Marital Status, Marital Strain, and Risk of Coronary Heart Disease or Total Mortality: The Framingham Offspring Study

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Objective: To determine if marriage and marital strain are related to the 10-year coronary heart disease (CHD) incidence or total mortality. Research has demonstrated associations between marital strain and prognosis of heart disease, but little research has addressed the association between specific aspects of marital strain and incident CHD. **Methods:** From 1984 to 1987, 3682 participants (mean age 48.5 ± 10.1 (standard deviation) years; 52% women) of the Framingham Offspring Study were examined; measures of marital status, marital strain, and risk factors for CHD were collected at the baseline examination. The present study describes the 10-year follow-up for incident CHD and total mortality. **Results:** After adjusting for age, systolic blood pressure, body mass index, cigarette smoking, diabetes, and total cholesterol/high density cholesterol, the married men compared with unmarried men were almost half as likely to die during follow-up (hazard ratio (HR) = 0.54; 95% confidence interval (CI): 0.34–0.83). Women who "self-silenced" during conflict with their spouse, compared with women who did not, had four times the risk of dying (HR = 4.01; 95% CI: 1.75–9.20). Men with wives who were upset by work were 2.7 times more likely to develop CHD (HR = 2.71; 95% CI: 1.22–6.03). Marital happiness, satisfaction, and disagreements were not related to the development of CHD or death in men or women. **Conclusions:** Our study suggests that marital communication, conflict, and strain are associated with adverse health outcomes. Further research into the influence of marital stress on health is merited. **Key words:** coronary heart disease, mortality, cohort study, marital strain, epidemiology.

CHD = coronary heart disease; **HR** = hazard ratio; **CI** = confidence interval.

INTRODUCTION

The concept that marital stress or strain may be related to coronary heart disease (CHD) has existed for many years. In 1976, Medalie and Goldbourt published data from over 10,000 Israeli men demonstrating that a wife's love and support were important in reducing the risk of developing angina pectoris (1). More recently, a population-based prospective study of women who had been hospitalized for acute myocardial infarction or unstable angina pectoris found that marital stress was associated with a 2.9-fold risk of recurrent events (2). In a follow-up study of the men who had participated in the Multiple Risk Factor Intervention Trial, those who divorced during the trial experienced a relative risk (RR) of 1.4 for total mortality, compared with those who remained married (3). Another study found that "marital quality" was significantly related to a 4-year survival in men and women with heart failure (4). These research findings lend credence to the notion that marital status and strain or stress may be associated with the development of CHD or total mortality.

Most studies to date examining marital characteristics and health outcomes have concentrated on marital feelings of happiness and satisfaction. The addition here of interpersonal reactions to conflict and the impact of spouses' work outside the home are new concepts in predicting health outcomes. Several measures of marital strain were used to form a conceptual framework for analyses: a) marital happiness and satisfaction; b) the amount and type of disagreements; c) feeling of being loved by one's spouse; d) how one reacts when in conflict with spouse; and e) the effect of the spouse's work outside the home on married life. The first three measures reflect feelings and interactions between spouses. The fourth reflects how one reacts interpersonally to stress and conflict with one's spouse and has been linked to depression in women in previous research (self-silencing) (5). The fifth reflects how the outside activity of spouse's work affects one's marital life. These last two areas have never been examined in relationship to incident CHD or total mortality.

The Framingham Offspring Study offers an opportunity to test the hypotheses in a longitudinal study that marriage and various aspects of marital strain are related to the development of CHD and total mortality in men and women.

METHODS

Participants in the Framingham Offspring Study, consisting of the offspring (and their spouses) of the Framingham Heart Study Original Cohort, were enrolled in 1971 to 1974. At their routine third visit (baseline, 1984–1987), 3873 participants returned for the examination and 95% of these participants completed psychosocial questionnaires that were mailed a few weeks before the examination. Exclusions from the present study included: a) incomplete questionnaire (n = 191) and b) prevalent CHD for the analyses of incident CHD (n = 107).

Participants were categorized as currently married if they indicated that they were married or living in a marital situation at the baseline examination. All others were classified as not currently married.

The scale termed "marital disagreement" was answered by both men and women and reflected the frequency (often, once in a while, or never) that the respondent and his/her spouse disagreed on 13 topics. The topics included such matters as finances, leisure time, religious matters, sexual relations, in-laws, chores, drinking, and gambling. For women, the "husband's work strain" scale measures whether her husband's job placed a big strain on her in regard to finances, long hours, health or safety, morale, and traveling. Men answered a scale called "wife's work disruptive," which asked questions about finances, inconvenient hours, safety, morale, objections to her working, if she came home upset, bringing work home, children, child care, and household responsibilities.

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Reflecting attitudes prevalent at the time the questionnaires were administered, the scales men and women completed were not exactly comparable. Women were asked if their husband's work put a "strain" on them, whereas men were asked if their wife's work was "disruptive" to their home life. Both men and women answered questions regarding their own and their spouse's feelings of marital happiness, their own marital satisfaction, if they showed feelings during a conflict with their spouse, and whether their spouse showed his/her love for them. The marital dissatisfaction and disagreement scales and work strain variables were developed, tested, and published previously (6). The reliability coefficients for the disagreements and satisfaction scales were 0.80 and 0.84, respectively, in the original Framingham cohort study and 0.76 for the 13 items constituting marital strain in the Offspring study. The other questions such as self-silencing and spouses' love have face or previous predictive validity but they lack formal validation. The psychological meaning of concepts such as these may not be straightforward and may depend on the respondent's gender (7).

For the scales reflecting marital disagreements and strain related to jobs, responses were scaled between 0 and 1, with the higher score indicating more frequent disagreement or strain. Regarding how disruptive his wife's work was, the question for men was scored 0, 0.33, 0.67, and 1. The marital disagreements scale was computed by summing the responses to the 13 distinct items. Each item asked about specific instances and the response options were "never disagree," "disagree once in a while," and "disagree often." The response options were scaled 0, 0.5, and 1, respectively. Some respondents failed to provide data on some of the items. However, the extent of missing data was minimal; each item had $<3\%$ missing values. If a respondent did not answer any of the 13 items, a scale could not be created. For everyone else, we summed the responses to the items. We coded missing items to 0 (for the people who were not missing on all items). We then dichotomized the composite scale score at the median and defined them as low and high.

The two outcomes of interest included the 10-year incidence of CHD and total mortality (8,9). The definition of CHD has been published previously (10); the manifestations of interest for CHD in these analyses included myocardial infarction (recognized and unrecognized), coronary insufficiency, and coronary death (both sudden and not sudden).

Potential confounders were classified at the baseline examination. All analyses were gender-specific. Multivariable models predicting the 10-year incidence of CHD and total mortality adjusted for age, systolic blood pressure, body mass index (kg/m^2), current cigarette smoking, diabetes (defined as fasting blood glucose of at least 126 mg/dl or on treatment), and total cholesterol/high density cholesterol.

We examined the relationship of the measures of marital status and marital strain to CHD risk factors classified at baseline with Pearson correlations and t tests for continuous and discrete variables, respectively. The 10-year age-adjusted rates and relative risks of CHD and total mortality were estimated using Cox proportional hazards regression. Each psychosocial predictor variable that reached a significance level of $p \leq .10$ in the age-adjusted analyses was examined in a multivariable-adjusted Cox proportional hazards model. RRs for incident disease were presented relative to a 1 standard deviation (SD) difference in each measure.

Previous research has shown that self-silencing may be related to depression and holding one's anger in (5,11). In exploratory analyses for the "self-silencing" scale, we additionally adjusted for two potential psychosocial mediators: symptoms of depression (Center for Epidemiologic Studies Depression 20-item scale) (12) and anger-in (keeping anger to oneself) (13). The use of the psychosocial survey in the Framingham Offspring Study was approved by the Office of Management and Budget in 1983. The Framingham Study protocol is approved by the Boston Medical Center Institutional Review Board, and all participants signed written informed consent. All analyses were performed in SAS version 8.2 (SAS Institute Inc., Cary North Carolina).

RESULTS

The study consisted of 1769 men and 1913 women, with a mean age of 48 $\pm$ 10 years (range, 18–77) at baseline. The causes of death for men and women, respectively, were 25% and 12% from CHD, 2.8% and 4.4% from stroke, and 35.4% and 55.4% from cancer. The analyses involving marital strain consisted of 1493 men and 1501 women currently married or "living in a marital situation" at the baseline examination. There were 780 people who did not complete the psychosocial questionnaire at the third examination. The people who completed the questionnaire were older compared to those who did not (48.8 vs. 47.2 years old, $p = .0004$), there was no difference between the groups in regard to education, systolic blood pressure, percent who were diabetic and the percent with a history of CVD. Responders had higher BMI (26.4 vs. 25.8) and a higher ratio of total cholesterol to HDL cholesterol (4.6 vs. 4.4). Nonresponders were more likely to be cigarette smokers.

Table 1 presents the descriptive data for the demographics and marital characteristics. The largest percentage of both men and women had a high school education or less with more men than women having some schooling after college. Men were significantly more likely than women to report higher total family income, a happier marriage, and more marital satisfaction. Men were more likely to keep their feelings to themselves during conflict with their spouses and to report their spouses show their love for them very often compared with women. There were no differences between men and women regarding the level of marital disagreements. For the type of disagreements, women were more likely than men to report that they disagreed with their spouses on family finances, leisure time, bringing up children, household chores, and drinking. Men reported more disagreements on sexual relations.

The beneficial relationship between total mortality and being married in men persisted in multivariable analyses (Table 2). Women who reported that, in conflict with their spouses, they usually or always kept their feelings to themselves (self-silencing), had over four times the risk of dying during the follow-up compared with women who always showed their feelings. The variable indicating a spouse's love was not enough or nonexistent was not associated with total mortality in the multivariable analysis in women. Men with working wives who reported disruption in their home life due to their wives being upset by her own work were almost three times more likely to develop CHD over the 10 years of follow-up. It should be noted that the presence of prevalent CHD was also entered into all multivariable analyses of total mortality, but this did not substantially change any of the reported results.

Secondary Analyses

To gain further insights into why "self-silencing" seemed to predict increased mortality in women, we further adjusted for other potential psychological mediators. When anger-in or symptoms of depression were entered into the multivariable equation with the variable indicating self-silencing during conflict with one's spouse, women who usually or always kept the conflict to themselves continued to have four times greater risk of dying (HR = 4.24; 95% CI: 1.80–9.99 or HR = 5.11; 95% CI: 1.96–13.30), respectively, compared with women who always showed feelings during conflict.

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TABLE 1. Demographics and Marital Strain Measures of Men and Women Married at Baseline

	Men	Women	*p*
Total Sample	*n* = 1,769	*n* = 1,912	
Mean age, years	48.8	48.2	.04
Currently married, %	84.4	78.5	<.0001
Married Participants	*n* = 1,493	*n* = 1,501	
Mean age, years	49.8	48.2	<.0001
Education			<.0001
≤12 years	40.8	47.0	
13–16 years	21.4	29.3	
≥17 years	37.7	23.7	
Total family income			.02
$0–$9,999	19.9	24.2	
10,000–19,999	20.7	22.2	
20,000–29,999	21.5	20.4	
30,000–49,999	37.9	33.2	
≥50,000	0.00	0.00	
How happy is your marriage			.003
Very happy	43.4	38.9	
Happy	33.1	32.3	
Average, unhappy, very unhappy	23.5	28.8	
Marital satisfaction compared with others			<.0001
More satisfied	53.8	45.04	
As satisfied	41.0	47.3	
Less satisfied	5.2	7.7	
When you have a conflict with your spouse do you			<.001
Always show it	17.3	20.9	
Usually show it	51.5	55.8	
Usually/always keep it to yourself	31.2	23.2	
Does your spouse show his/her love for you			.01
Very often	72.5	69.4	
Seldom	14.0	13.0	
Not enough/does not love me	13.5	17.6	
Marital disagreements scale			
Low	49.6	49.1	.79
High	50.4	50.9	
Marital disagreements (top 6)			
Sexual relations	9.1	7.1	.05
Family finances	6.2	8.5	.02
How to spend leisure time	6.2	8.1	.05
Bring up children	5.6	9.7	<.0001
Household chores	4.2	8.7	<.0001
Drinking	4.4	7.2	.002
Husband's work a strain?			
No		59.3	
Yes		40.7	
Husband's work a strain (top 4)			
Long or inconvenient hours		66.0	
Concern about his morale		41.7	
Worry about his safety		40.5	
Financially		33.7	
Work disruptive to your home life?			
Not at all	46.4		
Slightly to extremely	53.6		
Wife's work disruptive (top 4):			
Difficulties with accomplishing			
Household responsibilities	45.9		
She comes home upset with her work	45.3		
Long or inconvenient hours	32.3		
Concern about wife's morale	27.5		

Values are given as percent unless otherwise indicated.

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TABLE 2. Multivariable-Adjusted[a] Relative Risks for the 10-Year Occurrence of Coronary Heart Disease and Total Mortality in Men and Women

	Coronary Heart Disease		Total Mortality	
	Men	Women	Men	Women
Event numbers/persons at risk	126/1680	47/1895	175/1769	92/1913
All participants, RR (95% CI)				
Married versus not married	0.92 (0.51–1.65)	0.85 (0.43–1.70)	0.54 (0.35,0.83)*	1.04 (0.62–1.74)
Married participants, RR (95% CI)				
Conflict with spouse (referent = always show it)				
Usually show it	0.69 (0.43–1.10)	1.16 (0.47–2.85)	0.79 (0.53–1.19)	1.77 (0.76–4.09)
Usual/Always keep to self	0.89 (0.54–1.47)	1.29 (0.48–3.50)	0.87 (0.56–1.36)	4.01 (1.75–9.20)*
Spouse show's love for you (referent = very often)	1.00 (0.58–1.72)			
Seldom	0.96 (0.54–1.71)	1.12 (0.43–2.92)	1.01 (0.62–1.63)	0.93 (0.41–2.11)
Not enough/not love		0.59 (0.18–2.01)	1.06 (0.65–1.71)	1.57 (0.83–2.96)
Married men with an employed wife, RR (95% CI)				
How is your wife's work disruptive?	2.71 (1.22–6.03)*		1.39 (0.72–2.71)	
She gets upset with work (yes versus no)				

RR = relative risk; CI = confidence interval.
* $p < .05$.
[a] Adjusted for age, systolic blood pressure, body mass index, smoking, diabetes, total/high-density cholesterol.

DISCUSSION

In the current research, none of the characteristics conventionally thought of as reflecting marital strain—such as one's own marital satisfaction or happiness and marital disagreements—were significantly related to the development of CHD or total mortality in either women or men. Put into context with previous research, it seems that these characteristics are important in consideration of prognosis after a cardiovascular event, but they are unrelated to the development of CHD or mortality in people free of CHD at baseline (2,4).

Other measures of marital strain were found to be significantly associated with CHD or mortality. One measure is how one reacts when in conflict with one's spouse. The "self-silencing" theory was developed by Jack (5). Self-silencing is defined as the tendency to silence one's thoughts and feelings to maintain safe relationships, particularly intimate relationships. Self-silencing thoughts and feelings can precipitate an overall self-negation through progressive devaluation of one's own thought and beliefs (14) and has been found to correlate significantly with depressive symptoms in studies of various populations of women and men (11,15) and with irritable bowel syndrome in women (14). The formal Self-Silencing Scale was published after we collected the data for the present study; however, the question regarding communication during conflict may be construed as a measure of self-silencing. To further understand this association, we included other characteristics such as suppressed anger (anger-in) and depression in the multivariable models, but the association of self-silencing with mortality in women was not diminished. It is interesting to note that men were actually more likely to self-silence during conflict, but it had no effect on their risk of death or the development of CHD.

Among married men, only one characteristic of marital strain was significantly related to a health outcome. Men who reported that their wife's work was disruptive to their home life because she would come home upset with her work situation were 2.7 times more likely to develop CHD over the 10-year follow-up. It might be argued that men are expected to "protect" their wives and children (16). This "protection" is difficult because a wife's work environment is outside a husband's control or responsibility (17). The workplace could be a source of discontent and unhappiness where a husband cannot protect his wife. Whereas attention has been focused on the changing roles of women, the changing roles and expectations of husbands/men also need to be scrutinized and understood (17).

The present investigation of the Framingham Offspring Study substantiates the many other studies that demonstrate married men have a survival advantage over unmarried men (18–22). A prospective study of middle-aged men in Britain, 40 to 59 years of age, found that overall there was excess mortality in men who were single or recently divorced (18). A study of middle-aged Swedish men found that after adjustment for other risk factors, unmarried men had a significantly higher total mortality (19). The Whitehall Study also found that overall mortality was greater for all groups of unmarried men (20). In a study of middle-aged men in the Netherlands, unmarried men had significantly higher risk of all-cause mortality (RR = 1.7; 95% CI: 1.2–2.3) and coronary mortality (RR = 2.2; 95% CI: 1.2–4.2) than married men (21). In a Finnish study, unmarried men had significantly higher mortality rates compared with married men (22).

The influence of marital status on longevity in women has been studied less often. The Study of Osteoporotic Fractures, a study of older (≥65 years) White women, found that married participants showed lower covariate adjusted total and cardiovascular disease (CVD) death rates compared with unmarried participants (23). However, in the Finnish Study reported

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above, marriage did not convey a mortality benefit for women (aged 35–74 years) (22). The present study, a cohort similar in age to the Finnish Study, also observed that in women marital status did not seem to protect against mortality and CVD events. The lack of consistency between studies on the relationship of marital status and prognosis in women may, in part, be a result of the age differences in the studies. Being single may be more of a detriment in older, as compared with younger, women.

The strengths of the Framingham Offspring Study include a prospective design, participation of both men and women, a stable cohort, carefully assessed end points, and routinely ascertained information on standard risk factors. Except for the finding regarding marital status in men, to our knowledge, these findings are unique.

There are also a number of limitations to this study. Marital status and marital strain were measured only once in the Offspring at the third examination. We cannot make any conclusions about how change in marital status or marital strain might affect outcomes in this population. It would be interesting, for example, to ascertain if women who self-silence in one marriage, divorce and remarry, and self-silence in a different marriage. Perhaps self-silencing is a relatively stable personality trait rather than situation-based. Another limitation involves that lack of formal validity and reliability testing for the variables that provide some of the most interesting results in this research. It is important to take this into consideration when interpreting these findings. We examined multiple psychosocial attributes and scales in relationship to two end points. We cannot exclude the possibility that some of our findings may reflect false-positive findings from multiple statistical testing, or may reflect residual confounding by other risk factors for which we have not accounted. However, all analyses were based on a priori hypotheses. However, replication of our findings in other cohorts will be most useful. In addition, the study cohort was predominantly White and middle-aged; the findings may not be generalizable to other ethnicities or the elderly. Our sample in the Framingham Offspring Study, however, constitutes one of the larger datasets with prospective psychosocial data in women. With regard to the concepts of marital strain related to a spouse's job and to self-silencing, although these findings make some intuitive sense, the interpretation of these results must be approached with caution as significance may have arisen as a result of random chance.

In summary, being married is predictive of survival in men; however, traditional measures of marital disagreements and happiness did not reach significance as risk factors for the development of CHD or total mortality in men or women. However, particular characteristics related to marital relationships seem to be associated with health outcomes. As far as we are aware, this is the first time a measure of "self-silencing" has been examined in a prospective study of CHD and mortality in men and women. It is also the first time that a measure of the effect of women's work on husband's health has been studied in a prospective design. The association between specific aspects of martial strain should be validated in other cohorts before conclusions regarding their roles, as risk factors, can be determined.

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