/no questions on whether emotional problems affected the amount of time spent on work or other activities, accomplishing less, or doing work or other activities more carefully. For Bodily Pain, over 99% of the impaired women answered that they had at least moderate pain in the past 4 weeks. For Social Functioning, 95% of impaired women responded that their physical health or emotional problems interfered with social activities at least slightly. For Vitality, 95% of impaired women responded that they were full of pep or had a lot of energy only some of the time or less in the past 4 weeks.

Table 4 shows odds ratios and 95% confidence intervals for the unadjusted relationships between menopausal status (A) and ethnic group (B) and impaired functioning on each scale. For all scales, early perimenopausal women were significantly more likely than premenopausal women to report impaired functioning. Ethnic group was significantly related to impaired functioning on all scales. Except for the Role-Emotional domain, Hispanic women were most likely to report impaired function. Chinese and Japanese women were least likely to report impaired function for all domains. Compared with whites, blacks were more likely to report impaired functioning on the Pain and Social Functioning domains and less likely than whites to report impairment on Vitality.

Ethnicity, Menopausal Status, and Impaired Functioning, Adjusting for Covariates

Our third objective was to determine if ethnic differences in SF-36 scores could be explained by other factors such as socioeconomic status, sociodemographics, health, lifestyle, or social circum-

stances. Table 5A-E shows odds ratios and 95% confidence intervals for the relationship between ethnicity and impaired functioning after adjustment for each of these sets of predictor variables.

Socioeconomic variables (education and financial strain) explained the ethnic differences in the Role-Physical domain only. Sociodemographic variables did not explain ethnic differences in impaired function on any of the 5 scales (Table 5B).

Health variables appear to explain the ethnic differences in the Role-Physical, Vitality, and Role-Emotional domains (Table 5C). In particular, participants of Japanese and Chinese ethnicity were as likely as whites to have impaired function in the Role-Physical scale after adjustment for the lower prevalence of symptoms and comorbidities in these 2 Asian groups. As might have been expected, comorbidities and most symptoms increased the likelihood of impaired function in the Role-Physical domain; however, menopausal status did not affect this domain. Health variables did not explain the differences among ethnic groups for the Bodily Pain or Social Function domains. Hispanic, Chinese, and Japanese women have a

TABLE 4. Unadjusted Associations of Menopausal Status and Ethnic Group with Impaired Function on the SF-36 Scales (ie., ≤ 25th percentile)*

(A) Menopausal Status (Reference Group Is Premenopausal).					
	Role-Physical	Bodily Pain	Vitality	Role-Emotional	Social Function
Status (<i>P</i>)	<0.001	<0.01	<0.01	<0.001	<0.001
Early peri	1.31 (1.13, 1.53)	1.27 (1.08, 1.49)	1.26 (1.08, 1.47)	1.30 (1.13, 1.51)	1.32 (1.13, 1.55)

(B) Ethnic Group (Reference Group Is White)					
	Role-Physical	Bodily Pain	Vitality	Role-Emotional	Social Function
Ethnic group (<i>P</i>)	<0.001	<0.0001	<0.0001	<0.01	<0.0001
Black	1.07 (0.89, 1.28)	1.51 (1.25, 1.82)	0.81 (0.67, 0.97)	0.93 (0.78, 1.10)	1.70 (1.42, 2.05)
Chinese	0.93 (0.69, 1.26)	0.74 (0.52, 1.05)	0.61 (0.44, 0.85)	0.70 (0.52, 0.93)	0.96 (0.69, 1.33)
Hispanic	1.58 (1.20, 2.09)	3.87 (2.95, 5.08)	1.81 (1.38, 2.37)	0.81 (0.61, 1.08)	2.87 (2.19, 3.78)
Japanese	0.66 (0.49, 0.91)	0.52 (0.36, 0.76)	0.64 (0.47, 0.86)	0.58 (0.44, 0.78)	0.58 (0.41, 0.83)

*For each effect, the *P* value for the effect and the associated odds ratios and 95% confidence intervals are displayed.

higher odds ratio of limitation in the Bodily Pain domain after adjustment. However, in the Social Function domain, after adjustment for health variables, Hispanic women have a lower odds ratio and Chinese and Japanese women have a higher odds ratio of limitation.

Lifestyle variables (Table 5D) such as physical activity and BMI and social circumstances (Table 5E) also explained ethnic differences in impairment on the Role-Physical domain, mostly for Hispanic women. However, significant ethnic differences remained for all other domains after adjustment for lifestyle and social circumstances.

To summarize the results for ethnicity, ethnic differences in the Bodily Pain and Social Function domains were not explained by our sets of predictor variables, whereas ethnic differences on the Vitality and Role-Emotional domains were explained somewhat by health variables. Ethnic differences in the Role-Physical scale could be explained by several factors, including SES, lifestyle, social circumstances, and health variables. When significant ethnic differences remained, Hispanic women tended to be most likely to report impaired functioning, whereas Japanese and Chinese women tended to be least likely.

Because the Role-Physical domain could be explained by several sets of variables, we next sought to determine which set of predictors might explain the most variance. We ran an additional model (not shown) that included the significant predictors from the previous sets. The significant predictors of impairment in the Role-Physical

domain were the health and social circumstances variables. SES and BMI were not significant.

Our fourth objective was to test the hypothesis that menopause-related symptoms could explain the association between perimenopause and impaired functioning. As seen in Table 5C, menopausal status was no longer significant when analyses adjusted for health variables that included conditions, medications, and symptoms. However, to address our hypothesis concerning symptoms, we ran additional analyses in which only symptoms were included in the models. In these analyses (not shown), perimenopause remained significant in only the model for the Role-Emotional domain (odds ratio, 1.17; *P* = 0.04). These results suggest that menopausal symptoms explain impaired functioning in the Role-Physical, Bodily Pain, Vitality, and Social Function domains. However, menopausal symptoms explain some, but not all, of the effect of status on impaired functioning for the Role-Emotional domain.

Discussion

This study of middle-aged women reports scores on 5 SF-36 domains for women across 5 ethnic groups. SF-36 domain scores were slightly lower than general population norms published by Ware et al. for their sample of women aged 45 to 55 and others.^{27,55} In unadjusted analyses, significantly more early perimenopausal women, as

TABLE 5. Adjusted Models for Impaired Function on the SF-36 Scales

(A) SES Variables (Education, Financial Strain); Ethnicity and Site Forced into the Model. Reference Groups are College or Higher Education and no Trouble Paying for Basics.					
(N = 3165)	Role-Physical	Bodily Pain	Vitality	Role-Emotional	Social Function
Ethnic group (<i>P</i>)	0.21	<0.0001	0.001	0.0005	0.001
Black	0.94 (0.76, 1.16)	1.28 (1.03, 1.60)	0.68 (0.55, 0.84)	0.83 (0.68, 1.02)	1.40 (1.12, 1.74)
Chinese	0.95 (0.63, 1.45)	0.64 (0.40, 1.01)	0.68 (0.44, 1.04)	0.67 (0.45, 0.99)	0.81 (0.51, 1.27)
Hispanic	1.21 (0.76, 1.91)	2.74 (1.67, 4.49)	1.20 (0.77, 1.87)	0.59 (0.38, 0.92)	1.72 (1.06, 2.80)
Japanese	0.63 (0.41, 0.95)	0.55 (0.34, 0.89)	0.74 (0.49, 1.13)	0.57 (0.39, 0.85)	0.62 (0.39, 1.00)
Education (<i>P</i>)		0.006			0.0004
≤High school/GED		1.45 (1.15, 1.82)			1.56 (1.24, 1.96)
Some college		1.24 (1.01, 1.52)			1.33 (1.09, 1.63)
Paying for basic (<i>P</i>)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Very hard	2.05 (1.56, 2.68)	2.34 (1.77, 3.09)	2.25 (1.71, 2.95)	2.44 (1.87, 3.18)	2.85 (2.16, 3.75)
Somewhat hard	1.68 (1.41, 2.00)	1.39 (1.15, 1.69)	1.64 (1.37, 1.95)	1.65 (1.40, 1.96)	1.77 (1.47, 2.13)
(B) Sociodemographic Variables (Age, Marital Status); Ethnicity and Site Forced into the Model. Reference Group for Marital Status is Currently Married or Living as Married					
(N = 3190)	Role-Physical	Bodily Pain	Vitality	Role-Emotional	Social Function
Ethnic group (<i>P</i>)	0.0002	<0.0001	<0.0001	0.004	<0.0001
Black	1.02 (0.85, 1.24)	1.34 (1.10, 1.64)	0.78 (0.65, 0.95)	0.81 (0.68, 0.98)	1.49 (1.22, 1.81)
Chinese	0.94 (0.69, 1.27)	0.76 (0.53, 1.08)	0.62 (0.45, 0.86)	0.73 (0.54, 0.98)	1.01 (0.73, 1.40)
Hispanic	1.69 (1.27, 2.25)	4.24 (3.17, 5.66)	1.91 (1.44, 2.53)	0.84 (0.63, 1.13)	3.19 (2.39, 4.27)
Japanese	0.69 (0.50, 0.95)	0.56 (0.39, 0.82)	0.66 (0.48, 0.90)	0.62 (0.46, 0.84)	0.64 (0.44, 0.91)
Age (<i>P</i>)			0.0003	0.0002	0.003
Marital status (<i>P</i>)		0.008		<0.0001	<0.0001
Never married		1.18 (0.93, 1.51)		1.20 (0.96, 1.50)	1.15 (0.90, 1.46)
Divorced/widowed/separated		1.37 (1.12, 1.68)		1.67 (1.38, 2.01)	1.58 (1.30, 1.93)
(C) Health Variables (Sleep, Arthritis, Migraine, Night Sweats, Leaking Urine, Menopausal Status, Hot Flashes, Vaginal Dryness, Meds for Nerves); Ethnicity, Site, and Menopausal Status Forced into the Model. Reference Groups are Premenopausal; Good Sleep; no Arthritis Diagnosis; no Migraine Diagnosis; Taking no Medications for Nervous Conditions; and no Leaking Urine, Night Sweats, Hot Flashes, or Vaginal Dryness in the Last Two Weeks					
(N = 3110)	Role-Physical	Bodily Pain	Vitality	Role-Emotional	Social Function
Ethnic group (<i>P</i>)	0.14	<0.0001	0.06	0.12	<0.0001
Black	1.04 (0.83, 1.30)	1.58 (1.25, 2.01)	0.76 (0.61, 0.95)	0.96 (0.78, 1.18)	1.84 (1.47, 2.33)
Chinese	1.39 (0.90, 2.15)	1.09 (0.67, 1.78)	0.96 (0.61, 1.51)	0.87 (0.58, 1.33)	1.41 (0.88, 2.24)
Hispanic	1.54 (0.95, 2.50)	4.34 (2.56, 7.29)	1.53 (0.96, 2.45)	0.74 (0.47, 1.19)	2.62 (1.61, 4.35)
Japanese	0.76 (0.49, 1.17)	0.80 (0.48, 1.34)	0.95 (0.62, 1.48)	0.62 (0.42, 0.93)	0.80 (0.48, 1.31)
Sleep (<i>P</i>)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Poor sleep	1.64 (1.34, 1.99)	1.79 (1.45, 2.21)	2.59 (2.14, 3.15)	2.10 (1.74, 2.53)	2.21 (1.82, 2.71)
Arthritis (<i>P</i>)	<0.0001	<0.0001	0.0003		<0.0001
Diagnosis, no meds	1.43 (1.14, 1.79)	2.06 (1.63, 2.60)	1.40 (1.11, 1.76)		1.47 (1.16, 1.85)
Diagnosis, and meds	2.29 (1.64, 3.19)	5.35 (3.76, 7.60)	1.73 (1.24, 2.43)		1.90 (1.34, 2.66)
Migraine (<i>P</i>)	0.02	<0.0001			0.004
Diagnosis, no meds	1.20 (0.93, 1.55)	1.63 (1.25, 2.13)			1.55 (1.20, 2.01)
Diagnosis, and meds	1.60 (1.12, 2.20)	2.37 (1.66, 3.39)			1.16 (0.80, 1.69)
Meds for nerves (<i>P</i>)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Taking meds	1.96 (1.51, 2.55)	1.86 (1.41, 2.47)	2.02 (1.56, 2.62)	2.25 (1.75, 2.90)	2.83 (2.16, 3.71)
Menopausal status (<i>P</i>)	0.21	0.82	0.66	0.17	0.42
Early peri	1.11 (0.94, 1.32)	0.98 (0.82, 1.18)	1.04 (0.88, 1.23)	1.12 (0.95, 1.31)	1.08 (0.90, 1.28)
Leaking urine (<i>P</i>)	<0.0001	0.004	<0.0001	<0.0001	<0.0001
1-5 days	1.41 (1.16, 1.72)	1.17 (0.94, 1.46)	1.38 (1.13, 1.68)	1.60 (1.33, 1.93)	1.48 (1.21, 1.82)
6-14 days	1.99 (1.53, 2.59)	1.61 (1.21, 2.14)	1.82 (1.39, 2.38)	1.49 (1.15, 1.94)	1.73 (1.30, 2.27)
Night sweats (<i>P</i>)	<0.0001	0.003	0.009	0.01	<0.0001
1-5 days	1.55 (1.27, 1.91)	1.35 (1.08, 1.69)	1.32 (1.09, 1.61)	1.32 (1.09, 1.59)	1.55 (1.27, 1.89)
6-14 days	1.16 (0.81, 1.66)	1.69 (1.16, 2.46)	1.36 (0.98, 1.89)	1.14 (0.83, 1.57)	1.34 (0.96, 1.88)
Hot flashes (<i>P</i>)	0.02	0.009			
1-5 days	0.96 (0.76, 1.20)	1.43 (1.13, 1.81)			
6-14 days	1.56 (1.13, 2.17)	1.36 (0.95, 1.93)			
Vaginal dryness (<i>P</i>)			0.02	0.02	
1-5 days			1.17 (0.93, 1.48)	1.19 (0.95, 1.48)	
6-14 days			1.61 (1.14, 2.27)	1.51 (1.08, 2.11)	

(continues)

TABLE 5. (Continued)

(D) Lifestyle Variables (Smoking, Physical Activity, Alcohol, BMI); Ethnicity and Site Forced into the Model. Reference Groups Are no Current Smoking, and no Alcohol Consumption.

(N = 2895)	Role-Physical	Bodily Pain	Vitality	Role-Emotional	Social Function
Ethnic group (<i>P</i>)	0.26	<0.0001	<0.0001	0.002	<0.0001
Black	0.92 (0.73, 1.15)	1.14 (0.91, 1.45)	0.57 (0.45, 0.71)	0.86 (0.70, 1.06)	1.52 (1.21, 1.91)
Chinese	0.99 (0.64, 1.53)	0.70 (0.42, 1.16)	0.55 (0.34, 0.89)	0.66 (0.44, 1.00)	0.69 (0.43, 1.11)
Hispanic	1.33 (0.81, 2.17)	3.61 (2.14, 6.11)	1.28 (0.79, 2.08)	0.66 (0.41, 1.06)	2.12 (1.28, 3.51)
Japanese	0.66 (0.43, 1.03)	0.55 (0.33, 0.91)	0.83 (0.53, 1.31)	0.55 (0.37, 0.83)	0.59 (0.35, 0.97)
Smoking (<i>P</i>)		<.0001		<.0001	<.0001
Current smoker		1.81 (1.45, 2.26)		1.55 (1.26, 1.90)	1.89 (1.52, 2.35)
Phys. activity (<i>P</i>)	0.001	<0.0001	<0.0001	0.004	<0.0001
Per unit	0.92 (0.88, 0.97)	0.88 (0.84, 0.93)	0.77 (0.73, 0.81)	0.94 (0.89, 0.98)	0.88 (0.83, 0.93)
Alcohol (<i>P</i>)		0.04	0.005		0.002
Below median		0.80 (0.64, 0.99)	0.78 (0.64, 0.96)		0.74 (0.60, 0.92)
Above median		0.78 (0.62, 0.99)	0.72 (0.57, 0.90)		0.71 (0.56, 0.89)
BMI (<i>P</i>)	0.005	<0.0001	0.0002		
25<=BMI<30	1.14 (0.92, 1.42)	1.24 (0.97, 1.57)	1.12 (0.90, 1.41)		
30<=BMI	1.42 (1.15, 1.76)	1.76 (1.40, 2.22)	1.56 (1.25, 1.94)		

(E) Social Circumstance Variables. Ethnicity and Site Forced into the Model. Reference Groups are <16 on CES-D, no Upsetting Events, and High Social Support

(N = 3033)	Role-Physical	Bodily Pain	Vitality	Role-Emotional	Social Function
Ethnic group (<i>P</i>)	0.10	<0.0001	0.002	0.002	<0.0001
Black	0.94 (0.76, 1.18)	1.38 (1.10, 1.74)	0.65 (0.52, 0.82)	0.81 (0.64, 1.01)	1.69 (1.32, 2.15)
Chinese	1.21 (0.77, 1.89)	0.89 (0.55, 1.44)	0.86 (0.53, 1.37)	0.98 (0.62, 1.53)	1.41 (0.86, 2.31)
Hispanic	1.31 (0.80, 2.12)	3.66 (2.21, 6.06)	1.34 (0.83, 2.17)	0.54 (0.32, 0.90)	2.17 (1.29, 3.65)
Japanese	0.59 (0.38, 0.92)	0.54 (0.32, 0.89)	0.75 (0.48, 1.18)	0.54 (0.35, 0.83)	0.61 (0.36, 1.04)
CES-D (<i>P</i>)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
≥16	2.01 (1.64, 2.45)	1.96 (1.60, 2.40)	3.07 (2.52, 3.74)	4.35 (3.56, 5.33)	4.06 (3.32, 4.98)
Perc. Stress (<i>P</i>)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Per unit	1.08 (1.05, 1.12)	1.09 (1.05, 1.12)	1.13 (1.10, 1.17)	1.18 (1.14, 1.22)	1.16 (1.12, 1.20)
Upset events (<i>P</i>)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1	1.20 (0.96, 1.51)	1.17 (0.92, 1.49)	1.22 (0.96, 1.53)	1.34 (1.07, 1.69)	1.37 (1.07, 1.76)
2 or more	1.55 (1.27, 1.88)	1.68 (1.37, 2.06)	1.58 (1.30, 1.93)	2.16 (1.78, 2.63)	1.85 (1.50, 2.29)
Social support (<i>P</i>)	0.0003				
Low support	1.57 (1.26, 1.95)				
Med. support	1.29 (1.04, 1.60)				

*Ethnicity was forced into all the models. Site was forced into all the models because it was part of the sampling plan for the study (along with ethnicity). For each effect, the *P* value for the effect and the associated odds ratio and 95% confidence intervals are displayed. Reference group is white for all models.

compared with premenopausal women, were classified as having impaired functioning on all 5 domains. However, after adjusting for health conditions, including menopause-related symptoms, impaired function did not differ by menopausal status. Symptoms alone explained the effect of menopausal status for all but the Role-Emotional domain. This is consistent with other studies that have adjusted quality-of-life scores for symptoms,^{6,56} and provides support for the view that symptoms are important mediators between physiological conditions and HRQL.^{4,57} As SWAN continues to follow women through the menopausal

transition, we will determine if this finding holds true for later stages of the transition (ie, late peri- and postmenopause).

Unadjusted analyses showed significant ethnic group differences across all 5 domains. Hispanic women were significantly more likely than white women to have impaired functioning on all domains except the Role-Emotional domain, whereas Japanese women had significantly less impaired functioning across all domains. Ethnic groups no longer differed on the Role-Physical domain when analyses adjusted for socioeconomic status, health, or social circumstances.

Health factors also accounted for ethnic differences in the Vitality and Role–Emotional domains, suggesting that ethnic differences in health conditions and symptoms are important considerations in comparing HRQL across ethnicities. Despite adjusting for a wide range of variables, we still found significant ethnic group differences for the Bodily Pain and Social Functioning domains. Hispanic women were considerably more likely than whites to report Bodily Pain. Blacks, and particularly Hispanic women, continued to be significantly more likely to report impaired Social Functioning than whites.

Our findings comparing SF-36 scores across ethnic groups are consistent with the existing, limited research.^{21,22} Among a group of white, black, Hispanic, and Asian depressed patients, Jackson-Triche et al.²² found a similar pattern of unadjusted scores. An overall ethnicity effect for 6 of the 8 SF-36 domains remained after adjusting for age, gender, and income. Jackson-Triche did not include the health variables that we found explained much of the ethnic differences. Globe et al.²¹ report that Asians scored better than whites, blacks, and Hispanics on all SF-36 domains even after adjusting for sociodemographic and clinical conditions. They did not, however, adjust for variables that explained ethnic differences in our study.

Our findings suggest that differences in health and symptoms across ethnic groups can play a large role in explaining differences in the Role–Physical, Vitality, and Role–Emotional domains. Differences in social circumstances or health behaviors can also account for differences in the Role–Physical domain.

Despite the inclusion of a wide range of covariates, we still found ethnic differences in the Bodily Pain and Social Functioning domains. There are several possible explanations for these findings: 1) there are true ethnic/cultural differences in HRQL; 2) there are important predictors of HRQL that have not been included in the analyses and are confounded with ethnicity; and/or 3) there are ethnic or cultural differences in how some questions are interpreted, the meaning of health constructs, or in what answers are socially acceptable. Although we are unable to examine these different explanations, our findings reinforce the need for more research on cultural differences.^{3,58} Stewart and Nápoles-Springer³ discuss the issue of cultural equivalence of self-report measures among diverse populations and report good construct

validity of a Spanish version of the SF-36 among Cubans⁵⁹ but problems with discriminant validity in a Japanese version.⁶⁰ Barofsky⁵⁸ explains how problems can arise when questionnaires are developed for one population and then applied to another. He points out that Chinese people tend to cognitively organize categories differently from westerners, which could affect their interpretation of questions that ask about categories such as leisure or social activities. This is an area that warrants further investigation.

There are several limitations to this study. First, SWAN is not composed of a true national probability sample. Women in the cohort had more education, higher incomes, were less likely to be smokers, and rated themselves as higher on perceived health than eligible women who did not enroll. Because the study excluded women with past hysterectomy, bilateral oophorectomy, or recent hormone use, cohort participants were less likely to be women who had already experienced reproductive or perimenopausal problems. Second, because the data reported here are cross-sectional, we cannot rule out the possibility that impaired functioning on HRQL influences some of the predictors. Third, this article only includes women who are pre- and early perimenopausal. As SWAN continues to follow women throughout the menopausal transition, we will examine HRQL among all menopause statuses, how changes in menopausal status are related to changes in HRQL, and how changes in predictors subsequently impact HRQL.

These findings from SWAN are important for identifying how the early menopausal transition affects women. SWAN goes beyond earlier studies by drawing on a more diverse population, investigating multiple HRQL domains, and controlling for a wide variety of predictors. Although unadjusted analyses suggest that early perimenopausal status is associated with poorer outcomes, in more complete analytical models, we find that menopause-related symptoms exert a stronger influence on impaired functioning. This suggests that menopause per se does not impact quality of life. However, experiencing night sweats, urinary incontinence, and/or frequent hot flashes are associated with lower HRQL. Symptom management among symptomatic women could improve their quality of life. Ethnicity remains a predictor of some HRQL domains, which should stimulate more research on the meaning of these ethnic differences. Clearly, some of these differences are

the result of ethnic differences on variables that impact HRQL. A fuller understanding of whether observed differences are real or artifactual requires more examination of cultural influences on perceptions and response patterns as well as on biologic or behavioral states. Finally, our focus on impaired functioning is important because it points to women who are most vulnerable and potentially in need of clinical or public health intervention.

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