

## Multiple Roles and Stress Burden in Women: A Conceptual Model of Heart Disease Risk

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Coronary heart disease is the leading cause of mortality in adult women, and recent trends indicate that risk for women, particularly working mothers, has worsened during the last decade. The absence of a biological explanation for this gender discrepancy has led some to look to psychosocial risk factors. This literature review examines the effect of multiple roles on women's cardiovascular health. Further, a conceptual model of heart disease risk is proposed, which introduces background stress, a chronic stress burden, as a potential pathway between multiple roles and heart disease. Trends in the literature largely support the proposed conceptual model. Multiple roles that often place conflicting demands on women may affect health outcomes through an increase in total background stress.

Coronary heart disease (CHD), the most prevalent form of cardiovascular disease, is the leading cause of death and disability among women in developed and developing countries (American Heart Association, 2009). Traditionally considered a "man's disease," in the last three decades, more U.S. women than men have died of heart disease annually. Although women develop CHD later than men, once the disease manifests, women have no survival advantage over men. Moreover, women have higher mortality and morbidity rates than men following myocardial infarction (MI), a difference particularly evident in younger (<65) women as opposed to men (Vaccarino, Krumholz, Yarzebski, Gore, & Goldberg, 2001; Vaccarino et al., 2009). In addition, women have lower functional gains and higher readmission, mortality, and complication rates following coronary artery bypass graft surgery (Wenger, Shaw, & Vaccarino, 2008). Together these data suggest that there may be an underlying factor that accounts for these patterns in CHD risk, progression, and outcome.

To date, studies on CHD risk factors, diagnosis, prognosis, and rehabilitation have largely focused on men (Fleury, Keller, & Murdaugh, 2000) and far less is

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known about CHD patterns in women. Compelling evidence suggests that psychosocial factors are important determinants of CHD development, progression, and morbidity and mortality for both men and women (Chida & Hamer, 2008; Everson-Rose & Lewis, 2005; Smith & Ruiz, 2002); however, recent literature reviews have highlighted the relative importance of specific psychosocial risk factors for women (Brezinka & Kittel, 1995; Low, Thurston, & Matthews, 2010). Overall, observed trends in the literature suggest that women have a greater psychosocial risk burden than men (Wenger et al., 2008) and the association between psychosocial risk and CHD incidence has been shown to be stronger for women (Hallman, Burell, Setterlind, Od'en, & Lisspers, 2001; Thurston & Kubzansky, 2007). Moreover, psychosocial risk factors tend to co-occur more frequently among women and have an additive effect (Thurston & Kubzansky, 2007). For instance, low socioeconomic status (SES) has been linked to CHD incidence and mortality, and studies indicate that low SES is more detrimental in women than men (Thurston, Kubzansky, Kawachi, & Berkman, 2005). This relationship is particularly evident in single mothers, who may struggle financially and have more coronary-prone lifestyle patterns including smoking, poor diet, less exercise, and higher levels of stress (Young, Cunningham, & Buist, 2005).

This review examines the effects of psychosocial factors, particularly chronic stress, on CHD risk in women. Further, a novel model of heart disease risk is proposed that identifies total stress burden or background stress resulting from the demands of multiple roles as an understudied source of stress that increases susceptibility to the development of CHD and may contribute to CHD trends noted in the literature.

### Biological Pathways

#### *Estrogen*

Women have a markedly lower incidence of CHD prior to the age of 50 and develop CHD 9–10 years later than men, a trend noted worldwide (Anand et al., 2008). The delay in CHD onset is generally believed to be due to the protective effect of estrogen on the vascular system in premenopausal women (Kannel & Levy, 2004; Mendelsohn, 2008). In addition to activating endothelial nitric oxide synthase leading to arterial vasodilation, estrogen also has favorable effects on lipid levels, and modulates response to injury and atherosclerosis.

In spite of estrogen's beneficial effects on the vasculature, it seems to merely delay rather than protect women from heart disease. Stress presents as an important variable in the estrogen–heart disease relationship. Studies in premenopausal monkeys suggest that chronic psychosocial stress induces ovarian impairment, which is associated with exacerbated atherosclerosis in these females (Kaplan, Manuck, Anthony, & Clarkson, 2002). Increased CHD risk has also been linked

to stress-induced ovarian impairment in premenopausal women (Bailey Merz et al., 2003).

### *Sympathetic Nervous System*

Physiologically, stress evokes a set of fight-or-flight responses that include rapid heart rate and increased respiration. These responses are instrumental in ensuring an organism's survival when faced with a threat. However, severe, prolonged stress leads to tissue damage and disease (Selye, 1956). One possible pathway linking chronic stress disease is physiological reactivity. The reactivity hypothesis suggests that larger, more frequent, and longer lasting physiological changes such as increased blood pressure may contribute to the development and progression of stress-mediated disease (Kamarck & Lovallo, 2003; Krantz & Manuck, 1984).

### *Allostatic Load*

The body's ability to adapt to stressors and maintain homeostasis is adaptive over short term, but when the stressor is repeated or chronic, allostatic load can accelerate disease (McEwen, 1998). The cumulative burden of minor and major stressors that increase physiological arousal over time will result in wear-and-tear on the body. In addition to these stressors, a genetic loading combined with health behaviors calibrate one's physiological response to adapt to daily living. A greater allostatic load, in turn, will result in a disproportionately more reactive and/or a prolonged response, thereby increasing the susceptibility to disease.

### *Oxytocin*

Although the fight-or-flight stress response is widely accepted to explain physiological responses to stress in both men and women, an alternate "tend-and-befriend" profile seeks to explain the unique behavioral stress response in women (Taylor et al., 2000): When faced with stress, females nurture offspring (tend) and affiliate with a social group (befriend) to reduce risk. In addition, these affiliative responses to stress may be regulated via the release of oxytocin, a stress-buffering hormone. Therefore, in discussing the effects of stress on women's cardiovascular health, it is imperative to include the traditional fight-or-flight response that may over time result in disease, and to also consider the role of social relationships.

## Psychosocial Pathways: Stress

Stress presents as a psychosocial factor consistently linked with health outcomes (Chida & Hamer, 2008). Compared with other biological and lifestyle risk

factors, stress is a complex construct in that no consensus exists with respect to either definition or measurement. The Transactional Model defines stress as one's *appraisal* of the perceived demands of the environment being greater than one's perceived resources for coping with these demands (Lazarus & Folkman, 1984), thus positing a threat to the individual.

### Sources of Stress

#### *Employment*

Work-related stress is the most often studied source of chronic stress (Rozanski, Blumenthal, & Kaplan, 1999), and research findings indicate a strong association between this type of chronic stress and cardiovascular disease (Aboa-Eboule et al., 2007; Theorell et al., 1998). Karasek, Baker, Marxer, Ahlbom, and Theorell (1981) posited the "job strain" model, in which work environments that are particularly demanding and allow for little control pose the most significant health risk. The literature provides evidence for a relationship between these high demand/low control work environments and increased risk for cardiovascular morbidity and mortality (Kuper & Marmot, 2003; Marmot, Bosma, Hemingway, Brunner, & Standfeld, 1997; Theorell et al., 1998); however, occupational stress is only moderately predictive of incidence and prognosis of CHD in women relative to men (Eaker, 1998; Marmot et al., 1997; Orth-Gomér et al., 2000; Wamala, Mittleman, Horsten, Schenck-Gustafsson, & Orth-Gomér, 2000).

Even though the "job strain" model may not be as readily applicable to women, it may capture important characteristics of one's transactions with the environment that are not limited to the work setting. Some research findings show that low control at home, not work, was associated with increased CHD risk in women (Chandola, Kuper, Singh-Manoux, Bartley, & Marmot, 2004). A study examining the effects of daily experiences on atherosclerosis in healthy adults found that participants reporting higher demands in daily life showed larger carotid intima-medial thickness (Kamarck et al., 2004). These findings were not limited to the workplace or to employed individuals, leading the authors to conclude that previous findings linking job stress to heart disease may, in fact, reflect the broader effect of daily psychosocial demands that are not necessarily limited to the workplace.

#### Non-Employment-Related Sources of Chronic Stress

To date, relatively little research has examined the relationship between chronic, non-work-related daily life stressors and cardiovascular disease. In a longitudinal study of 73,000 initially healthy Japanese adults, women reporting high levels of nonspecific daily life stress were nearly twice as likely to die of

cardiovascular disease as women with lower stress levels (Iso et al., 2002). This association was not observed in men in the same study.

### *Caregiving*

A specific source of non-work-related chronic stress is caregiving. Caregiving has consistently been associated with adverse psychosocial and physical health outcomes (Etters, Goodall, & Harrison, 2008), including increased CHD risk in women (Lee, Colditz, Berkman, & Kawachi, 2003; Von Kaenel et al., 2008). Caregiving of elderly parents, ill spouses, or children, is more frequently the primary responsibility of women, and women typically report a greater burden (Kramer & Kipnis, 1995) and experience more psychiatric morbidity attributable to caregiving than men (Covinsky et al., 2003).

### Marriage: A Source of Social Support or Chronic Stress?

Higher levels of social support have been linked with a number of health benefits, including protection against cardiovascular morbidity and mortality (Berkman, 1995; Kaplan & Kronick, 2006; Uchino, 2006). For many adults, the marital relationship is a primary source of social support, and being married may be a health advantage by protecting against the well-documented risks associated with social isolation (Berkman, 1995; Brummett et al., 2001). However, the findings concerning marital status and health have generally been less consistent for women than for men (Brezinka & Kittel, 1995; Shumaker & Hill, 1991).

The relationship between social support and cardiovascular health may be more complicated for women than men. Emotional ties may be perceived as more stressful than supportive by women, as they may be associated with both emotional distress and family responsibilities (Orth-Gomér et al., 2000). Women are often the providers as well as the receivers of support, as both men and women are more likely to turn to women for support (Orth-Gomér & Chesney, 1997). Moreover, caretaking of children and elderly parents falls more frequently on women than men (Lee et al., 2003). Therefore, social relationships may often come at a cost for women.

Research examining the role of the quality of the relationship may yield some insight into the inconsistencies in the social support literature. Marriage has been associated with health benefits for women, but only if marital satisfaction was high (Gallo, Troxel, Matthews, & Kuller, 2003). In studies of self-reported health in women with and without partners, women with supportive partners rated their health significantly better and experienced lower levels of distress than those without a partner (Kostiainen, Martelin, Kestilä, Martikainen, & Koskinen, 2009; Reese, Somers, Keefe, Mosley-Williams, & Lumley, 2010); however, women with poor support from their partner reported poor health and showed more symptoms of distress than women who had no partner at all. Rohrbaugh,

Shoham, and Coyne (2006) found that poor marital quality was a better predictor of mortality in female as compared to male CHD patients. Some research suggests that women are more sensitive than men to negative aspects of relationships. For example, women generally display more pronounced physiological responses to marital conflict when compared with men (Kiecolt-Glaser et al., 1997; Smith, Gallo, Goble, Ngu, & Stark, 1998).

In female coronary patients, work stress did not predict coronary events; however, long-term survival was poorer in women who experienced high marital stress (Orth-Gomér et al., 2000), and the combined effects of stress arising in both work and marital spheres was associated with the worst health outcome (Orth-Gomér & Leineweber, 2005). Similarly, prolonged exposure to marital and work stress has been linked with progressive atherosclerotic narrowing in female coronary patients (Wang et al., 2007).

#### *Gender Differences in Stressor Effects*

Findings in several studies suggest that there are gender differences in what is perceived as threatening that may affect the physiological stress response. Women are typically less hemodynamically reactive than men to standard laboratory stressors, which tend to be performance-based (Kajante & Phillips, 2006; Kudielka, Buske-Kirschbaum, Hellhammer, & Kirschbaum, 2004), and more reactive than men to emotionally and socially challenging tasks, such as accompanying a child to a routine doctor's visit (Lundberg, de Chateau, Winberg, & Frankenhaeuser, 1981) or experiencing social rejection (Stroud, Salovey, & Epel, 2002). These differences in reactivities may translate outside the laboratory setting and suggest that women likely experience heightened reactivity to socially or emotionally challenging situations, such as balancing work and family life.

#### Multiple Roles

Interest in the relationship between social roles and health was provoked by women's entry into the labor force in the 1960s, prompting the development of two opposing theories on the effect of multiple roles on health: the role accumulation hypothesis and the role strain hypothesis. The *role accumulation* hypothesis posits that the combination of different roles *benefit* women's health by providing women with more resources, including increased attachment to the community, higher self-esteem, and financial independence (Lahelma, Arber, Kivelä, & Roos, 2002; Martikainen, 1995; Waldron, Weiss, & Hughes, 1998).

The *role strain* hypothesis, on the other hand, proposes that combining the competing demands and expectations associated with the roles of mother, partner, and employee lead to role strain and are *detrimental* to women's health (Chandola et al., 2004; Fokkema, 2002; Lahelma et al., 2002; Martikainen, 1995).

### Background Stress: A Measure of Total Stress Burden

The aforementioned sources of stress underscore the notion that people rarely experience one stressor at a time; rather, they typically face a multitude of stressors of various durations and intensities. Stress from many sources combines to pose a stress burden, the sum total of ongoing hassles and major and minor stressors, past stressors, and anticipated future stressors. Research has shown that ongoing chronic stress or previous experience with stress can affect coping and consequences of current stressors, whether related or not, both psychosocially and physiologically (Gump & Matthews, 1999).

Background stress, a previously understudied source of stress, is a chronic stress burden that involves ambient (environmental) stressors and minor daily hassles upon which new stressors may be superimposed. The absence of a measure capable of accurately measuring the construct of background stress has prevented researchers from examining the cumulative toll of minor stressors that potentially lurk in the “background” of people’s thought processes.

### Background Stress Model: A Conceptual Model of Heart Disease Risk

We propose the background stress model as an extension of the role strain hypothesis (see Figure 1). In this model, the demands of women’s multiple roles contribute to a chronic underlying stress burden, or background stress. Factors contributing to background stress arise from various sources that may be particularly salient for working mothers; for example, stressors associated with household and childcare responsibilities, safety of one’s neighborhood, access to health care or caring for an ill family member, financial obligations, meeting deadlines at work while finding time to spend with loved ones, and maintaining social relationships. This constantly present stress burden affects health either directly via psychophysiological processes or indirectly by influencing health-related behaviors (Gump & Matthews, 1999).

A potential mechanism in the relationship between multiple roles, stress burden, and heart disease may be through an increase in cardiovascular and/or hemodynamic responses to stress. As previously discussed, chronic stress is reliably associated with heart disease (e.g., Rozanski et al., 1999). In addition, background stress can affect how an individual responds to a new (or current) stressor; for instance, by amplifying and prolonging cardiovascular reactivity to and recovery from an acute stressor (Matthews, Gump, Block, & Allen, 1997). Therefore, based on this proposed model, an increase in role demands and, consequently, background stress, affects cardiovascular responses to new stressors and may contribute to heart disease risk.

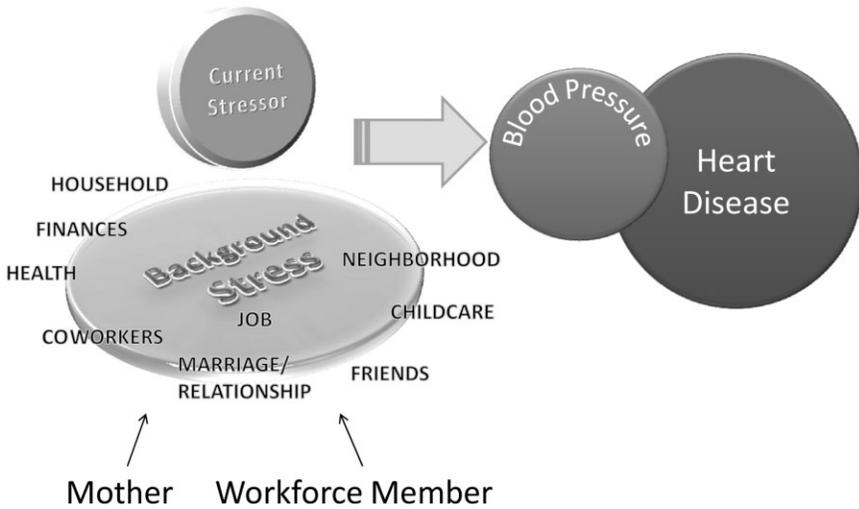


Figure 1. Background stress model: A conceptual model of heart disease risk in which demands of women’s multiple roles contribute to a chronic underlying stress burden, or background stress, that may affect response to current stressors as well as increasing heart disease risk.

### Women’s Stress Burden

Women tend to report a higher amount of stress and psychosocial load than men (Theorell, 1991). Role conflicts and work overload may create role strain and contribute to an increased stress burden for women.

To date, women comprise 46.5% of the total U.S. labor force (Solis & Hall, 2009). But being equally involved in paid employment does not necessarily translate into equality in domestic gender roles. Women from dual career households continue to carry primary responsibility for housework and child care (Coltrane, 2000). National and international studies have documented that women invest more time into family and household than their male counterparts and women report having the main responsibility for household duties and child care (Berntsson, Lundberg, & Krantz, 2006; Krantz, Berntsson, & Lundberg, 2005; Sayer, 2005; Thurston, Sherwood, Matthews, & Blumenthal, 2011). This difference in workload increases when children are present in the household and is more pronounced in mothers than fathers (Kiker & Ng, 1990).

Inequalities in workload that are linked with traditional gender roles may be tied to problems in recovery after MI. Research suggests that female patients tend to ignore symptoms of overexertion and resume contraindicated physically demanding household chores such as vacuuming within a shorter time period

after hospital discharge than male patients (Lemos, Suls, Jenson, Lounsbury, & Gordon, 2003; Rose, Suls, Green, & Gordon, 1996). Women are also less likely than men to enter and more likely to withdraw from cardiac rehabilitation due to family obligations versus other nonmedical reasons (Jackson, Leclerc, Erskine, & Linden, 2005; Marzolini, Brooks, & Oh, 2008).

### *Role Perception*

Women's experiences are more complex than the role accumulation/role strain dualism implies. Recent research suggests that in households where gender roles are more egalitarian, paid and unpaid workloads are more similar in men and women (Corrigall & Konrad, 2007). It is possible that it is the quality, not mere quantity, of the social roles that mediates the relationship between roles and health. For example, Walters et al. (1997) found that time pressures in family roles, unappreciated work, and multiple competing demands were inversely related to health. Furthermore, stress related to paid and unpaid work among women is influenced by attitudes toward housework and perceived fairness in distribution of housework, and discrepancies between attitudes and time spent on paid and unpaid work are associated with lower well-being and increased role strain (Claffey & Mickelson, 2009; Greenstein, 2009).

### Work versus Family Roles and Health

For many women, having both work and family roles is associated with higher levels of well-being (Marshall, 1997). On the other hand, the heavier total workload for working women compared to men is often pointed to as a reason for women's higher rate of ill-health (Krantz & Ostergren, 2000). For some women, the combined responsibility of work and family is associated with perceived increased time pressure and an inability to meet the demands of the various roles, which is associated with higher risk for depression and anxiety, fatigue, and poorer physical health (Brezinka & Kittel, 1995).

Although health benefits have been associated with the mother role (Fokkema, 2002; Martikainen, 1995), motherhood can be related to increased strain and distress (Evenson & Simon, 2005; Kostianen et al., 2009; Matthews & Power, 2002), and the presence of children may heighten women's risk for several physical disorders, including cardiovascular disease (Hardy, Lawlor, Black, Wadsworth, & Kuh, 2007; Haynes & Feinleib, 1980; Lawlor et al., 2003). More negative consequences may be associated with having a career and raising children under certain conditions, such as when caring for small children while beginning an occupational career (Halpern, 2005; Pavalko & Woodbury, 2000).

The literature shows that multiple roles and paid work are associated with positive health outcomes (Kostianen et al., 2009; Lahelma et al., 2002;

Martikainen, 1995) and may protect women from CHD (Brezinka & Kittel, 1995; Carson et al., 2009). However, the combination of employment and family appears to be associated with worse health outcomes (Lahelma et al., 2002; McMunn, Bartley, & Kuh, 2006) and may enhance CHD risk (Brezinka & Kittel, 1995; Low et al., 2010; Theorell, 1991). Findings from the Framingham Heart Study indicate that the incidence of CHD over eight years was nearly twice as high in employed women with three or more children as in employed women without children (Haynes & Feinleib, 1980).

### *Caregiving Role and Health*

As previously discussed, caregiving is a source of chronic stress more often shouldered by women that is associated with adverse psychosocial and physiological health outcomes. Overall, a pattern in family and work stress interaction emerges in the caregiver burden literature that is similar to that seen in the stress burden literature. Studies have shown that employed caregivers report less caregiving strain and better psychosocial health outcomes (Dilworth & Kingsbury, 2005; Stephens & Townsend, 1997); however, stress related to providing care for an ill parent was aggravated by occupying three roles (i.e., mother, wife, and employee) in addition to being a caregiver (Stephens & Townsend, 1997).

### Lone Working Mothers

Lone mothers form a critical case, since they have fewer supports and greater burdens, and therefore are expected to have poorer health. Studies throughout the world demonstrate that lone mothers are at higher risk for physical and mental health problems and higher mortality rates compared to partnered mothers (Lahelma et al., 2002; Martikainen, 1995; Whitehead, Burstroem, & Diderichsen, 2000). Lone mothers are also at higher risk for heart disease (Higgins, Young, Cunningham, & Naylor, 2006; Young et al., 2005). The relationship between lone motherhood and increased disease and mortality risk may be in part due to the lower SES in this population (Weitof, Haglund, & Rosen, 2000). A study comparing the health of lone mothers in Britain and Sweden—the latter of which has more favorable social policies and should protect lone mothers from poverty—found that the health of lone mothers is as poor in Sweden as in Britain (Whitehead et al., 2000). Notably, the difference in health between lone and partnered mothers was of a similar magnitude in Sweden and Britain; however, whereas in Britain financial poverty was a primary pathway to poor health outcome, the authors proposed that “time poverty” leading to increased stress was a potential pathway explaining poor health in Swedish lone mothers.

### Conclusions and Future Directions

Several lines of data suggest that the growing incidence of heart disease in women and their increased risk for mortality due to heart disease are attributable to a confluence of factors. Together, these factors contribute to a gradually increasing vulnerability to heart disease, a process that may begin as early as in one's 20s–30s. Perhaps more so than any other developmental period, women are struggling to meet the competing demands of their multiple roles of job and family, which in turn may represent the basis for preventive intervention to address the potential influences on adverse health outcomes.

In this context, we offer a conceptual model (Figure 1) that incorporates background stress, an understudied chronic stress burden, to illustrate a potential pathway between multiple roles and heart disease. The research literature presented in this review largely supports this conceptual model; multiple roles that often place conflicting demands on women may affect health outcomes through an increase in total background stress. In particular, working mothers who shoulder responsibilities of child care, housework, and paid employment likely contend with this under-recognized stress burden, which may contribute to the development of CHD. This proposed model underscores this role and attempts to define the routes by which multiple roles may lead to health consequences.

To date, a measure capable of accurately capturing the construct of background stress has not been available to researchers interested in examining the cumulative toll of minor stressors that potentially lurk in the “background” of people's thought processes that is thought to contribute to disease risk in our proposed model; however, the Background Stress Inventory is currently being developed to capture this understudied source of stress.

Future research should aim to identify and test potential underlying mechanisms, such as changes in cardiovascular and/or hemodynamic reactivity, in the relationship between multiple roles, background stress, and heart disease risk. In addition, this model was specifically developed to describe the potential relationship between multiple roles and heart disease risk in women because women are traditionally more likely to be the primary caregivers in families and be employed (i.e., they are more likely to occupy multiple roles that have competing demands) than men. In addition, women may be more vulnerable to certain types of psychosocial stressors that may contribute to risk. It is possible that men occupying a less traditional gender role and are primary caregivers while also being employed are also at higher risk for heart disease; however, to date, there is a lack of research in this area. Therefore, future research may need to include working mothers and working fathers (who are primary caregivers) to determine if the effect of background stress on heart disease is particular to women or if it is common to working parents in general.

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