

Women, Work and Coronary Heart Disease: Prospective Findings from the Framingham Heart Study

SUZANNE G. HAYNES, PHD, AND MANNING FEINLEIB, MD, DRPH

Abstract: This study examined the relationship of employment status and employment-related behaviors to the incidence of coronary heart disease (CHD) in women. Between 1965 and 1967, a psychosocial questionnaire was administered to 350 housewives, 387 working women (women who had been employed outside the home over one-half their adult years), and 580 men participating in the Framingham Heart Study. The respondents were 45 to 64 years of age and were followed for the development of CHD over the ensuing eight years. Regardless of employment status, women reported significantly more symptoms of emotional distress than men. Working women and men were more likely to report Type A behavior, ambitiousness, and marital disagreements than were housewives; working women experienced more job mobility than men,

and more daily stress and marital dissatisfaction than housewives or men. Working women did not have significantly higher incidence rates of CHD than housewives (7.8 vs 5.4 per cent, respectively). However, CHD rates were almost twice as great among women holding clerical jobs (10.6 per cent) as compared to housewives. The most significant predictors of CHD among clerical workers were: suppressed hostility, having a nonsupportive boss, and decreased job mobility. CHD rates were higher among working women who had ever married, especially among those who had raised three or more children. Among working women, clerical workers who had children and were married to blue collar workers were at highest risk of developing CHD (21.3 per cent.) (*Am J Public Health* 70:133-141, 1980.)

Introduction

During the past 30 years, the number of women participating in the United States labor force has risen sharply. In this period, the proportion of women in the labor force has increased from 28 per cent in 1950 to 42 per cent in 1978.^{1, 2} Most of this growth has resulted from an influx of married women into the labor force.³

The growing participation of women in the work place has brought fears that women will lose their survival advantage over men, and will have increasingly higher mortality rates from chronic diseases such as coronary heart disease (CHD). Contributing to these fears is an unsubstantiated assumption that men live fewer years than women because they work outside the home.

At the present time, there is no evidence from mortality statistics to suggest that women are losing their survival advantage over men because of their increased participation in the labor force. On the contrary, in the last 10 years, mortality rates from coronary heart disease have been declining in both men and women at all ages,⁴ with greater percentage declines seen among women than men.

Since mortality rates may not reflect trends in illness or disability, morbidity rates among men and women should also be examined. Unfortunately, morbidity statistics are usually collected in cross-sectional surveys. Since these surveys do not follow populations over time, they are not useful in determining whether working women have incurred higher rates of CHD over time than working men or housewives.

In order to examine the effect of employment on the cardiovascular health of women, the present study followed working women, housewives, and men participating in the Framingham Heart Study over an eight-year period for the development of coronary heart disease. In addition, the behaviors and family responsibilities associated with employment outside the home were examined in relation to CHD incidence.

Materials and Methods

Between 1965 and 1967, an extensive psychosocial questionnaire was administered to a sample of men and women in the Framingham cohort undertaking their 8th or 9th biennial medical examinations. The present analysis includes the 350 housewives, 387 working women, and 580 men, aged 45 to 64 years, who were free of coronary heart disease at the time of the examinations. Although persons 65 years of age and over were also included in the original study, the present analysis was restricted to individuals in their employment years. A comprehensive description of the characteristics of this sample of the Framingham cohort has

Address reprint requests to Suzanne G. Haynes, PhD, Epidemiology Branch, National Heart, Lung, and Blood Institute, Federal Building, Room 2C08, Bethesda, MD 20205. Dr. Feinleib is Associate Director, Epidemiology and Biometry Program, NHLBI. This paper, submitted to the *Journal* April 23, 1979, was revised and accepted for publication July 31, 1979.

Editor's Note: See also related editorial, p. 120, this issue.

been reported previously. In most respects, the sample under study appears representative of the entire study population. The questionnaire, also described previously, assessed employment and occupational status as well as personality types, situational stress, reactions to anger, somatic strains, sociocultural mobility, and family responsibilities.⁵

Women who indicated they had been employed outside the home for over one-half their adult years (age 18+) were designated "working women"; otherwise they were classified as "housewives." Thus, a working woman 50 years of age would have worked the full-time equivalent of at least 15 years outside the home. Although complete work histories were not available for the Framingham population for the period prior to the first examination in 1950, calculation of the number of years worked was possible between 1950 and 1967. Using a 10 per cent random sample of women, single working women were found to have worked outside the home at least two-thirds of their adult years. In contrast, working women who had ever married were employed about one-half and housewives were employed less than 10 per cent of their adult years.

In addition, working women were separated into those who were currently employed, unemployed, or retired at the time of the study. Housewives included only women who had ever been married. Twelve women, including two nuns and one single housewife, were excluded from the study population because of inappropriate or missing data on employment status.

Occupation, as defined by one's usual lifetime work, was grouped into the following six categories according to the Warner index of status characteristics:⁶ professionals, proprietors and managers, businessmen, clerks and kindred workers, manual workers, and protective and service workers. The first three groups were designated white-collar occupations, the last two groups were blue-collar occupations, and clerical jobs were considered separately.

Twenty psychosocial scales were examined in this study. A complete description of their content, including reliability coefficients and interscale correlations, may be found in a previous publication.⁵ The scales were grouped in five categories: behavior types, situational stress, anger reactions, somatic strains, and sociocultural mobility.

The behavior types studied included the Framingham Type A behavior, ambitiousness, emotional lability, and non-easygoing scales. Several validation studies⁷ on the Framingham Type A scale have found it to be measuring some, but not all, aspects of the Type A behavior pattern* described by Rosenman and Friedman.⁸ The situational stress scales represented situations in marriage, work, or life that posed a potential threat to the respondent. These scales included measures of work overload, nonsupport from one's boss, marital disagreements and dissatisfaction, aging and personal worries.

Two scales assessed educational and occupational mobility as compared to one's father, and another scale measured social class incongruity as compared to one's ac-

quaintances. The mobility scales were scored as upwardly mobile (3), stable (2), or downwardly mobile (1). Finally, a family responsibility scale was developed to account for marital status and the number of children in family. Respondents were scored as single (1); ever-married, no children (2); ever-married, 1-2 children (3); or ever-married, 3+ children (4).

The entire study group was followed for the development of coronary heart disease over an eight-year period. Coronary heart disease was diagnosed if, upon review of all clinical and examination data, a panel of investigators agreed that a myocardial infarction, coronary insufficiency syndrome, angina pectoris, or CHD death had occurred. Definitions of these clinical manifestations of CHD have been presented elsewhere.⁷

Statistical differences in demographic characteristics and coronary incidence rates were determined by a two-sided Chi-square test. To test whether the psychosocial scales and coronary risk factors varied across employment groups, mean scores among working women, housewives, and men were compared using Student's t-test. The direct method of age-adjustment, using all Framingham men and women (ages 45-54 and 55-64 years) in this study as the standard population, was used to test whether observed differences in mean scale scores, CHD risk factors, and CHD rates were due to differences in the age distributions between groups. With one exception (marital status), the associations were unaffected by the adjustment for age. Thus, unless otherwise stated, unadjusted incidence rates and mean levels of psychosocial and coronary risk factors for the entire age group 45-64 years will be presented throughout the analysis.

Results

Demographic characteristics

Table 1 summarizes selected demographic characteristics of the working women and housewives examined in this study. There were no significant differences between working women and housewives according to age or educational level. Significant differences in marital status and number of children were observed since almost 20 per cent of working women were single (i.e., never married) and almost 25 per cent of ever married working women had no children. Working women were also less likely to have husbands employed in white collar jobs (13 per cent) than were housewives (26 per cent).

Over one-third of all working women had been employed in clerical and kindred occupations during their working years. Secretaries, stenographers, bookkeepers, bank clerks and cashiers, and sales personnel made up the majority of these positions. Although equal proportions of working women and men were employed in white-collar jobs (20 per cent), more women (37 per cent) were employed in clerical occupations than men (18 per cent), and fewer women (43 per cent) were employed in blue collar jobs than men (62 per cent) ($p = .000$, comparing occupations of men with women). The majority of men with white collar occupations were graduate degree professionals (lawyers, doctors, dentists,

*Aggressiveness, competitiveness, ambition, restlessness and a chronic sense of time urgency (associated with high CHD rates).

TABLE 1—Demographic Characteristics of Working Women and Housewives in the Framingham Cohort Aged 45 to 64 Years at their 8th or 9th Biennial Medical Examinations

Selected Characteristics (%)	Working Women (N = 387)	Housewives (N = 350)	Significance
Age			
45-49 years	21.0	25.6	N.S.
50-54 years	33.5	30.4	
55-59 years	27.5	24.1	
60-64 years	17.9	19.9	
Education¹			
≤8 years	20.4	16.6	N.S.
9-12 years	54.3	54.3	
13+ years	25.3	29.1	
Marital Status¹			
Single	18.6	—	p = .000
Married	62.0	87.9	
Divorced, widowed, or separated	19.4	12.1	
Number of children among the ever married			
0	24.8	5.7	p = .000
1-2	46.2	48.9	
3+	29.0	45.4	
Husband's occupation among the ever married			
White-collar	12.8	25.9	p = .000
Clerical and kindred	19.1	17.5	
Blue-collar	68.1	56.6	

1) Since the age distributions of working women and housewives were similar, age-adjusted proportions were identical to the unadjusted proportions shown in the Table.

men were similar, but significantly different from those of housewives, suggesting that the differences were related to employment per se. That is, these behaviors were either the result of working outside the home or the result of self-selection into the work force. Employed persons, regardless of sex, were more likely than housewives to score higher on the Framingham Type A behavior, ambitiousness, and marital disagreement scales. For example, mean scores on the Type A scale were similar for working women and men (.38 and .39, respectively), although both were significantly higher than the mean score for housewives (.31).

Several scales appeared to reflect the specific role of being an employed woman. On these scales, working women scored significantly higher or lower than both men and housewives. Working women experienced more daily stress, marital dissatisfaction, and aging worries and were less likely to show overt anger (as measured by a low score on the anger-out scale) than either housewives or men. In addition, working women had considerably more occupational mobility and more job and line of work changes than men, but received fewer promotions than men in the 10 years before the survey.

TABLE 2—Mean Psychosocial Scores among Housewives (HW), Working Women (WW), and Men Aged 45-64 Years at their 8th or 9th Biennial Medical Examinations

Psychosocial Scales Grouped according to Differences by	Housewives (350)	Working Women (387)	Men (580)
Sex¹			
Emotional lability	.36	.37	.30
Tension	.36	.40	.25
Anxiety symptoms	.21	.20	.11
Anger symptoms	.30	.31	.18
Anger-in	.51	.54	.47
Educational mobility	2.38	2.37	2.53
Employment²			
Framingham Type A	.31	.38	.39
Ambitiousness	.37	.48	.51
Marital disagreement	.14	.18	.17
Sex and Employment³			
Daily stress	.27	.33	.29
Anger-out	.13	.10	.12
Marital dissatisfaction	.22	.27	.19
Aging worries	.16	.19	.15
Occupational mobility	1.80	2.02	1.81
Job changes in past 10 years	—	.51	.36
Line of work changes in past 10 years	—	.33	.25
Times promoted in past 10 years	—	.46	.57

1) For these six variables, comparisons were statistically significant (p ≤ .05) for HW vs men and WW vs men.

2) For these three variables, comparisons were statistically significant (p ≤ .05) for WW vs HW and men vs HW. For the ambitiousness scale, comparison of WW vs men was also significant at the .05 < p ≤ .10 level.

3) For the first five variables (except anger-out), comparisons were statistically significant (p ≤ .05) for WW vs HW and WW vs men. For the anger-out scale, comparisons between WW vs men were significant at the .05 < p ≤ .10 level. In the last three variables, comparisons were significant (p ≤ .05) for WW vs men.

etc.) or business managers, while most women professionals were teachers, nurses, or librarians.

Behavioral Differences by Sex and Employment Status

Mean scores on the 20 psychosocial scales used in this study were compared among working women, housewives, and men. Table 2 summarizes the results of these comparisons, listing only those scales which varied according to sex and employment status. Since the age distributions were similar among the three employment groups, unadjusted mean scores for the age group 45-64 were identical to the age-adjusted mean scores.

Sex differences are reported for scales in which scores among working women and housewives were similar, but significantly different from scores among men, a pattern suggesting that women, regardless of employment status, differed from men on these characteristics. Sex differences were found for scales dealing with symptoms reflecting emotional distress, such as tension, anxiety, anger and emotional lability. For example, women regardless of employment status scored higher on the tension scale than men (about .40 and .25, respectively). Women were also more likely to exhibit anger-in and to have experienced less educational mobility than men.

Behaviors related to employment are also summarized in Table 2. Here scale scores among working women and

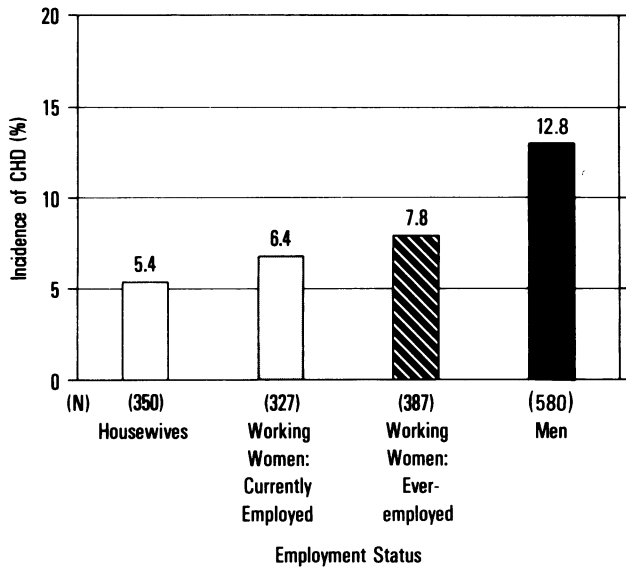


FIGURE 1—Eight Year Incidence of Coronary Heart Disease by Employment Status among Men and Women Aged 45–64 Years

Incidence Rates of Coronary Heart Disease

Figure 1 presents incidence rates of coronary heart disease over the eight-year period among housewives, working women, and men aged 45–64 years. Data were also analyzed separately for working women, as previously defined, who were currently employed at the time of the study. All working women were included in the ever-employed group.

Employment status did not significantly affect the risk of developing CHD in women. Incidence rates were only slightly higher among the ever-employed working women than among housewives (7.8 vs 5.4 per cent, respectively). The incidence rate of CHD among these working women was lower than the rate for men, which was about 13 per cent ($p = .02$).

Likewise, employment status at the time of the study did not affect these associations. Although CHD rates were generally lower among workers employed at the time of the study, currently employed working women had lower incidence rates of CHD than currently employed men (6.4 vs 12.4 per cent, respectively). As expected, working women and men who were unemployed or retired at the time of the study had the highest rates of CHD (13.8 and 24.0 per cent, respectively, for women and men).

Figure 2 shows incidence rates of CHD among working women and men according to the usual occupation held during the working years. Among women, clerical workers were almost twice as likely to develop coronary disease as either white- or blue-collar workers. The incidence rate of CHD among women clerical workers (10.6 per cent) was higher than the rate among housewives (5.4 per cent, $p = .06$).

Among men, an entirely different pattern was observed, with higher rates occurring among white-collar workers (19.8 per cent) and lower rates occurring among clerical (5.8 per

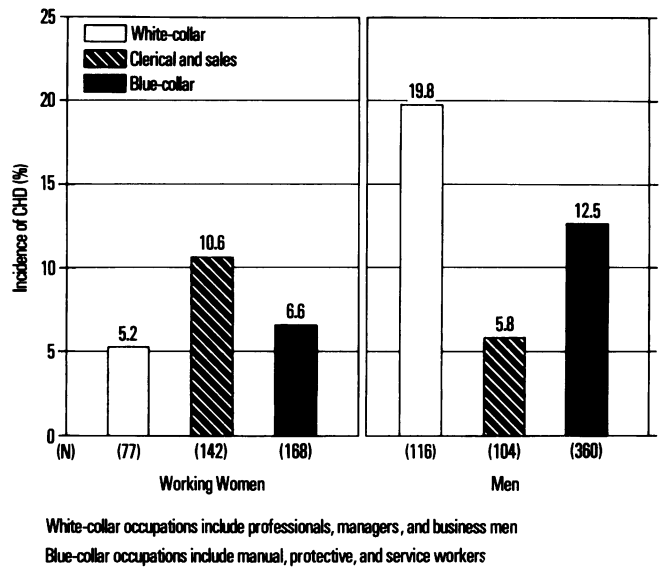


FIGURE 2—Eight Year Incidence of Coronary Heart Disease by Occupational Status among Working Women and Men Aged 45–64 Years

cent) and blue-collar (12.5 per cent) employees ($p = .01$). Only among clerical workers were the rates of coronary disease greater in women than in men, although this difference did not achieve statistical significance.

Age-adjusted coronary rates were examined among working women and housewives according to marital status. No significant differences were observed among housewives who were married and housewives who were widowed, divorced, or separated (WDS) (4.6 vs 6.9 per cent, respectively). Married and WDS working women had similar age-adjusted rates of CHD (8.1 and 8.5 per cent, respectively), while single working women exhibited the lowest rate of coronary disease (4.2 per cent).

Since women who had ever married were at greater risk of developing CHD than single women, the effect of having children on CHD was also examined. Among working women, the incidence of CHD rose as the number of children increased (Figure 3). Working women with three or more

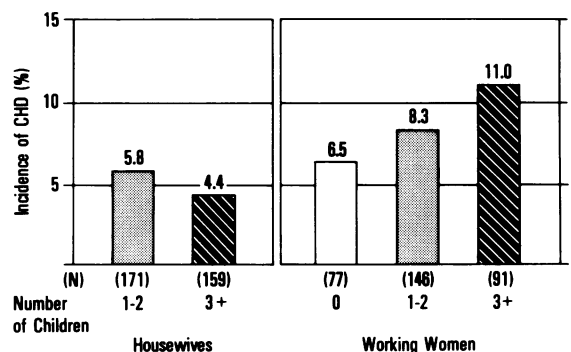


FIGURE 3—Eight Year Incidence of Coronary Heart Disease by Number of Children among Women Aged 45–64 Years

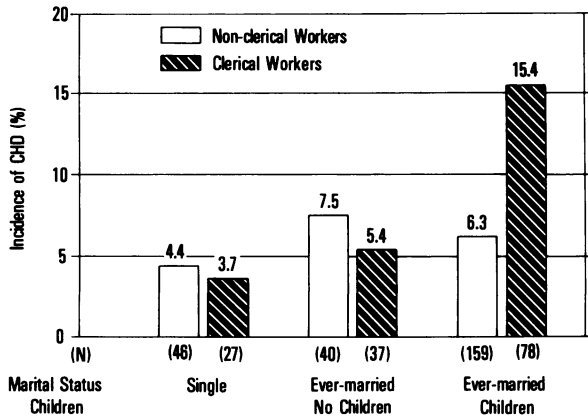


FIGURE 4—Eight Year Incidence of Coronary Heart Disease by Occupation, Marital Status, and Children among Working Women Aged 45–64 Years

children (11.0 per cent) were more likely to develop CHD than working women with no children (6.5 per cent) or than housewives with three or more children (4.4 per cent, $p = .08$). Although there were not enough childless housewives for comparison ($n = 20$), CHD rates were similar among housewives with 1–2 or 3+ children.

Although one would expect working women to be equally affected by family responsibilities, the relationship of these responsibilities to CHD incidence was examined among clerical and non-clerical working women (Figure 4). Surprisingly, single or married clerical workers without children were at no greater risk of developing CHD than other workers. However, clerical workers who had ever married and had children were over twice as likely to develop CHD than non-clerical workers in the same situation (15.4 and 6.3 per cent, respectively, $p = .04$). Thus, the excess risk of

CHD previously observed among women employed in clerical jobs occurred only among women with children.

Economic pressures due to an increased family size could have motivated women to seek employment outside the home. Pressures associated with a low socioeconomic status might then explain the higher incidence rate of coronary heart disease among working women with children. Although measures of family income were not available, the occupation of a woman's past or present husband was examined. For these comparisons, men employed in white-collar and clerical occupations were combined. Rates of CHD were not significantly different among working women married to men employed in white-collar or blue-collar occupations. However, the risk of developing CHD did increase among clerical working women married to blue-collar workers. Among working women who had blue-collar husbands, clerical workers with children were over three times more likely to develop CHD than non-clerical mothers (21.3 and 6.0 per cent, respectively) ($p = .004$). Among mothers married to white-collar workers, clerical work posed no excess risk of CHD. The incidence rates of CHD among non-clerical mothers, employed in either white- or blue-collar occupations, were not affected by the husband's occupation.

Standard Coronary Risk Factors

Table 3 presents mean levels of the standard coronary risk factors measured between 1965–1967 among the various employment groups. The risk factors included age, systolic and diastolic blood pressure, serum cholesterol, cigarette smoking, and glucose intolerance. The proportion of persons on antihypertensive medication was also compared.

Mean levels of all six risk factors examined were similar among working women and housewives. Likewise, no significant differences were observed between housewives and white-collar, clerical, or blue-collar working women. Preva-

TABLE 3—Mean Levels of Coronary Risk Factors among Housewives, Working Women, and Men Aged 45–64 Years at their 8th or 9th Biennial Medical Examinations

Risk Factors	Housewives (350)	Working Women				Men (580)
		Total (387)	White-Collar (77)	Clerical (142)	Blue-Collar (168)	
Age (years)	54.1	54.1	54.9	53.5	54.2	53.6
Systolic Blood Pressure (mm Hg)	135.8	135.4	134.5	135.2	135.9	136.0
Diastolic Blood Pressure (mm Hg)	82.1	82.0	81.9	81.7	82.2	83.6*
Serum Cholesterol (mg/100 ml)	238.9	242.2	243.9	241.2	242.4	229.0*
Cigarettes Smoked per Day	7.6	7.5	8.6	7.9	6.7	12.3*
Glucose Intolerance (per cent)	5.1	5.5	2.6	5.0	7.2	5.5
Anti-hypertensive Medication (per cent)	15.0	15.5	9.3	17.7	15.8	8.5*

* $p \leq 0.5$ when comparing men with working women and housewives. Comparisons of working women with housewives were not statistically significant.

TABLE 4—Mean Scale Scores for CHD Cases and Non-cases among Women, Aged 45–64 Years, in Clerical Occupations

Psychosocial Scales	Clerical occupations	
	Cases (15)	Non-Cases (127)
Behavior Type		
Framingham Type A	.41	.37
Emotional lability	.34	.33
Ambitiousness	.54	.45
Non-easygoing	.18	.23
Reactions to Anger		
Anger-in	.64	.52*
Anger-out	.02	.12***
Anger-discuss	.38	.63**
Situational Stress		
Nonsupport from boss	.38	.13***
Marital dissatisfaction	.24	.23
Marital disagreement	.16	.19
Aging worries	.14	.21
Personal worries	.09	.15**
Sociocultural Mobility		
Job changes in past 10 years	.13	.77***
Line of work changes in past 10 years	.26	.38
Times promoted in past 10 years	.71	.95
Educational mobility	2.17	2.35
Occupational mobility	2.13	1.97
Social class mobility	2.07	2.02
Somatic Strain		
Tension state	.47	.36
Daily stress	.37	.30
Anxiety symptoms	.21	.18
Anger symptoms	.23	.30

*.05 < p ≤ .10

**.01 ≤ p ≤ .05

*** p < .01

lence rates of hypertension (SBP ≥ 160 or DBP ≥ 95) among women did not vary by employment or occupational status.

Men, on the other hand, had significantly higher levels of cigarette consumption and lower levels of serum cholesterol than working women or housewives. Mean levels of diastolic blood pressure were also significantly higher among men than women. This finding may be partially explained by the lower proportion of men on antihypertensive medication.

Psychosocial Risk Factors among Women

In a previous report from Framingham,⁷ several psychosocial scales were associated with the development of CHD in women, depending upon employment status. Controlling for the standard risk factors, Framingham Type A behavior and suppressed hostility (not discussing anger) were significant predictors of CHD incidence among all working women aged 45–64 years. In contrast, being easygoing, showing tension symptoms, and the Framingham Type A behavior were associated with CHD among housewives of the same age.⁷

Since clerical workers had a greater risk of CHD than other workers or housewives, the psychosocial risk fac-

tors for CHD were examined separately in this group (Table 4). Clerical workers who developed CHD were more likely to suppress hostility (in terms of the anger-in, anger-out, anger-discuss scales), to have a nonsupportive boss, to report fewer personal worries, and to experience fewer job changes over a previous 10-year period than clerical workers remaining free of CHD. Similar associations were observed among clerical women who had ever married and raised children.

In order to determine the independent effect of these scales, each was included, along with the standard coronary risk factors and a measure of family responsibility, in a multivariate logistic regression analysis.⁹ As seen in Table 5, the anger-discuss, nonsupport from boss and family responsibility scales remained independent predictors of CHD. Infrequent job changes were also associated with the incidence of CHD in the multivariate analysis, but the association did not reach statistical significance (p = .11). None of the standard coronary risk factors included in the analysis (age, systolic blood pressure, serum cholesterol, or cigarette smoking) were associated with CHD in this group of 125 women. Thus, remaining in a job with a nonsupportive boss while not discussing one's anger increased the risk of coronary heart disease among clerical working women. This risk was further increased with the size of the family.

Discussion

The present study has shown that employment by women, per se, is not related to an increased risk of coronary heart disease. In fact, women who were employed the longest period of time, i.e., single working women, had the lowest rate of CHD. The lack of association between employment status and CHD in women is not surprising. Although previous research has not examined the effect of employment on the incidence of CHD, three prevalence surveys found that working women were no more likely to have had CHD than housewives.^{10–12} In the 1960–1962 U.S. Health Examination Survey, prevalence rates of definite coronary heart disease, myocardial infarction, and angina pectoris were greater among women (aged 18–79 years) keeping house than among women who usually worked.¹⁰ In the 1972 Health Interview Survey, the prevalence of coronary heart disease was similar among women (aged 45–64 years) who usually worked or who usually kept house.^{11*} Prevalence rates of CHD among Framingham working women (currently or ever-employed) and housewives aged 45–64 were comparable to those of the Health Interview Survey (35.6, 39.9 and 27.6 per 1000, respectively).¹²

The tendency for housewives to have similar or higher prevalence rates of CHD as compared to working women

*In both national surveys, women who usually worked included those whose usual activity during the preceding 12-month period was paid employment. Women usually keeping house included women whose major activity over the same period was described as keeping house.¹⁰

TABLE 5—Multiple Logistic Regression of the 8 Year Incidence of Coronary Heart Disease among Clerical Working Women Aged 45–64 Years†

Variables	Standardized Coefficient	T
Age (years)	.06	.12
Systolic Blood Pressure (mm Hg)	.34	.84
Serum Cholesterol (mg/100 ml)	.46	1.22
Cigarettes Smoked per Day	-.19	-.51
Anger-discuss	-1.32	-2.70*
Nonsupport from Boss	.92	2.56*
Job Changes in past 10 Years	-1.96	-1.58
Family Responsibility	1.27	2.69*

†Analysis based on 125 women

*P < .01

may reflect the healthy worker effect,¹³ i.e., the selection of certain women into the labor force because of relatively good health, while women in poor health who are unable to seek, obtain, or hold jobs become or remain housewives.¹⁴ The National Health Survey¹⁴ found higher rates of disability due to cardiovascular-renal and most other chronic diseases among housewives as compared to working women at all ages.

Although CHD incidence was similar in working women and housewives in this study, some groups of working women were more susceptible to the development of CHD than others. In particular, women clerical workers who had ever married and had children experienced coronary rates that were twice as great as those of other comparable non-clerical workers or housewives.

The higher incidence rate of CHD among working women who had ever married appears to contradict the general pattern of increased CHD death rates among single rather than married persons. However, close examination of published morbidity and mortality data in the U.S. shows that single white women have CHD rates that are lower than or equivalent to married or ever-married women.^{10, 15–17}

Age-adjusted death rates from arteriosclerotic heart disease in the U.S. were lower among single as compared to ever-married white women in 1959–61 and mortality rates from CHD were quite similar among single and married women.¹⁵ Married women had lower age-specific death rates from CHD than single women between the ages of 20 and 54, while for the ten-year age groups 55–64 and 65–74, the reverse was true.¹⁵ The prevalence of definite coronary heart disease among women aged 18–79 in the Health Examination Survey was lowest among single women (.6 per cent), followed by the married, divorced, and widowed women (1.5, 3.7 and 6.1 per cent, respectively).¹⁰

Moriyama, et al, have suggested that the biologic function of childbearing or the psychologic and socioeconomic correlates of childbearing may provide a mortality advantage before age 50.¹⁶ Selection of healthier women for marriage could also be a factor. After age 50, one would expect the effect of selection on marriage to decline. Reasons for the shift in favor of single women past the 50th year are unknown. Zalokar has postulated that, despite the advantages

of ever-married women in selection and environment, childbearing may produce a more severe strain on the circulatory system, although the effects do not culminate in increased mortality until the end of the childbearing period.¹⁷

That prior childbearing may produce increased risks of CHD past age 50 was borne out among working women, but not among housewives in Framingham. Women who had worked outside the home and had raised three or more children were twice as likely to develop CHD as housewives with the same family responsibilities. Bengtsson, et al, found that Swedish women aged 50–54 with four or more children were more likely to have had a myocardial infarction than women in the general population.¹⁸ Approximately two-thirds of the Swedish women had been employed outside the home.

These findings suggest that the dual roles of employment and raising a family may produce excessive demands on working women. Perceived demands on time (at home and in general) and psychiatric symptoms have been shown to increase monotonically among employed women with an increase in the number of children.¹⁹ However, since this trend was also observed among housewives, it does not explain the differences in coronary rates between working women and housewives with three or more children noted in the present study. Perhaps demands on the job, coupled with demands at home, explain the high incidence of CHD among working women with several children.

Of the occupations examined in this study, clerical work was associated with the greatest risk of CHD among women. Since over one-third of the female workers in the U.S. are employed in clerical jobs,²⁰ reasons for this excess risk require further examination. Unfortunately, few epidemiologic data are available on cardiovascular morbidity or mortality among women according to occupation.

The association between occupational status and CHD incidence in women could be explained, in part, by the distribution of standard coronary risk factors by employment and occupational status. However, mean levels of blood pressure, serum cholesterol, cigarette smoking, and glucose intolerance in Framingham were similar among housewives and working women, regardless of occupation. These findings are consistent with other national and population-based surveys.^{21–25} Using Framingham data, Johnson has also shown that sex differences in the standard risk factors do not explain the sex differential in CHD incidence past age 54.²⁶

In previous reports from Framingham, two of the strongest psychosocial predictors of CHD among all working women and white-collar men were Type A behavior and suppressed hostility.⁷ Of further note in the present study was the finding that suppressed hostility predicted CHD incidence among working women with the greatest risk of CHD, i.e., clerical employees. For female clerks, having a nonsupportive boss and few job changes were also associated with the incidence of CHD.

Many of these behaviors appear to be related to employment, i.e., the result of working outside the home or the self-selection of certain persons into the work force. Support for this interpretation comes from several studies which have shown Type A behavior²⁷ and need for achievement^{28–29} to

be higher among employed women than among housewives. Working men and women aged 45-64 in the Chicago Heart Association Detection Project also had similar scores on the Jenkins Activity Survey Type A scale.³⁰ Studies by Harburg, et al, among employed persons in Detroit, showed that white women were more likely than white men to suppress hostility (more anger-in and less anger-out) when confronted with an arbitrary boss.³¹

In Framingham, suppression of hostility coupled with a non-supportive boss and a lack of job mobility were associated with the incidence of coronary heart disease among clerical working women. These findings are consistent with observations that women clerical workers may experience several forms of occupational stress, including a lack of autonomy and control over the work environment, underutilization of skills, and lack of recognition of accomplishments.²⁰

The excess risk of CHD observed among women employed in clerical jobs occurred only among women with children and among women married to blue-collar workers, suggesting that economic pressures may also have affected the decision or necessity to work. Since the risks of CHD did not increase among white- or blue-collar working mothers with blue-collar husbands, the exact meaning of these results is unclear. The occupational status of one's spouse reflects not only an economic status, but also certain life style behaviors and attitudes, not measured in this study.

In conclusion, although employment, per se, was not associated with the incidence of coronary heart disease in women, behaviors and situations related to employment were associated with CHD among some working women. Working women who had ever married, had raised children, and had been employed in clerical work were at increased risk of developing CHD. The risk factors for CHD among clerical women included suppressed hostility, a non supportive boss, few job changes over a 10-year period, and family responsibilities. These risk factors may be the product of one or more of the following factors: the particular working environment for clerical occupations, self-selection of certain personalities into the labor force, or economic stress. Whatever the origins of these risk factors, the findings suggest that interpersonal relationships, coping styles, and the occupations of some employed women, coupled with family responsibilities, may be involved in the development of coronary heart disease.

REFERENCES

1. U.S. Dept. of Labor, Women's Bureau: Changes in Women's Occupations 1940-1950. Washington, DC: U.S. Govt Printing Office, Women's Bureau Bulletin 253, 1954.
2. U.S. Dept. of Labor, Bureau of Labor Statistics: Employment and Earnings. Washington, DC: U.S. Govt Printing Office, December 1978.
3. Lipman-Blumen J: Demographic trends and issues in women's health. In Olesen V., (ed): Women and Their Health: Research Implications for a New Era. Washington, DC: U.S. Govt Printing Office, DHEW Publication No (HRA) 77-3138, 1977.
4. U.S. Dept. of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics: Chartbook for the Conference on the Decline in Coronary Heart Disease Mortality. Hyattsville, MD: August 1978.
5. 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* 107:362-383, 1978.
6. Warner WL, Meeker M, Eells K: Social Class in America. New York: Science Research, 1949.
7. Haynes SG, Feinleib M, Kannel WB: The relationship of psychosocial factors to coronary heart disease in the Framingham Study III. Eight year incidence of coronary heart disease. *Am J Epidemiol*, 111, 1980.
8. Rosenman RH, Friedman M, Straus R, et al: A predictive study of coronary heart disease: the western collaborative group study. *JAMA* 189:15-22, 1964.
9. Walker SH, Duncan DB: Estimation of the probability of an event as a function of several independent variables. *Biometrics* 54:167-179, 1967.
10. U.S. Dept. of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics: Coronary Heart Disease in Adults—United States, 1960-1962. Vital and Health Statistics, Series II, No. 10. Washington, DC: U.S. Govt Printing Office, 1965.
11. U.S. Dept. of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics: Prevalence of chronic circulatory conditions—United States, 1972. Vital and Health Statistics, Series 10, No. 94. Washington DC: U.S. Govt Printing Office, DHEW Publication No. (HRA) 75-1521, 1975.
12. Haynes SG, Feinleib M, Kannel WB, et al: The relationship of psychosocial factors to coronary heart disease in the Framingham study II. Prevalence of coronary heart disease. *Am J Epidemiol* 107:384-402, 1978.
13. McMichael AJ, Haynes SG, Tyroler HA: Observations on the evaluation of occupational mortality data. *J Occup Med* 17:128-131, 1975.
14. U.S. Dept. of Health, Education, and Welfare, Public Health Service: The Prevalence of Disabling Illness Among Male and Female workers and Housewives. Washington DC: U.S. Govt Printing Office, Public Health Bulletin No. 260, 1941.
15. U.S. Dept. of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics: Mortality from Selected Causes by Marital Status—Part A. Vital and Health Statistics, Series 20, No 8a. Washington, DC: U.S. Govt Printing Office, 1970.
16. Moriyama IM, Krueger DE, Stamler J: Cardiovascular Diseases in the United States. Massachusetts: Harvard University Press, 1971.
17. Zalokar JB: Marital status and major causes of death in women. *J Chronic Dis* 11:50-60, 1960.
18. Bengtsson C, Hallstrom T, Tibblin G: Social factors, stress experience and personality traits in women with ischemic heart disease, compared to a population sample of women. *Acta Med Scand (Suppl)* 549:82-92, 1973.
19. Gove WR, Geerken MR: The effect of children and employment on the mental health of married men and women. *Soc Forces* 56:66-76, 1977.
20. Stellman JM: Occupational health hazards of women: an overview. *Prev Med* 7:281-293, 1978.
21. U.S. Dept. of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics: Hypertension and Hypertensive Heart Disease in Adults—United States, 1960-1962. Vital and Health Statistics, Series 11, No. 13. Washington, DC: U.S. Govt Printing Office, 1966.
22. Hauenstein LS, Kasl SV, Harburg E: Work status, work satisfactions, and blood pressure among married black and white women. *Psychol Women Q* 1:334-349, 1977.
23. Mushinski MH, Stellman SD: Impact of new smoking trends on women's occupational health. *Prev Med* 7:349-365, 1978.
24. Sterling TD, Weinkam JJ: Smoking characteristics by type of employment. *J Occup Med* 18:743-754, 1976.
25. Slack J, Noble N, Meade TW, et al: Lipid and lipoprotein concentrations in 1604 men and women in working populations in northwest London. *Br Med J* 2:353-356, 1977.

26. Johnson A: Sex differentials in coronary heart disease: the explanatory role of primary risk factors. *J Health Soc Behav* 18:46-54, 1977.
27. Waldron I: The coronary-prone behavior pattern, blood pressure, employment and socioeconomic status in women. *J Psychosom Res* 22:76-87, 1978.
28. Baruch R: The achievement motive in women: implications for career development. *J Pers Soc Psychol* 5:260-267, 1967.
29. Kriger SF: N Ach and perceived parental child-rearing attitudes of career women and homemakers. *J Voc Behav* 2:419-432, 1972.
30. Waldron I, Zyzanski S, Shekelle RB, et al: The coronary-prone behavior pattern in employed men and women. *J Hum Stress* 3:2-18, 1977.
31. Harburg E, Blakelock EH, Roeper PJ: Resentful and reflective coping with arbitrary authority and blood pressure. *Psychosom Med* 41: 189-202 1979.

ACKNOWLEDGMENTS

This paper was presented in part at the 1978 American Psychological Association meetings and the 1979 American Psychosomatic Society meetings.

CHIEF

PREVENTION, EDUCATION, AND MANPOWER BRANCH Division of Lung Diseases

The National Heart, Lung, and Blood Institute is seeking applicants for the position of Chief, Prevention, Education, and Manpower Branch of the Institute's Division of Lung Diseases. The Prevention, Education, and Manpower Branch responsible for design and management of programs which facilitate or implement the transfer of knowledge gained through research and development in the program area into clinical practice through educational measures, demonstrations, control programs, and planning and directing a program for the development of manpower trained in research pursuits.

Applicants must have a broad knowledge in one of the following fields: education, epidemiology, public health or preventive medicine, and have experience in administering, supervising, and performing scientific work in programs sup-

ported by grants-in-aid and by contract research. Applicants must have as a minimum, an M.D., or formal training through the Ph.D or its equivalent. Additionally, the applicant must show evidence of having ability in program planning.

Salary range GS-14 to GS-15, dependent upon qualifications. Interested persons should submit curriculum vitae, bibliography, and a completed form SF-171 (Personal Qualifications Statement) by February 1, 1980 to Mr. Herb Jones, NHLBI Personnel Office, NATIONAL INSTITUTES OF HEALTH, Public Health Service, 9000 Rockville Pike, Building 31, Room 5A-32, Bethesda, Maryland 20205. For additional information please call (301) 496-6477. Equal Opportunity Employer.

NATIONAL INSTITUTES OF HEALTH