Final Progress Report

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"Impact of Work Organization on Women's Postpartum Health"

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Abstract

This research addressed the National Occupational Research Agenda (NORA) priority area of Work Environment and Workforce: Organization of Work. This award provided R03 funding for Dr. Marshall, an established investigator of ernployment and health, for secondary analysis of existing data to examine the relationship between the organization of work and women's post-partum health.

Maternal employment rose dramatically over the second half of the 20th century. While employment has had positive effects for women and for their families, working mothers of young children continue to face specific health risks. Women are susceptible to the same health risks as men related to poor job quality and working long hours. However, women continue to spend more time than do men on housework and child care in the family, and face additional health risks associated with combining these family demands with employment.

With more than half of all mothers of infants returning to work within the first three months postpartum, understanding women's postpartum health requires an examination of both family factors and work factors, as well as the work-family interface.

This study examined work and family characteristics and depressive symptomatology among over 700 working mothers of infants, from the NICHD Study of Early Child Care and Youth Development (NICHD SECCYD), a prospective longitudinal study of 1,364 families from 10 sites around the United States. Working mothers in poorer quality jobs, as well as working mothers who were single, or whose infant's health was poorer than that of other infants, reported greater depressive symptomatology. The effect of job quality on depressive symptomatology was mediated by work-family conflict, while other work-family variables had direct effects on depressive symptomatology. While women who worked longer hours reported greater work-family conflict at both 6- and 15-months post-partum, hours worked were unrelated to levels of depressive symptomatology.

Addressing the impact of these factors on working mothers' health requires action from a variety of directions. First, the trend of fathers' increasing time in parenting is positive; as men become more involved in the day-to-day family care and housework, the demands on working mothers should be lessened. However, change is also warranted in the workplace and in government policy. While some employers are increasing efforts to become more family-friendly, greater availability of paid sick leave for the care of sick children and other accommodations for working mothers of infants would likely reduce the stress of combining employment with caring for an infant. In addition, some families would benefit from access to paid parental leave. The current U.S. Family and Medical Leave Act is limited, providing only three months unpaid leave ("Family and Medical Leave Act of 1993," 1993). Changes in public and private parental leave policies that provided more time off and provided paid leave would also support the health of working mothers of infants.

Highlights/Significant Findings

Using an ecological systems model as our theoretical framework, the goal of this study was to examine working mothers' postpartum health. Our model examined two aspects of the paid work microsystem – job quality and work hours – in conjunction with three aspects of the family microsystem – number of children, infant health problems, and the presence of a spouse or partner. We found that women who worked more hours reported greater work-family conflict at both 6- and 15-months post-partum. However, work hours were unrelated to depressive symptomatology.

Job quality was a bigger factor in depressive symptomatology for working mothers of infants. We found that job quality was a significant predictor of depressive symptomatology at both 6- and 15-months post-partum. However, this relationship was mediated by the quality of the interface between work and family. Women in poorer quality jobs reported greater work-family conflict, which was related, in turn, to greater depressive symptomatology. At 6-months, job quality was mediated by both work-to-home interference and home-to-work interference. However, at 15-months, job quality was mediated only by home-to-work interference. This seemingly anomalous finding is actually consistent with other research (Byron, 2005). The significant relation of job quality to home-to-work interference may be a function of the permeability of the work-family interface, or may reflect the reciprocal crossover of work strain to family life within couples (cf., Baker, Demerouti, Dollard, 2008; Bolger, DeLongis, Kessler, Wethington, 1989).

The family microsystem was also important to working women's postpartum health. While the number of children was not related to depressive symptomatology, mothers with infants who were less healthy than other babies, at both 6- and 15-months, reported greater depressive symptomatology. In addition, single mothers reported significantly greater depressive symptomatology at 6-months, but not at 15-months. The effects of family characteristics on depressive symptomatology were not mediated by work-family conflict.

This research extends prior work through the application of an ecological systems model to women returning to work after childbirth. Our analyses considered both the paid work and family microsystems, as well as the interface between work and family. Our study provided additional support for the role of work-family conflict as an intervening variable in the pathway from job quality to health, providing a more detailed picture of the processes by which employment affects the health of working mothers of infants. However, we did not find support for the role of work-family conflict as a mediator of family factors; rather, marital status and infant health had independent, direct effects on depressive symptomatology.

While research on the relation between working conditions and working mothers' postpartum health is limited, the present study does provide additional evidence of the particular challenges faced by employed mothers of infants. Examining work and family issues among subgroups of working women is central to understanding the apparent contradictions among studies finding that employment has positive health effects vs. studies finding that work-family conflict has negative health effects. A recent study of trends over time concluded that, on balance, women's employment has positive health effects; however, these benefits are reduced for working mothers of young children (Schnittker, 2007). Studies such as the present one are important to an understanding of the factors that contribute to this life stage-related reduction in benefits.

Translation of Findings

Maternal employment rose dramatically over the second half of the 20th century. While employment has had positive effects for women and for their families, working mothers of young children continue to face specific health risks. Women are susceptible to the same health risks

as men related to poor job quality and working long hours. However, women continue to spend more time than do men on housework and child care in the family, and face additional health risks associated with combining these family demands with employment.

With more than half of all mothers of infants returning to work within the first three months postpartum, understanding women's postpartum health requires an examination of both family factors and work factors, as well as the work-family interface. We found that longer work hours and poorer job quality increase work-family conflict; poorer job quality also indirectly affects depressive symptomatology. These results are consistent with research on working fathers, and on workers without children; efforts to improve job quality would support health and wellbeing for all workers, including working mothers of infants.

Working mothers of infants also face demands unique to their life stage – the demands of parenting an infant. These life-stage demands are evident in the impact of child health on mothers, and in the importance of a spouse or partner to mothers of 6-month olds. Addressing the impact of these factors on working mothers' health requires action from a variety of directions. First, the trend of fathers' increasing time in parenting are positive; as men become more involved in the day-to-day family care and housework, the demands on working mothers should be lessened. However, change is also warranted in the workplace and in government policy. While some employers are increasing efforts to become more family-friendly, greater availability of sick leave for the care of sick children and other accommodations for working mothers of infants would likely reduce the stress of combining employment with caring for an infant. In addition, some families would benefit from access to paid parental leave. The current U.S. Family and Medical Leave Act is limited, providing only three months unpaid leave ("Family and Medical Leave Act of 1993," 1993). Changes in public and private parental leave policies that provided more time off and provided paid leave would also support the health of working mothers of infants.

Scientific Report

This research addressed the National Occupational Research Agenda (NORA) priority area of Work Environment and Workforce: Organization of Work. This award provided R03 funding for Dr. Marshall, an established investigator of employment and health, for secondary analysis of existing data to examine the relationship between the organization of work and women's post-partum health.

The purpose of this project was to estimate a model relating the organization of work (job stress, work schedule, job flexibility), hours of paid work, family workload (hours of family labor, level of family demands), and work-family conflict, to women's health at critical points in time after childbirth. The research model is grounded in ecological systems theory (Bronfenbrenner 1989), and integrates research on work organization and health, multiple roles and emerging research on employed women's post-partum health. The study uses existing data collected at 1- month post-partum and at 3-month intervals from 3- to 36-months post-partum, from a longitudinal study of over 1300 families (the NICHD Study of Early Child Care).

The Specific Aims are:

1. Model the relationship between the organization of work and women's post-partum health trajectories.
2. Model the role of perceived work-family conflict as a mediator of the relationship between the organization of work and women's post-partum health at specific points in time.
3. Model the relationship between total workload (paid employment as well as family factors) and women's post-partum health at specific points in time.

Background and Significance

Women comprise nearly half of the United States workforce, with 60% of women either employed or looking for work (NIOSH Fact Sheet 2001). Working women face health risks at work that are similar to those faced by men, such as stress from the organization of work (e.g., job demands, little control over work, work schedule). However, rates of stress-related illness, including depression, are nearly twice as high for women as for men (NIOSH Fact Sheet 2001; NORA Update 2003). In addition, work and family balance issues are an additional health risk factor for women with children (Sauter, Brightwell, Colligan, Hurrell et al. 2002). Employment rates among mothers of infants have risen from 31% in 1976 to over 50% by 2000 (U.S. Census Bureau 2001). While the Family and Medical Leave Act provides unpaid leave for eligible employees for up to 12 weeks, over 90% of parents who take leave to care for a newborn or adopted child return to paid work at the end of the 12 week period (Cantor, D., Waldfogel, J., Kerwin, J. et al. 2000). In 2003, maternal employment remained high; 53.7% of mothers with children under the age of 1 were in the labor force (U.S. DOL 2004).

The relationship between work organization, particularly workload demands and limited control over work, and worker health has been well-established (NIOSH Fact Sheet 2001). However, recent changes in the organization of work coincide with the rising workforce participation of mothers of young children to create potential health risks, the effects of which are unknown. For example, trends in the new economy, including downsizing and outsourcing of core functions, increasing use of contingent labor, flatter management structures and lean production technologies, have contributed to reduced job stability and increased workload (Sauter, et al. 2002; Hertz & Marshall 2001). A significant proportion (25%-30%) of workers report high levels of emotional exhaustion at the end of the workday (Sauter, et al. 2002). Workers in their prime family-formation years are working longer hours at a time when their workload demands at home are also higher (Gerson & Jacobs 2001).

Integrating Three Traditions Of Research

The proposed study brings together three research traditions – research on work organization and worker health; research on working women and multiple roles; and emerging research on post-partum health of employed women.

Work organization and health. Existing research has identified several characteristics of work organization that are associated with poorer health, including greater demands, reduced worker control, lower levels of substantive complexity, reduced opportunities to serve others in service industries, and reduced work-related social support (c.f., Caplan, Cobb, French, Van Harrison & Pinneau 1975; House & Wells 1978; Kohn & Schooler 1983). One of the leading theoretical models in the field of occupational health is the demand-control model, developed by Karasek and colleagues (c.f., Karasek & Theorell 1990). The demand-control model posits that the combination of heavy demands and limited control or decision latitude to moderate those demands results in job strain, and job strain, in turn, leads to negative health consequences. Several studies have supported this model. The demand - control model has been confirmed in random samples of male workers in the US and Sweden (Karasek 1979), and for men and women using the US Quality of Employment Surveys data in 1972 and 1977 (Karasek & Theorell 1990), as well as in studies of specific occupations, including clerical workers in the finance industry, employees in manufacturing, and German metalworkers (Karasek & Theorell 1990; Dwyer & Ganster 1991). However, a recent evaluative review of the research found only modest support for the job strain (high demands combined with low control) model; support was strongest for psychological distress or well-being outcomes (de Lange, Taris, Kompier, Houtman & Bongers 2003).

One possible source of the mixed results of research to date is the fact that the demand-control model was developed during a manufacturing economy; indeed, it receives greatest support in studies conducted prior to the recent rise in the service industries, or on samples drawn from the manufacturing industry. Muntaner and colleagues have posited that Karasek's job characteristics scales are limited to domains more characteristic of traditional industrial jobs (Muntaner, Eaton & Garrison 1993). In response to these limitations, research on the service industries has amended these scales to capture additional characteristics of work. For example, Soderfeldt and colleagues have added an index of emotional demands (Soderfeldt, Soderfeldt, Muntaner, O'Campo et al. 1996, 1997). Similarly, in our research on LPNs and social workers, and on two-earner couples, we added items on emotional demands and an index to assess intrinsic rewards from service to others (Marshall, Barnett, Baruch & Pleck 1991; Marshall, Barnett & Sayer 1997).

Early research on occupational health has also identified the importance of social support, particularly work-related social support, to men's health (c.f., House & Wells 1978). In the 1990's, research on women and health established the importance of social support for women workers as well (Marshall & Barnett 1992; Loscocco & Spitze 1990; Vermeulen & Mustard 2000). The demand-control model has been elaborated to include work-related support, as the demand-control-support model (Johnson & Hall 1988).

Beginning in the 1980's, a growing body of research on employment and health specifically examined women's health and found that women, like men, are susceptible to the health effects of stressful jobs (see Swanson, Piotrkowski, Keita & Becker 1997 for a review; more recent studies include Borrell, Muntaner, Benach & Artazcoz 2004; O'Campo, Eaton & Muntaner 2004). Our own work has also supported this conclusion. In a study of LPNs and social workers (Marshall, Barnett, Baruch & Pleck 1991; Barnett, Davidson & Marshall 1991; Marshall & Barnett 1994), we found that jobs with heavy demands, limited decision authority, poor supervisor support and few intrinsic rewards from helping others were associated with greater psychological distress, reduced well-being and poorer physical health. In a follow-up study of

two-earner couples, we found no gender difference in the relation between work organization and health – change in job stress was associated with change in psychological distress for both women and men (Barnett, Raudenbush, Brennan, Pleck & Marshall 1995).

Working women and multiple roles research. Multiple roles research examines the additive or cumulative impact of participation in both the work and family systems (c.f., Marshall 1997; Voydanoff & Donnelly 1999). The scarcity hypothesis posits that *work-family strain* occurs when the combined demands of the work and family systems are too great for available resources (c.f., Coser 1974; Goode 1960). Role enhancement theory suggests that occupying multiple roles enhances the performance in individual roles and leads to *work-family gains*, such as greater self-esteem, social recognition, and social involvement (c.f., Kim & Moen 2002; Marks 1977; Sieber 1974).

Another perspective focuses on the interface between the two systems; work-family conflict occurs when the tasks or responsibilities of one system interfere with those of the other system (c.f., Burke 1988; Frone, Russell, & Cooper 1991; Marshall & Barnett 1993a). For example, when the schedules of paid work and family demands are incompatible, mothers of young children may choose non-day work schedules to facilitate combining work and family – working evenings or nights, while the father works days. However, Voydanoff (1989) found that women working non-day shifts experienced higher levels of work-family conflict, possibly because their lives were "out of sync" with the lives of their societal supports, including family and friends, as well as with formal child care. Hattery (2001) found that, while couples liked working opposite shifts because it allowed them to save on child care costs and to be with their children, it also led to a lack of marital couple time. In our own work, we found that other aspects of work organization (job stress, number of hours worked) were important predictors of work-family strains for both women and men in two-earner couples (Marshall & Barnett 1993a).

New directions in occupational health research: Post-partum health of employed women. There is growing recognition of the importance of multi-level analysis in health research (c.f., Bachrach & Abeles 2004). Sauter and colleagues (2002) outline a multilevel concept of work organization that "illustrates the continuity between (1) broad economic and public policy and other forces at the national and international level, (2) organization-level structures and processes, and (3) job demands and conditions in the workplace." In their introduction to the special issue of the Journal of Occupational Health Psychology on work-family research, Westman and Piotrokowski (1999) called for the use of systems theory as a starting point in theorizing work-family research in occupational health, because "it allows for a broad, unifying theoretical perspective in which both workplaces and families are considered semiopen systems with permeable boundaries." Ecological systems theory combines systems theory with a multi-level model, placing the microsystems of workplaces and families within the exosystem of economic and public sector institutions and policies, which are embedded in a macrosystem of societal and cultural beliefs and practices (Bronfenbrenner 1989). Since Westman and Piotrokowski's call, several important articles have appeared which use ecological systems theory in occupational health and/or work-family research (c.f., Ettner & Grzywacz 2001; Grzywacz & Marks 2000; Voydanoff 2002). The proposed study uses ecological systems theory to understand the relation between work organization and women's health in the context of family demands and the work-family interface, and the broader context of the new economy and public policy initiatives, such as the FMLA.

Equally important is a life span perspective in research on health and disease (OBSSR 2002). A life span perspective that recognizes changes in the individual organism from the pre-natal period through death is broadly used, particularly in research on children, but increasingly in research on aging. However, a life span perspective is also important in understanding both specific stages of adulthood and trajectories of adult development (c.f., Moen, Robison &

Dempster-McClain 1995). Research on post-partum health has identified challenges faced by women, including physical recovery from childbirth, post-partum blues or depression, stresses in the marital relationship, and health problems of the newborn, that are specific to the post-partum period (c.f., Ellis & Hewitt 1985). The life span perspective is important to an interpretation of the finding from the multiple roles tradition that, while combining employment and family is positive for many women, women with young children are likely to report greater work-family strains (c.f., Barnett & Gareis 2000; Killien, Habermann & Jarrett 2001; Marshall & Barnett 1993a; Tausig & Fenwick 2001). Emergent research in occupational health in the post-partum period has focused on maternity leave and found that greater time off from work has a positive relation to maternal health and quality of life (McGovern et al 1997; Chatterji & Markowitz 2004; Gjerdingen & Chaloner 1994; Hyde et al. 1995). The proposed study builds on this, and other, existing life span research to examine the relation of work organization and health at a particular point in the life span, among women with young children.

Methods

This study uses data from the NICHD Study of Early Child Care and Youth Development (NICHD SECCYD), a prospective longitudinal study of 1,364 families from 10 sites around the United States. Families were randomly selected from all births in 1991 at hospitals in each of the 10 sites. Recruitment was restricted to healthy mothers over the age of 18 and conversant in English, with a newborn who was a healthy singleton. The original NICHD sample reflected the population of the United States in 1991: the majority of mothers were white (82%), had at least a high school education (89%), and were partnered (86%). Eighty-three percent of the women in the NICHD SECCYD sample were employed prior to the birth of the study child. The response rate for families continuing in the study through 36 months post-partum was 89%. At 1-, 6- and 15-months, mothers were interviewed in their homes. The interviews collected standardized data on demographics, employment, work-family conflict, maternal depressive symptomatology and child health, among other variables. Further information on sampling and data collection procedures can be found in publications of the NICHD Early Child Care Network (NICHD ECCRN 2002).

Analysis Sample. The analysis sample consists of all women employed at least 10 hours per week at 6-months (N=756). The mean age of the women was 28.75 (SD=5.23); 86% of the analysis sample was White. At 6-months post-partum, 88% of the women were married or living with a partner, and the mean income-to-needs ratio was 4.21. Women had a mean of 1.7 children, and worked a mean of 34.58 hours per week at 6-months post-partum.

Measures

All measures that are not self-explanatory are described in detail below.

Paid work microsystem characteristics. We include two measures of paid work microsystem characteristics, work hours and job quality. Mothers were asked how many hours per week they were working at all jobs at each assessment. On average, women in the analysis sample were employed 34.58 hours at 6-months, and 35.56 hours at 15-months; 72% of the women were employed full-time (35 hours/week or more) by 6-months. Job quality – the respondent's assessment of working conditions – was measured using a short form of the Job-Role Quality (JRQ) Scale (Marshall, Barnett & Sayer, 1997). The JRQ includes items to measure job demands, skill discretion and decision authority, as well as other working conditions. The Cronbach alpha for the total measure in the NICHD SECCYD is .82 at 6-months and .84 at 15-months. The mean job quality scores for women in the analysis sample were -1.06 at six-months, and -1.15 at 15-months. A negative score reflects a job with more positive ratings than negative ratings, as in a job with greater skill discretion and decision authority and fewer job demands; a positive score reflects a poorer quality or more stressful job.

Family microsystem characteristics include three variables: number of children, partner present (1=yes; 0=no), and the health of the child. Mothers were asked to rate their baby's overall health on a scale from 1=poor to 4=excellent. The mean child health rating was 3.32 at 6-months, and 3.19 at 15-months; 48% of 6-month-olds, and 40% of 15-month-olds, were rated as in excellent health. In comparison, nationally, the mean health rating was 3.37 among parents of children ages birth to 4 years (calculated from National Center for Health Statistics, 2007). In the present study sample, the overall health rating was significantly associated with mothers' reports of the number of illnesses at 6- and 15-months (NICHD 1994). The most common illness was respiratory infections (colds, runny noses, coughs) – 76% of 6-month-olds, and 73% of 15-month-olds, had had at least one respiratory infection in the previous three months. Other common illnesses included ear infections and gastrointestinal problems. At 6-months, 20% of babies had not had any of these illnesses, while 39% had had two or more in the past three months; rates at 15-months were 16% and 46%, respectively.

Work-family conflict. Work-family conflict is measured by two scales from Wortman and colleagues (Wortman, Biernat & Lang, 1991). The extent to which work interferes with home is measured by a 6-item scale; sample items include: "Your working creates strains for your children," and "Working leaves you with too little energy to be the kind of parent you want to be." The extent to which home interferes with work is measured by a 5-item scale; sample items include: "Thinking about your children interferes with your performance at work," and "Because of your family responsibilities, you have to turn down work activities or opportunities that you would prefer to take on." Response categories for all items range from 1= "not at all true" to 4 ="very true." Each scale is scored as the mean of the scale items. The Cronbach alpha on the work-to-home interference scale was .85 at 15-months; the Cronbach alpha on home-to-work interference scale was .69 at 15-months (alphas at 6-months were nearly identical). *Work-family conflict* is the mean of these two scale scores; a positive score indicates higher levels of conflict between work and family systems.[1] The mean work-family conflict score at 6-months was 1.75, and 1.74 at 15-months.

Depressive symptomatology was assessed using the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). The CES-D is a 20-item checklist measuring the presence and frequency of depressive symptoms in the previous week. Response categories range from 0 ="rarely or none of the time (less than once a week)" to 3 ="Most or all of the time (5-7 times a week)." Radloff reports reliabilities in the .84-.90 range (1977). The CES-D is one of the most widely used research measures of depressive symptoms, and has been extensively tested for validity and reliability (Cho, Moscicki, Narrow, Rae et al., 1993). The 20-item scale was administered at 1-, 6- and 15-months; alphas in this sample ranged from .85 to .90. The mean CES-D score was 10.28 at 1-month, 8.08 at 6-months and 8.11 at 15-months.

Controls. Models include demographic controls commonly used in work-family research (LaPierre & Allen, 2006): mother's age, race/ethnicity (1=non-Hispanic white, 0= all other) and family income (measured as income-to-needs ratio). All control variables were measured at one point in time, with the exception of family income, which was measured at all time points.

All models control for *negative affectivity* – the propensity to view the world negatively – which was assessed at six months post-partum. Individuals predisposed to negative affectivity may be more likely to report poorer job quality, as well as more likely to report greater depressive symptomatology, introducing a bias into the analyses in studies using self-report measures (Schaubroeck, Ganster & Fox, 1992; Schonfeld, 1996; Noor, 1997; Brennan & Barnett, 1998). Negative affectivity is measured in the NICHD SECCYD by the 12-item Neuroticism subscale of the NEO Five-Factor Inventory (Costa & McCrae, 1985), which measures a predisposition to respond with negative affect. Sample items include: "I often get angry at the way people treat me," and "Too often, when things go wrong, I get discouraged and feel like giving up." The

Cronbach's alpha for the Neuroticism scale was .835 in the NICHD SECCYD sample.

Results[2]

We estimated the relationships specified in Hypotheses 1 through 3 using ordinary least squares regression techniques. All models controlled for negative affectivity, mother's age, mother's race, family income-to-needs ratio and depressive symptomatology at the immediately prior assessment point (i.e., 6 months CES-D regressed onto 1 month CES-D, 15 months CES-D regressed onto 6 months CES-D).

Hypotheses 1 and 2: Unmediated Models

We hypothesized that characteristics of both the work microsystem and the family microsystem would be associated with employed mothers' depressive symptomatology. The results of the model estimating the unmediated effects of work microsystem variables and family microsystem variables are given in Table 1 (Model 1). At both 6- and 15-months, the predictive value of the models are high (R^2 = 0.46 & 0.34, respectively, p<0.001).

Work Characteristics. At both 6- and 15-months post-partum, job quality is significantly associated with depressive symptomatology (β = 0.06, p<0.05; β = 0.16, p<0.001, respectively), however, hours worked is not (β = 0.02, *ns*; β = -0.01, *ns*, respectively). Hypothesis 1 – Job quality and number of hours worked will be associated with working mothers' depressive symptomatology – is supported.

Family Characteristics. Family characteristics are also significantly associated with depressive symptomatology. At six-months, single mothers reported higher depressive symptomatology than did married or partnered mothers (β = -0.10, p<0.01); marital status is in the same direction but does not reach significance at 15-months (β = -0.05, *ns*). In addition, child's health is associated with depressive symptomatology (β = -0.06, p<0.01 at both time points). Hypothesis 2 – Characteristics of the family microsystem, as well as characteristics of the work microsystem, will be associated with working mothers' depressive symptomatology – is supported.

Control Variables. Negative affectivity consistently predicted depressive symptomatology at each time point (βs = 0.50 & 0.15, p<0.001). The only other control variable predicting depressive symptomatology was the previous level of symptomatology (βs = 0.20 & 0.36, p<0.001).

Hypothesis 3: Mediated Models

Following Baron and Kenny (1986), we tested the mediation hypothesis by estimating three models. The first (Model 1) regresses the dependent variable on the independent variables; the second (Model 2) regresses the hypothesized mediator, work-family conflict, on the independent variables; and the third (Model 3) regresses the dependent variable on both the independent variables and the work-family conflict mediator (see Table 1). Mediation is supported if the independent variable of interest (in this case, work and family characteristics) predicts both the mediator and the dependent variable; when the mediator is included in Model 3, the mediator must be related to the dependent variable, and the effect of the independent variable of interest must be less in Model 3 than in Model 1.

Model 2: Work-family conflict. As shown in Table 1, Model 2, both work characteristics are significantly associated with work-family conflict at both 6- and 15-months (job quality: βs = 0.29 & 0.25, p<0.001; work hours: βs = 0.25 & 0.17, p<0.001). However, because work hours were not related to depressive symptomatology in Model 1, work-family conflict cannot serve as a mediator of the relation between work hours and depressive symptomatology. In addition, none of the family characteristics is significantly associated with work-family conflict; therefore, work-

Table 1. *Regression Coefficients For Unmediated And Mediated Models.*

	Model 1		Model 2		Model 3	
Time Point	Predictors of Depressive Symptomatology		Predictors of Work-Family Conflict		Model 1 with Work-Family Conflict Added	
Variables	B	β	B	β	B	β
6 months post-partum	(n=746)		(n=746)		(n=746)	
CES-D at 1 month	0.19***	0.20	0.01**	0.09	0.18***	0.21
Age	0.01	0.02	0.01	0.07	0.02	0.01
Race	0.08	0.00	0.02	0.02	-0.04	-0.00
Income-to-needs ratio	0.02	0.01	-0.00	-0.01	0.02	0.01
Negative affectivity	0.51***	0.50	0.02***	0.21	0.49***	0.47
N children	0.08	0.01	0.02	0.03	0.05	0.01
Child's health	-0.58*	-0.06	0.01	0.02	-0.60*	-0.06
Marital status	-2.26***	-0.10	0.02	0.01	-2.30***	-0.10
Job quality	0.51*	0.06	0.17***	0.29	0.24	0.03
Work hours	0.01	0.02	0.01***	0.25	-0.01	-0.01
WF conflict					1.63***	0.12
R^2	0.46***		0.30***		0.47***	
15 months post-partum	(n=739)		(n=738)		(n=738)	
CES-D at 6 months	0.38***	0.36	0.01**	0.12	0.37***	0.36
Age	-0.02	-0.02	0.01	0.05	-0.03	-0.02
Race	-0.28	-0.01	0.01	0.01	-0.29	-0.01
Income-to-needs ratio	-0.09	-0.04	-0.00	-0.01	-0.09	-0.04
Negative affectivity	0.17***	0.15	0.01***	0.17	0.15***	0.14
N children	0.16	-0.02	0.00	0.01	0.16	-0.02
Child's health	-0.61*	-0.06	- 0.02	-0.02	-0.59*	-0.06
Marital status	-1.16	-0.05	0.03	0.02	-1.19	-0.05
Job quality	1.32***	0.16	0.14***	0.25	1.17***	0.14
Work hours	-0.01	-0.01	0.01***	0.17	-0.01	-0.02
WF conflict					1.03*	0.07
R^2	0.34***		0.21***		0.34***	

* $p < .05$. ** $p < .01$. *** $p < .001$.

family conflict cannot serve as a mediator of the relation between these family microsystem variables and depressive symptomatology.

Model 3: Depressive symptomatology with work-family conflict added. As Table 1, Model 3, shows, work-family conflict is significantly related to depressive symptomatology at 6- and 15-months (β= 0.12, $p \leq 0.001$; β=0.07, $p<0.05$). In addition, the effect of job quality is reduced to nonsignificance (β = 0.03, *ns*), meeting the requirements for a test of mediation (Baron & Kenny, 1986). Hypothesis 3 – The relation between the work and family microsystems, on the one-hand, and depressive symptomatology, on the other, will be mediated by work-family conflict – is supported for job quality, but not for work hours or for the family systems characteristics included in these models.

In follow-up analyses (not shown), we examined separately the role of work-to-home interference, and home-to-work interference, as mediators. We found no differences in these models, compared to the models for the combined work-family conflict measure, at 6-months. At 15-months, work-interferes-with-home did not reach significance as a predictor of depressive symptomatology, although the association was in the expected direction (β= 0.05, p=0.18); home-interferes-with-work was significant (β= 0.08, $p<.001$), indicating that the relation of job quality to depressive symptomatology is mediated by home interference with work.

Discussion

Using an ecological systems model as our theoretical framework, the goal of this study was to examine working mothers' postpartum health. Our model examined two aspects of the paid work microsystem – job quality and work hours – in conjunction with three aspects of the family microsystem – number of children, infant health problems, and the presence of a spouse or partner. We found that women who worked more hours reported greater work-family conflict at both 6- and 15-months post-partum. However, work hours were unrelated to depressive symptomatology.

Job quality was a bigger factor in depressive symptomatology for working mothers of infants. We found that job quality was a significant predictor of depressive symptomatology at both 6- and 15-months post-partum. However, this relationship was mediated by the quality of the interface between work and family. Women in poorer quality jobs reported greater work-family conflict, which was related, in turn, to greater depressive symptomatology. At 6-months, job quality was mediated by both work-to-home interference and home-to-work interference. However, at 15-months, job quality was mediated only by home-to-work interference. This seemingly anomalous finding is actually consistent with other research (Byron, 2005). The significant relation of job quality to home-to-work interference may be a function of the permeability of the work-family interface, or may reflect the reciprocal crossover of work strain to family life within couples (cf., Baker, Demerouti, Dollard, 2008; Bolger, DeLongis, Kessler, Wethington, 1989).

The family microsystem was also important to working women's postpartum health. While the number of children was not related to depressive symptomatology, mothers with infants who were less healthy than other babies, at both 6- and 15-months, reported greater depressive symptomatology. In addition, single mothers reported significantly greater depressive symptomatology at 6-months, but not at 15-months. The effects of family characteristics on depressive symptomatology were not mediated by work-family conflict.

This research extends prior work through the application of an ecological systems model to women returning to work after childbirth. Our analyses considered both the paid work and family microsystems, as well as the interface between work and family. Our study provided additional support for the role of work-family conflict as an intervening variable in the pathway from job

quality to health, providing a more detailed picture of the processes by which employment affects the health of working mothers of infants. However, we did not find support for the role of work-family conflict as a mediator of family factors; rather, marital status and infant health had independent, direct effects on depressive symptomatology.

While research on the relation between working conditions and working mothers' postpartum health is limited, the present study does provide additional evidence of the particular challenges faced by employed mothers of infants. Examining work and family issues among subgroups of working women is central to understanding the apparent contradictions among studies finding that employment has positive health effects vs. studies finding that work-family conflict has negative health effects. A recent study of trends over time concluded that, on balance, women's employment has positive health effects; however, these benefits are reduced for working mothers of young children (Schnittker, 2007). Studies such as the present one are important to an understanding of the factors that contribute to this life stage-related reduction in benefits.

Future research should address these issues among other populations. Working fathers also report work-family conflict, although the predictors of working fathers' experiences of work-family conflict have been found to be different from those of working mothers (Marshall & Barnett, 1993; Lee, Vernon-Feagans, Vazquez & Kolak, 2003). Research with large samples is also needed that examines health among women of color, and among low-income women, who are combining employment and the parenting of an infant. Comparative research that compares the health of U.S. working mothers of infants to the health of similar women in countries with different family policies would also shed light on the question of how best to support the health of mothers of infants.

Publications

Marshall NL, Tracy AJ. [Under Review] After the Baby: Job Stress, Work-Family Conflict and Working Mothers' Health. *Family Relations*.

This article presents the findings reported in this final report.

Marshall NL, Tracy AJ: [2006] Work Organization and Employed Women's Post-Partum Health. Paper presented at the annual meetings of the American Sociological Association, Montreal, CA.

This paper presented preliminary findings.

Marshall NL: [2006] Work Organization and Employed Women's Post-Partum Health. Poster presented at the NORA Symposium 2006: Research Makes a Difference!, Washington, DC.

This poster presented preliminary findings.

Inclusion of gender and minority study subjects

As Messing and colleagues (Messing, Punnett, Bond, Alexanderson, et al. 2003) argue, it is important for occupational health research to consider the role of gender in the ways in which "occupational health issues are experienced, expressed, defined and addressed." While both men and women experience similar health consequences from job stress, women returning to work after childbirth face a combination of workplace demands (both traditional and new demands from the new economy), physical recovery from childbirth, and family demands that are different from those faced by men. As a result, the health issues faced by post-partum employed women are specific to women, while sharing some features with those of fathers of infants. Therefore, to meet the scientific goals of the proposed study, only women are included in the proposed study. In addition, the dataset to be used for secondary analysis includes data on work organization and health for mothers of infants, but does not include comparable data for fathers of infants.

The proposed study sample includes all employed respondents in the NICHD SECC sample; 18% of the sample are minorities. Specifically, the sample is 13% (N=174) Black or African American; 1% (N=8) American Indian, Eskimo, Aleut; 2% (N=30) Asian or Pacific Islander; 2% (N=25) Other (primarily mixed ancestry). While the sample was not designed to be nationally representative, this distribution of minorities is comparable to national distributions at the time of sample enrollment (1991).

Inclusion of Children

Children are not included in this study, because the research questions under investigation concern work organization and occupational health among employed adults; inclusion of children would not be appropriate to the scientific goals of the project.

Materials available for other investigators

The activities conducted under this award did not produce any materials to be shared with other investigators.

FINANCIAL STATUS REPORT

(Long Form)

(Follow instructions on the back.)

1. Federal Agency and Organizational Element to Which Report is Submitted	2. Federal Grant or Other Identifying Number Assigned By Federal Agency	OMB APPROVAL No. 0348-0039	
DHHS/CDC	5 R03 OH008351-02		Page 1 of 1 pages

3. RECIPIENT ORGANIZATION (Name and complete address, including ZIP code)

Wellesley College
106 Central Street
Wellesley, MA 02481

4. EMPLOYER IDENTIFICATION NUMBER	5. Recipient Acct Number or Identifying Number	6. Final Report	7. Basis
04-2103637	25970	[X] Yes [ ] No	[X] Cash [ ] Accrual

8. Funding/Grant Period (See Instructions) From: (Month, Day, Year)	To: (Month, Day, Year)	9. Period Covered by this Report From: (Month, Day, Year)	To: (Month, Day, Year)
8/1/2005	7/31/2008	8/1/2005	7/31/2008

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total outlays	0.00	152,754.00	152,754.00
b. Refunds, rebates, etc.	0.00	0.00	0.00
c. Program income used in accordance with the deduction alternative	0.00	0.00	0.00
d. Net outlays (Line a, less the sum of lines b and c)	0.00	152,754.00	152,754.00
Recipient's share of net outlays consisting of:			
e. Third party (in-kind) contributions	0.00	0.00	0.00
f. Other Federal awards authorized to be used to match this award	0.00	0.00	0.00
g. Program income used in accordance with the matching or cost share alternative	0.00	0.00	0.00
h. All other recipient outlays not shown on lines e, f or g	0.00	0.00	0.00
i. Total recipient shares of net outlays (Sum of lines e, f, g and h)	0.00	0.00	0.00
j. Federal share of net outlays (line d less line i)	0.00	152,754.00	152,754.00
k. Total unliquidated obligations			0.00
l. Recipient's share of unliquidated obligations			0.00
m. Federal share of unliquidated obligations			0.00
n. Total federal share (sum of lines j and m)			152,754.00
o. Total federal funds authorized for this funding period			152,754.00
p. Unobligated balance of federal funds (Line o minus line n)			0.00
Program income, consisting of:			
q. Disbursed program income shown on lines c and/or g above			0.00
r. Disbursed program income using the addition alternative			0.00
s. Undisbursed program income			0.00
t. Total program income realized (Sum of lines q, r and s)			0.00

11. Indirect Expense	a. Type of Rate (Place "X" in appropriate box)	[ ] PROVISIONAL	[X] PREDETERMINED	[ ] FINAL	[ ] FIXED
	b. Rate	c. Base	d. Total Amount	e. Federal Share	
	73.0%	72,763.93	53,117.66	$53,117.66	

12. REMARKS (Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.

13. CERTIFICATION: **I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.**

Typed or Printed Name and Title	Telephone (Area code, number and extension)
James J. Sullivan, Associate Controller for Sponsored Research	(781) 283-2250
Signature of Authorized Certifying Official	Date Report Submitted
	10/23/2008

Form Approved Through 11/30/2010
OMB No. 0925-0001

Department of Health and Human Services

Final Invention Statement and Certification

(For Grant or Award)

DHHS Grant or Award No.

R03 OH008351

A. We hereby certify that, to the best of our knowledge and belief, all inventions are listed below which were conceived and/or first actually reduced to practice during the course of work under the above-referenced DHHS grant or award for the period

08/01/06 *original effective date* through 07/31/08 *date of termination*.

B. Inventions (Note: If no inventions have been made under the grant or award, insert the word *"NONE"* under Title below.)

NAME OF INVENTOR	TITLE OF INVENTION	DATE REPORTED TO DHHS
NONE.		
(Use continuation sheet if necessary)		

C. Signature — This block ***must*** be signed by an official authorized to sign on behalf of the institution.

Title
Dean of the College

Typed Name
Andrew Shennan

Signature
Andrew Shennan

Date
10/29/08

Name and Mailing Address of Institution

Wellesley College
106 Central Street
Wellesley, MA 02481

HHS 568 (Rev. 11/07)