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Employment and Coronary Risk in Women at Midlife: A Longitudinal Analysis

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This study investigated the relation between employment and cholesterol in 541 women aged 42–50 years who resided in Allegheny County, Pennsylvania, in 1985–1988. Employment, health-related variables, and cholesterol were assessed at baseline and 3 years later. At baseline, employed and nonemployed women did not differ in cholesterol or health behaviors. However, women employed at baseline had a significant decrease in total high density lipoprotein cholesterol (1.9 mg/dl) and high density lipoprotein$_2$ cholesterol subfraction (3.2 mg/dl) at follow-up. Those who were employed at both assessments had the lowest high density lipoprotein cholesterol at follow-up. These effects could not be accounted for by sociodemographics or employment quality variables. Post hoc analyses were conducted to examine health behaviors as a potential mechanism to account for the association between employment status and cholesterol. Over the study period, those who were employed at baseline were less likely to increase exercise and more likely to gain weight than those who were not employed at baseline. With menopause-related changes in metabolism, this can result in detrimental effects for cholesterol levels and coronary health. The results highlight the importance of longitudinal assessment in the study of employment and health. *Am J Epidemiol* 1996;143:144–50.

cholesterol; coronary disease; employment; women

Women at midlife experience increasing risk for coronary disease (1–3). Among the endocrine, physiologic, and biochemical changes that occur are increases in low density lipoprotein cholesterol (LDL cholesterol) and concomitant decreases in high density lipoprotein cholesterol (HDL cholesterol), including the HDL_2 cholesterol subfraction. Although menopause appears to accelerate these lipid changes (4), physical activity has been shown to mitigate these effects (5).

Recent studies have focused on the relation between employment and risk factors for coronary disease in women. In general, these studies have suggested that employment may be a protective factor (6, 7). However, in two large, community-based studies that have focused on women in midlife, findings have been inconsistent. Results from the Framingham Heart Study indicated no difference in total cholesterol between employed and nonemployed women, with employment defined as having worked at least half of adult years (8). However, in the Rancho Bernardo Heart Survey, currently employed women had lower total cholesterol than did currently nonemployed women (9).

To date, few studies have used longitudinal designs to examine employment and coronary disease risk in women. As an exception, Haertel et al. (10) assessed HDL cholesterol and health-related factors at baseline and again 3 years later. At baseline, employed women had higher HDL cholesterol than did nonemployed women, even after controlling for health behaviors, hormone use, and reproductive history. Longitudinal analyses indicated that a change from employment to nonemployment was associated with a decrease in HDL cholesterol. Two features of the study should be noted. First, the study included women spanning a broad age range (ages 25–64 years). Second, in their effort to evaluate change in employment, the authors did not distinguish between women who remained employed and those who remained nonemployed at

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Abbreviations: BMI, body mass index; HDL cholesterol, high density lipoprotein cholesterol; HDL_2 cholesterol, high density lipoprotein cholesterol subfraction; LDL cholesterol, low density lipoprotein cholesterol.

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both assessment points (i.e., a "no change" group was used as the reference group in regression analyses).

The purpose of our study was to replicate and extend the study by Haertel et al. (10). Specifically, we extended these analyses by 1) disaggregating the no change reference group to examine the effects of continuous employment versus continuous nonemployment; 2) including the HDL_2 cholesterol subfraction as a dependent measure; and 3) conducting follow-up analyses to examine potential mechanisms to explain the link between employment and cholesterol.

HDL cholesterol subfractions are increasingly recognized as an important factor associated with cardiovascular health. HDL_2 cholesterol had the strongest association with the extent of coronary artery disease in a study of men (11) and was significantly associated with myocardial infarction in another study that included men and women, even after controlling for many demographic, medical, and behavioral risk factors (12).

The primary aim of this study was to evaluate the relation between employment and cholesterol in women at midlife, including measures of LDL cholesterol, total HDL cholesterol, and the HDL_2 cholesterol subfraction. A secondary aim was to examine employment quality as a potential mediator of the relation between employment and cholesterol. Finally, we examined health behaviors as a potential mechanism to account for the association between employment status and cholesterol.

MATERIALS AND METHODS

Study participants

A sample of 541 premenopausal women aged 42–50 years residing in Allegheny County, Pennsylvania, participated in a prospective study of biologic and behavioral characteristics of women across the menopause (for detailed description of sample and methods, see reference 2). Sociodemographic and descriptive data appear in table 1.

Procedures

Participants completed baseline assessment at a university clinic and were seen for follow-up an average of 30 months later. In addition, women completed a self-report inventory that included sociodemographic characteristics, health behaviors, measures of employment status, and perceived employment quality (2, 13). A total of 478 women completed both assessments (retention rate, 88 percent). The analyses in this study used 449 participants for whom the data were complete.

Measures

Health behaviors were coded as follows: current smoking (smoker, nonsmoker), alcohol consumption (grams per day), physical activity (kilocalories per week), and dietary intake of cholesterol (Keys index score (14)). Body mass index (BMI) was calculated as weight (in kilograms) divided by height (in meters) squared. At follow-up, menopausal status was designated as pre-, peri-, or postmenopausal, and use of hormone replacement therapy (no/yes) was noted.

Biologic measures included LDL cholesterol, total HDL cholesterol, and HDL_2 cholesterol. Levels of total HDL cholesterol (15) and the HDL_2 cholesterol subfraction (16) were measured by a lipid laboratory using the standards of the Centers for Disease Control and Prevention. LDL cholesterol was estimated using the Friedwald equation (17).

As in previous longitudinal research (10, 18, 19), participants' employment pattern was classified as continuously employed, continuously nonemployed, newly employed (nonemployed at baseline and employed at follow-up), and newly nonemployed (employed at baseline and nonemployed at follow-up). Employment quality measures consisted of five self-report indices: job satisfaction, use of skills, job future ambiguity, job tedium, and supervisory support. The first four were adapted from an inventory developed by Caplan et al. (20); supervisory support was assessed by a seven-item scale used in the Framingham Heart Study (21).

Statistical analyses

To examine baseline differences between employed and nonemployed women, *t* tests and chi-square analyses were conducted. These analyses were used because the groups did not differ in age, obviating the need to covary age, as was done in previous studies (10).

Repeated measures analysis of covariance was used to evaluate change in LDL cholesterol, total HDL cholesterol, and the HDL_2 cholesterol subfraction. Employment pattern (i.e., continuously employed, newly employed, newly nonemployed, continuously nonemployed) was the between-subjects factor, time (i.e., baseline, follow-up) was the within-subjects factor, and sociodemographics and health variables were used as covariates. This strategy was chosen because it enabled us to examine mean changes in cholesterol as a function of change in employment status, and it avoided potential problems (e.g., nonnormality, compounded error) associated with the use of change scores. As in Haertel et al. (10), the covariates included sociodemographics (age, education, marital

TABLE 1. Means, standard deviations, percentages, and frequencies of sociodemographics, health variables, and cholesterol at baseline, Allegheny County, Pennsylvania, Healthy Women Study, 1983/1984–1987/1988

	Employed (n = 339)			Nonemployed (n = 110)			t test	χ^2 test
	Mean (SD)†	%	No.	Mean (SD)†	%	No.		
Sociodemographics								
Age (years)	47.6 (1.6)			47.7 (1.6)			0.68	
Race/ethnicity								0.33
Nonwhite		8.6	(29)		8.2	(9)		
White		91.5	(310)		91.8	(101)		
Education								20.26*
12 years or less		23.9	(81)		40.9	(45)		
Some college		22.1	(75)		22.7	(25)		
4-year degree		23.0	(78)		24.6	(27)		
Advanced degree		31.0	(105)		11.8	(13)		
Marital status								22.68*
Married		67.9	(230)		90.9	(100)		
Unmarried		32.2	(109)		9.1	(10)		
Health variables								
Smoking								0.33
No		70.8	(240)		73.6	(81)		
Yes		29.2	(99)		26.4	(29)		
Alcohol (g/day)	8.67 (10.50)			8.73 (10.73)			0.05	
Physical activity (kcal/week)	1,485 (1,845)			1,522 (1,261)			0.24	
Dietary intake (Keys score)	50 (16.39)			47.03 (16.95)			0.84	
Body mass index	24.70 (4.48)			24.75 (4.62)			0.10	
Cholesterol								
LDL†	107.36 (30.56)			112.72 (29.23)			1.62	
HDL†	59.67 (13.86)			60.31 (12.98)			0.42	
HDL_2†	21.19 (9.97)			21.05 (10.25)			−0.13	

* $p < 0.01$.
† SD, standard deviation; LDL cholesterol, low density lipoprotein cholesterol; HDL cholesterol, high density lipoprotein cholesterol; HDL_2 cholesterol, high density lipoprotein cholesterol subfraction.

status, race/ethnicity), menopausal status, use of exogenous hormones at follow-up, the interaction between menopausal status and use of exogenous hormones, and health variables (BMI, alcohol consumption, smoking status, physical activity, and dietary cholesterol) at follow-up.

Hierarchical multiple regression was used to test the hypothesis that employment quality would account for a significant proportion of the variance in cholesterol at follow-up after controlling for baseline cholesterol and other factors. The following blocks of predictors were entered sequentially using the forced entry method: 1) sociodemographics; 2) baseline cholesterol; 3) menopausal status and use of exogenous hormones at follow-up; 4) health variables at follow-up; and 5) employment quality.

In a final set of analyses, hierarchical regression was conducted to examine the association of health behaviors, employment, and cholesterol. Specifically, we examined the direct effects of change in body mass index and exercise as well as the interaction of these variables with employment status (after controlling for relevant sociodemographic and health variables). This tests a potential mechanism by which employment might have its effect on cholesterol over time.

RESULTS

Employment, health variables, and cholesterol at baseline

There were few differences between employed and nonemployed women at baseline (table 1). There were no significant differences in cholesterol levels or other health-related variables. However, employed women had more education and were less likely to be married.

Employment and changes in cholesterol over time

Analyses of covariance with repeated measures, using four employment patterns and two time points,

were computed separately for LDL cholesterol, total HDL cholesterol, and the HDL_2 cholesterol subfraction. Unadjusted mean values at baseline and follow-up appear in table 2.

There was a significant increase in LDL cholesterol from baseline to follow-up (mean increase = 9.42 mg/dl; $F(1, 445) = 44.40$, $p < 0.001$). The HDL_2 cholesterol subfraction decreased over time (mean decrease = 2.45 mg/dl; $F(1, 445) = 15.74$, $p < 0.001$), and there was a significant interaction between time and employment pattern for both HDL_2 cholesterol ($F(3, 445) = 6.35$, $p < 0.001$) and total HDL cholesterol ($F(3, 445) = 3.24$, $p < 0.05$). Comparisons computed separately for each employment pattern revealed significant decreases in mean total HDL cholesterol and HDL_2 cholesterol for the women who were employed at baseline. Among women who were not employed at baseline, changes in total HDL cholesterol and HDL_2 cholesterol were nonsignificant.

Employment status was significantly associated with decreases in HDL cholesterol and HDL_2 cholesterol even after controlling for demographic variables (e.g., age, race, and education), menopausal status, use of hormone replacement therapy, and other health variables (e.g., BMI, smoking) known to affect cholesterol levels. This indicates that employment had an effect on cholesterol above and beyond the effect accounted for by these factors. It is interesting to note, however, that women employed at baseline tended to gain weight over the study period ($\chi^2 = 5.5$, $p < 0.07$) and were less likely to increase their levels of physical activity ($\chi^2 = 13.7$; $p < 0.04$) than were nonemployed women. Together, these would have a detrimental effect on cholesterol levels and coronary health.

Employment quality and changes in HDL cholesterol and the HDL_2 cholesterol subfraction

We sought to determine whether aspects of employment quality were associated with the declines in HDL cholesterol among women who were employed at baseline ($n = 339$ employed at baseline with complete job data). Independent analyses were conducted for total HDL cholesterol and the HDL_2 cholesterol subfraction. Hierarchical multiple regression was used to examine the contribution of the following "blocks" of predictors: 1) sociodemographics (age, race/ethnicity, education, marital status); 2) baseline HDL cholesterol or HDL_2 cholesterol; 3) menopausal status, use of exogenous hormones at follow-up, and their interaction; 4) health variables (BMI, alcohol consumption, smoking status, physical activity, and dietary cholesterol) at follow-up; and 5) job quality (job satisfaction, use of skills, job future ambiguity, job tedium, and supervisory support) at baseline when all were employed. The results are reported in table 3.

In step 1 of table 3, the sociodemographic characteristics were added; as a group, these variables did not contribute to the prediction of cholesterol at follow-up. In step 2, baseline cholesterol was added; in each equation, cholesterol at baseline (HDL cholesterol, total or HDL_2 cholesterol) accounted for more than one half of the variance in cholesterol at follow-up, as indicated by the change in R^2. After sociodemograph-

TABLE 2. Unadjusted mean cholesterol (mg/dl) at baseline and follow-up by employment pattern, Allegheny County, Pennsylvania, Healthy Women Study, 1983/1984–1987/1988

	Baseline/follow-up pattern								Total ($n = 449$)	
	Employed/employed ($n = 299$)		Employed/not employed ($n = 40$)		Not employed/employed ($n = 34$)		Not employed/not employed ($n = 76$)			
	Mean*	(SD†)	Mean*	(SD)	Mean*	(SD)	Mean*	(SD)	Mean*	(SD)
LDL cholesterol†										
Baseline	106.9‡	(29.7)	111.1‡	(36.8)	105.1‡	(33.3)	116.1‡	(26.8)	108.7‡	(30.3)
Follow-up	116.9§	(32.5)	121.3§	(31.4)	115.5§	(33.7)	122.1§	(23.8)	118.1§	(31.1)
HDL cholesterol†										
Baseline	59.3‖	(13.6)	62.3¶	(15.4)	60.6‖	(13.6)	60.2‖	(12.8)	59.8‖	(13.6)
Follow-up	57.4#	(13.0)	59.6‖	(14.9)	60.8‖	(14.2)	61.3‖	(15.3)	58.5‖	(13.7)
HDL_2 cholesterol†										
Baseline	20.9**	(9.7)	23.7††	(11.9)	21.3**	(10.0)	20.9**	(10.4)	21.2**	(10.0)
Follow-up	17.7‡‡	(9.0)	19.8**	(10.2)	20.2**	(11.1)	21.50**	(10.9)	18.7‡‡	(9.7)

* Differing subscripts indicate statistically significant mean differences ($p < 0.05$).

† SD, standard deviation; LDL cholesterol, low density lipoprotein cholesterol; HDL cholesterol, high density lipoprotein cholesterol; HDL_2 cholesterol, high density lipoprotein cholesterol subfraction.

‡§ LDL cholesterol increased from baseline to follow-up across all employment patterns.

‖, ¶, #; **, ††, ‡‡ There were statistically significant interactions for time and employment pattern for both HDL and HDL_2 cholesterol.

TABLE 3. Summary of hierarchical regression analyses predicting HDL cholesterol* and HDL_2 cholesterol* at follow-up women employed at baseline (n = 339), Allegheny County, Pennsylvania, Healthy Women Study, 1983/1984–1987/1988

Step† Variables entered‡	R^2§	Change R^2‖	F (R^2 change)¶	p (F)#
Dependent variable: HDL cholesterol total at follow-up				
1. Sociodemographics (age, race, education, marital status)	0.03	0.03	1.64	0.15
2. Baseline HDL cholesterol total	0.67	0.64	554.10	0.0001
3. Menopause status and hormone replacement	0.67	0.002	0.48	0.75
4. Health (BMI, alcohol consumption, smoking, physical activity, dietary cholesterol)	0.69	0.02	2.72	0.02
5. Job quality (job satisfaction, use of skills, job future ambiguity, tedium, supervisory support)	0.69	0.003	0.48	0.82
Dependent variable: HDL_2 cholesterol at follow-up				
1. Sociodemographics (age, race, education, marital status)	0.03	0.03	1.93	0.09
2. Baseline HDL_2 cholesterol	0.55	0.51	322.81	0.0001
3. Menopause status and hormone replacement	0.55	0.007	1.02	0.39
4. Health (BMI, alcohol consumption, smoking, physical activity, dietary cholesterol)	0.58	0.03	3.76	0.003
5. Job quality (job satisfaction, use of skills, job future ambiguity, tedium, supervisory support)	0.59	0.01	1.19	0.31

* HDL cholesterol, high density lipoprotein cholesterol; HDL_2 cholesterol, high density lipoprotein cholesterol subfraction; BMI, body mass index.
† Step, order in which the variables were entered into the hierarchical regression equation.
‡ Variables entered specifies the block of variables entered at each step.
§ R^2, R^2 for the entire equation at each step (i.e., variance in the dependent variable explained).
‖ Change R^2, change in R^2 from step x to step $x + 1$; indicates how much additional variance is explained based on adding a new block of predictors.
¶ $F(R^2$ change), F statistic specific to each step in the regression.
# $p(F)$, probability associated with F statistic for each step.

ics and baseline lipoprotein levels were controlled for, menopausal status and hormone use failed to explain a significant proportion of the variance in HDL cholesterol or HDL_2 cholesterol (step 3). In contrast, it has been reported elsewhere (2, 22) that among employed and nonemployed women combined, menopausal status and hormone use predicted declines in HDL cholesterol and the HDL_2 cholesterol subfraction. This discrepancy is probably because fewer of the women in this analysis were postmenopausal or used hormones. In step 4, adding the health-related variables to the equation yielded a significant increase in explained variance of cholesterol at follow-up. Specifically, those with higher body mass index had a greater decline in HDL_2 cholesterol, and those who exercised less had a greater decline in both HDL_2 cholesterol and total HDL cholesterol. Finally, employment quality produced an increase of less than 1 percent of explained variance and hence, contrary to predictions, failed to contribute to the understanding of decreases in HDL cholesterol and the HDL_2 cholesterol subfraction among employed women (step 5).

Association between employment, health behaviors, and cholesterol

Post hoc analyses were conducted to examine the association of health behaviors, employment, and cholesterol. These test potential mechanisms by which employment might have its effect on cholesterol over time. On the basis of the study findings reported thus far, we decided to examine the direct effects of change in body mass index (an indicator of obesity) and change in physical activity (i.e., exercise), as well as the interaction of these variables with employment status on HDL cholesterol and HDL_2 cholesterol at follow-up. Hierarchical multiple regression was used as described above: Steps 1–3 were conducted to control for sociodemographic variables (age, race/ethnicity, education, marital status) (step 1), baseline HDL cholesterol and HDL_2 cholesterol (step 2), and menopausal status, use of exogenous hormones at follow-up, and their interaction (step 3). Step 4 included employment status, change in BMI, change in exercise, and two interaction terms (employment status with change in BMI and employment status with

change in exercise). The entire study sample for whom data were complete ($n = 449$) was included in these analyses.

After the variables entered in steps 1–3 were controlled for, a significant portion of the variance in total HDL cholesterol was explained by the direct effects of employment status ($\beta(15,432) = -0.10$; $p < 0.01$), change in BMI ($\beta(15,432) = -0.35$; $p < 0.001$), and the interaction between employment status and change in BMI ($\beta(15,432) = 0.32$; $p < 0.01$). Regardless of employment status at follow-up, those employed at baseline had greater increases in BMI over the study period compared with their nonemployed counterparts (mean change in BMI, 1.22 vs. 0.89) and lower total HDL cholesterol at follow-up.

After the variables entered in steps 1–3 were controlled for, a significant portion of the variance in the HDL_2 cholesterol subfraction was explained by the direct effects of employment status ($\beta(15,432) = -0.13$; $p < 0.01$) and change in physical activity ($\beta(15,432) = 0.16$; $p < 0.05$). In this case, the effects seem to be driven by employment status at follow-up; that is, those who were not employed at follow-up reported significant increases in physical activity (mean increase = 612.6 kcal/week), whereas those employed at follow-up reported slight declines in physical activity (mean decrease = −59.0 kcal/week).

DISCUSSION

This study investigated the relation between employment and cholesterol over a 3-year period among women at midlife. At baseline, there were no differences between employed and nonemployed women in any risk factor assessed. Longitudinal analyses revealed that, although LDL cholesterol increased over time from 108.67 mg/dl to 118.09 mg/dl, this change was independent of employment. In contrast, employment at baseline was associated with a subsequent decline of 1.9 mg/dl in total HDL cholesterol and 3.2 mg/dl in HDL_2 cholesterol at follow-up. Although relatively small, the magnitude of these changes is consistent with those found in previous studies. For example, Haertel et al. (10) reported a 2–3 mg/dl decrease in HDL cholesterol in their sample. Differences in HDL cholesterol of as little as 1 mg/dl have been shown to be associated with coronary risk in previous studies (23).

What is it about employment that might result in a decline in HDL cholesterol in this population? These data indicated that aspects of employment quality were not associated with HDL cholesterol in this study sample. Employment does appear to be related to health behaviors: Women employed at baseline gained more weight over the study period, and those employed at follow-up were less likely to increase their physical activity. Those who are working may certainly have less time to exercise; this can result in weight gain, especially when combined with menopause-related changes in metabolism. Workplace interventions with regard to diet and exercise may be important for women in midlife, especially around the transition from pre- to postmenopause. Even so, after controlling for health behaviors and other health-related factors at follow-up, employment still had a significant direct effect on lipid levels. Perhaps employment also was associated with other health-related factors not measured in the current study (e.g., self-efficacy, stress), which may in turn affect cholesterol levels (24).

The finding of reduced HDL cholesterol in continuously employed women parallels findings from two previous studies of psychologic adjustment and employment status. Those studies suggested that continued employment was associated with decreased psychologic well-being (19) and increased depressive symptoms (18).

Our study failed to replicate the cross-sectional and longitudinal findings of Haertel et al. (10). Specifically, those authors found that at baseline employed women had significantly higher HDL cholesterol than did nonemployed women. In longitudinal analyses, newly nonemployed women exhibited a decrease in HDL cholesterol relative to women who were newly employed or whose employment status remained constant. In the present extension of that study, the finding that employment at baseline was associated with a decline in HDL cholesterol, irrespective of employment status at follow-up, points to a qualified negative relation between employment and HDL cholesterol. This finding suggests that to look only at patterns or change in employment status without considering status itself may obscure important differences between these groups with respect to health outcomes.

There are several plausible explanations for the failure to replicate previous findings. First, this study included initially healthy, premenopausal, middle-aged women. Thus, it is possible that employment serves a different role for these women and, hence, may have unique psychosocial and biomedical correlates. In addition, the present sample reflects a smaller age range (42–50 years at baseline); it should be noted that Haertel et al. (10) found that differences in HDL cholesterol between employed and nonemployed women were smallest in women above age 45 years.

Several limitations of this study should be noted. First, the 3-year follow-up period allowed for the possible occurrence of intervening events that could influence the relation between employment and cho-

lesterol. Future studies should incorporate shorter and more frequent follow-ups to more closely track changes over time. Relatedly, several potential intervening variables (e.g., reasons for employment, household income) were not assessed and should be included in future studies. Third, because two thirds of the women in this study were continuously employed, statistical power to detect differences in the newly employed, newly nonemployed, and continuously nonemployed groups was limited. Future studies should attempt to include more women in these groups. Finally, like most studies in this area, these results are based on relatively healthy women. When they entered the study, none had chronic diseases requiring pharmacologic treatments that would interfere with risk factor tracking. The implications of this sampling bias are twofold. First, caution must be exercised in generalizing the results to less healthy women. Second, with this restriction of range in the health of participants, detection of any association between cholesterol and employment is challenging. More heterogeneous samples are needed to address this issue.

Our study underscores the importance of longitudinal assessment in the study of employment and coronary disease risk in this population. Stability and/or change in employment, along with its demographic, psychosocial, and behavioral correlates, must be considered if we are to understand better the role of employment in coronary disease risk for women.

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REFERENCES

1. Gordon T, Kannel WB, Hjortland MC, et al. Menopause and coronary heart disease: the Framingham Study. Ann Intern Med 1978:89:157–61.
2. Matthews KA, Meilahn E, Kuller LH, et al. Menopause and risk factors for coronary heart disease. N Engl J Med 1989: 321:641–6.
3. Campos H, McNamara JR, Wilson PW, et al. Differences in low density lipoprotein subfractions and apolipoproteins in premenopausal and postmenopausal women. J Clin Endocrinol Metab 1988:67:30–5.
4. Stevenson JC, Crook D, Godsland IF. Influence of age and menopause on serum lipids and lipoproteins in healthy women. Atherosclerosis 1993:98:83–90.
5. Owens JF, Matthews KA, Wing RR, et al. Can physical activity mitigate the effects of aging in middle-aged women? Circulation 1992:85:1265–70.
6. Rodin J, Ickovics JR. Women's health: review and research agenda as we approach the 21st century. Am Psychol 1990: 45:1018–34.
7. LaCroix AZ, Haynes SG. Gender differences in the health effects of workplace roles. In: Barnett RC, Biener L, Baruch GK, eds. Gender and stress. New York, NY: Free Press, 1987:96–121.
8. Haynes SG, Feinleib M. Women, work, and coronary heart disease: prospective findings from the Framingham Heart Study. Am J Public Health 1980:70:133–41.
9. Kritz-Silverstein D, Wingard DL, Barrett-Connor E. Employment and heart disease risk factors in middle-aged women: the Rancho Bernardo Study. Am J Public Health 1992:82:215–19.
10. Haertel U, Heiss G, Filipiak B, et al. Cross-sectional and longitudinal associations between high density lipoprotein cholesterol and women's employment. Am J Epidemiol 1992: 135:68–78.
11. Drexel H, Amann FW, Rentsch K, et al. The relation of the level of high-density lipoprotein subfractions to the presence and extent of coronary artery disease. Am J Cardiol 1992:70: 436–40.
12. Buring JE, O'Connor GT, Goldhaber SZ, et al. Decreased HDL_2 and HDL_3 cholesterol, Apo A-I and Apo A-II, and increased risk of myocardial infarction. Circulation 1992:85: 22–9.
13. Matthews KA, Kelsey S, Meilahn E, et al. Educational attainment and behavioral and biologic risk factors for coronary heart disease in middle-aged women. Am J Epidemiol 1989: 129:1132–44.
14. Keys A, Anderson JT, Grande F. Serum cholesterol responses to changes in the diet. II. The effect of cholesterol in the diet. Metabolism 1965:14:759–65.
15. Warnick GR, Albers JJ. A comprehensive evaluation of the heparin-manganese precipitation procedure for estimating high density lipoprotein cholesterol. J Lipid Res 1978:19: 65–76.
16. Gidez LI, Miller GJ, Burstein M, et al. Analyses of plasma high density lipoprotein subclasses by a precipitation procedure: correlations with preparative ana analytical centrifugation. In: Lippel K, ed. Report of the High Density Lipoprotein Methodology Workshop, San Francisco, CA, March 12–14, 1979. Bethesda, MD: Department of Health, Education, and Welfare, 1979:328–42. (NIH publication no. 79–1661).
17. Friedwald WT, Levey RI, Frederickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clin Chem 1972:18:499–502.
18. Bromberger JT, Matthews KA. Employment status and depressive symptoms in middle-aged women: a longitudinal investigation. Am J Public Health 1994:184:202–6.
19. Ickovics JR, Martin JA. The impact of employment on the psychological well-being of Army wives: a longitudinal survey study. Military Med 1987:152:500–3.
20. Caplan RD, Cobb S, French JRP Jr, et al. Job demands and worker health: main effects and occupational differences. Ann Arbor, MI: Institute for Social Research, 1980.
21. Haynes SG, Levine S, Scotch N, et al. The relationship of psychosocial factors to coronary heart disease in the Framingham Study. I. Methods and risk factors. Am J Epidemiol 1978:107:362–83.
22. Matthews KA, Wing, RR, Kuller LH, et al. Influence of the perimenopause on cardiovascular risk factors and symptoms in middle-aged healthy women. Arch Intern Med 1994;154: 2349–55.
23. Gordon DJ, Probstfield JL, Garrison RJ, et al. High density lipoprotein cholesterol and cardiovascular disease: four prospective American studies. Circulation 1989:79:8–15.
24. Frankenhaeuser M, Lundberg U, Chesney M, eds. Women, work and health: stress and opportunities. New York, NY: Plenum Press, 1991.