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Work-family conflict, cardiometabolic risk and sleep duration in nursing employees

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Abstract

The study investigates the associations of work-family conflict and other work and family conditions with objectively-measured outcomes cardiometabolic risk and sleep duration in a study of employees in nursing homes. Multilevel analyses are used to assess cross-sectional associations between employee and job characteristics and health in analyses of 1,524 employees in 30 extended care facilities in a single company. We examine work and family conditions in relation to two major study health outcomes: 1) a validated, Framingham cardiometabolic risk score based on measured blood pressure, cholesterol, glycosylated hemoglobin (HbA1c), body mass index (BMI), and self-reported tobacco consumption, and 2) wrist actigraphy-based measures of sleep duration. In fully-adjusted multi-level models, Work-To-Family conflict, but not Family-to-Work conflict was positively associated with cardiometabolic risk. Having a lower-level occupation (nursing assistants vs. nurses) was also associated with increased cardiometabolic risk, while being married and having younger children at home was protective. A significant age by Work-To-Family conflict interaction revealed that higher Work-To-Family conflict was more strongly associated with increased cardiometabolic risk in younger employees. With regard to sleep duration, high Family-To-Work Conflict was significantly associated with shorter sleep duration. In addition, working long hours and having younger children at home were both independently associated with shorter sleep duration. High Work-To-Family Conflict was associated with longer sleep duration. These results indicate that different dimensions of work-family conflict (i.e., Work-To-Family Conflict and Family-To-Work Conflict) may both pose threats to cardiometabolic risk and sleep duration for employees. This study contributes to the research on work- family conflict suggesting that Work-To-Family and Family-To-Work conflict are associated with specific outcomes. Translating theory and our findings to preventive interventions entails recognition of the dimensionality of work and family dynamics and the need to target specific work and family conditions.

Keywords

work-family conflict; Work-To-Family Conflict; Family-To-Work Conflict; supervisor support; long work hours; cardiometabolic risk; sleep duration

INTRODUCTION

Over the last several decades, as women have increasingly joined the full-time labor force in most industrialized countries, it has become clear that combining the responsibilities of caring for families while also maintaining full-time employment may often be challenging (King et al., 2013). This challenge may be greater for women in lower- and middle-wage jobs where benefits are fewer and economic resources flowing to families are constrained (Damaske, 2011; Montez, Hummer, Hayward, Woo, & Rogers, 2011; Montez & Zajacova, 2013b). Men may also increasingly experience these challenges as dual-earner families and single parenthood become more common for both women and men. These challenges are further enhanced in the United States by the absence of many public social protections that enable working men and women to reduce conflicts between work and family responsibilities (Gornick & Meyers, 2003; Gornick, Meyers, & Ross, 1997; Heymann, 2000; Kelly, 2003; Kelly & Moen, 2007; King, et al., 2013). Evidence from Scandanavia suggests

that extensive social policies supporting working parents have benefits for both parents and children (Burstrom et al., 2010; Fritzell et al., 2012; Whitehead, Burstrom, & Diderichsen, 2000) but may not reduce sickness absence or burnout, especially for women. Rates of sickness absence remain high in Sweden and women dominate among the long-term sick listed (Johansson, 2002; Vingard et al., 2005). This suggests that social policies related to family leave may not be sufficient to improve well-being. The division of household responsibilities and less formal workplace practices, norms and values may play additional critical roles (Bratberg, S., & E., 2002; Lidwall, Marklund, & Voss, 2010). Women still bear the majority of home responsibilities though changes have occurred over the last years. Strained financial situations, low occupational grade, demanding jobs and single motherhood may lead to particular vulnerabilities and strains leading to sickness absence (Casini, Godin, Clays, & Kittel, 2013; Josephson, Heijbel, Voss, Alfredsson, & Vingard, 2008; Vingard, et al., 2005; Voss et al., 2008). Thus, norms and values related to home responsibilities and informal practices and strains at work create risks as well as opportunities, especially for women. This multitude of polices, practices and norms may well lead to patterns of strain, increases in work-family conflict and resultant health and sickness absence risks.

Over the last 30-40 years, women's adult life expectancy in the United States has virtually stagnated while life expectancy in almost all other industrialized nations has improved, as a recent National Academy of Science Panel has shown (National Research Council (US) Panel on Understanding Divergent Trends in Longevity in High-Income Countries, 2011). The US now ranks at the bottom of OECD countries in life expectancy for women whereas 40 years ago, the United States life expectancy for women ranked in the middle of industrialized OECD nations. Furthermore, less educated women have actually experienced absolute increases in mortality rates over this period (Montez & Zajacova, 2013b; Olshansky et al., 2012) with these striking losses apparent in a number of states and counties across the US (Kindig & Cheng, 2013). We theorize that these poor international rankings and absolute decreases in life expectancy in less educated and socioeconomically disadvantaged women are in part due to the labor participation of women who also have responsibility for caregiving of young (and old) family members in the absence of many formal or informal work/family practices or policies. Employers have become increasingly concerned with this work/family challenge, especially those companies with female-dominated labor forces. In fact, many corporations have developed work/life policies in the absence of public sector programs (Gornick & Meyers, 2003; Gornick, et al., 1997; Kelly, 2003, 2006; E.E. Kossek, 2005; E.E. Kossek, Barber, & Winters, 1999; E.E. Kossek & Hammer, 2008).

The health care sector is a rapidly growing major industry experiencing many of the challenges associated with work/family issues. Although nursing and related occupations have become somewhat more gender integrated, the majority of those working in extended care jobs are women, many of whom are in the age range when family formation is common (Artazcoz, Borrell, & Benach, 2001; Avendano, Glymour, Banks, & Mackenbach, 2009; Cherlin, 2010). The challenge to health care organizations is to maintain a workforce capable of delivering high quality care to patients while at the same time remaining economically viable in a competitive market constrained by regulations and cost reimbursement policies. Health care industries are also challenged by the need to maintain

adequate work forces 24/7 with complex organizational requirements leading to multiple shifts and long work hours. Almost all health care jobs require face time; little of the work can be done at home or off site. Many of these working conditions, including long work hours and variable shift schedules, are known to be related to work-family conflict (Greenhaus & Beutell, 1985) and have health risks for employees (Floderus, Hagman, Aronsson, Marklund, & Wikman, 2009; Joyce, Pabayo, Critchley, & Bambra, 2010; Karlsson, Knutsson, Lindahl, & Alfredsson, 2003). Work patterns that give the worker more choice or control are likely to have positive effects on work-family conflict (Hammer, Allen, & Grigsby, 1997) and health and wellbeing (Moen, Kelly, & Lam, 2013; Moen, Kelly, Tranby, & Huang, 2011).

The aim of this paper is to describe associations between work-family conflict and worker health in nursing home employees. We are particularly interested in two dimensions of work-family conflict: that is, Work-To-Family Conflict and Family-To-Work Conflict (i.e., the degree to which work interferes with family and the degree to which family interferes with work). Additional conditions of interest include work and family factors such as long work hours and children in the household, schedule control, and supervisor support that may also contribute to work-family effects on health. This study falls into a larger class of studies that have, for the past three to four decades, examined the role of workplace conditions and the work/life interface among men and women in relation to biological indicators of physiologic stress responses, cardiometablolic function, injuries and mental health. Much of this foundational work was conducted in Scandinavia. In the 1970's Frankenhaeuser (Frankenhaeuser, 1989; Frankenhaeuser & Gardell, 1976; Frankenhaeuser & Johansson, 1986; Frankenhaeuser et al., 1989), Lundberg (Lundberg, Mardberg, & Frankenhaeuser, 1994), Gardell (Gardell, 1982), Johansson (Johansson, 1989) and others building on stress theories developed by Cannon (Cannon, 1932) decades earlier, developed a biopsychosocial approach to work-life issues (Frankenhaeuser, 1989). During virtually the same time, Karesek (Karasek, 1979; Karasek, Baker, Marxer, Ahlbom, & Theorell, 1981), Theorell (Karasek & Theorell, 1990) and others developed a model of the ways in which job strain might impact the health of workers.

The primary aim of the biopsychosocial approach to working life was "to provide a broad scientific base for redesigning jobs and modifying work organization in harmony with human needs, abilities and constraints"(Frankenhaeuser, 1989). This work led to the Swedish Work Environment Act effective since 1977 related to adapting working conditions and job redesign. The Work, Family and Health Network study rests on this body of work recognizing that job redesign and how work is organized is central to the health and well-being of workers. The United States lags far behind many European countries in both labor policies, practices and, in fact, in epidemiologic research in this area. Furthermore, other epidemiologists and behavioral and social scientists prominently Orth-Gomer (Orth-Gomer, 2007) Lundberg (Berntsson, Lundberg, & Krantz, 2006; Lundberg, et al., 1994), Karasek and Theorell (Karasek & Theorell, 1990) developed studies in which they investigated the role of job strain or work, family or marital stress in physiologic responses ranging from HPA axis responses, perceptions of symptoms to acceleration of coronary disease progression. Orth-Gomer and colleagues in particular, have made notable advances to the understanding of cardiovascular risks in women (Orth-Gomer, 2012; Orth-Gomer et al.,

2009; Orth-Gomer et al., 2000). Her work indicates that women may have different psychosocial risks than men. Specifically, marital stress may be more central to cardiovascular disease for women than job strain (Orth-Gomer, et al., 2000).

The Work, Family and Health Network Study of nursing home employees adds to the rich history in this area by incorporating biomarkers of cardiometabolic risk and sleep duration in this study of US nursing home employees, most of whom are low and middle-wage working women. These analyses link work and family exposures to directly measured cardiometabolic and sleep risks from the occupational sample of nursing home employees in the Work, Family and Health Study (Bray et al., 2013; King, et al., 2013). Our aim is to link work-family conflict to major health outcomes of the study and to provide baseline descriptions of the sample. Earlier findings from a smaller pilot of other nursing homes from different companies(n=4 sites) (Berkman, Buxton, Ertel, & Okechukwu, 2010) informed many of the approaches and measures. Here we extend our analyses to a wide range of work-family conditions and related job characteristics in this larger, more comprehensive study of direct care workers in nursing homes.

Specifically, we conduct multilevel regression analysis of the associations between work-family conflict and health. We do this in a multilevel context at the level of the individual employee and at the worksite (nursing home) level and using two major health outcomes of the WFH study. Measured cardiometabolic risk is based on a modified Framingham risk factor score (Marino et al., 2014) including blood pressure, cholesterol, glycosylated hemoglobin (HbA1c), body mass index (BMI), and tobacco consumption. Objectively-measured sleep duration is assessed from wrist actigraphy monitoring and recently validated (Marino et al., 2013), and is related to workplace conditions in extended care workers (Berkman, et al., 2010). Sleep has been related to wellness outcomes in multiple workplace studies in direct care workers (Buxton et al., 2012; Sorensen et al., 2011), the personal safety of medical interns and their patients (Barger et al., 2005; Landrigan, Lockley, & Czeisler, 2005; Landrigan et al., 2010; Landrigan et al., 2004), and has been termed a ‘health imperative’ (Luyster, Strollo, Zee, & Walsh, 2012).

We focus attention on the associations between these two outcomes and work-to-family conflict and family-to-work conflict, but also include a range of other work-family conditions that may be related to health as well, specifically long work hours, schedule control, Family Supportive Supervisor Behaviors (FSSB), and having young children living at home. We include demographic, socioeconomic and job strain (job demands and decision authority) characteristics in our analyses to be sure there is not confounding by these factors associated with our two health outcomes.

This work builds on a number of related theories proposing that psychosocial strains, in this case primarily related to the work/family interface, influence health. The specific theories related to work-family conflict fall in a class of larger frameworks related to biopsychosocial and ecosocial frameworks developed by Frankenhaeuser (Frankenhaeuser, 1989; Frankenhaeuser & Johansson, 1986) and Krieger (Krieger, 2011) respectively. These frameworks outline models in which social and economic conditions may induce stressful person-environment interactions and cause such strains to become biologically embedded

through stressful physiologic responses or risk related behaviors. Ecosocial theory shares a great deal with biopsychosocial frameworks (Krieger, 2011) in which social strains produce physical stress that then influences markers of disease processes commonly related to cardiovascular and metabolic disorders. Here we integrate these theories as others have done (King, et al., 2013) to help us frame an understanding of why work-family conflicts, in both directions, have important consequences for the health and wellbeing of employees, especially those with fewer social or economic resources.

Specific theories of work-family conflict extend and specify further the above macro theories. Theories developed by Bianchi and Moen (Bianchi & Milkie, 2010; Moen, 2003; Moen, Kelly, & Hill, 2011) suggest that work-family conflict also builds on role theories in which conflicting demands shape strains. At the interface between job and family, both jobs and families can have variable demands, resources and sources of control to moderate those demands. In a measure of work-family conflict developed by Netemeyer (Netemeyer, Boles, & McMurrian, 1996), conflict can occur from work to family, or family to work. For women, especially, who even today fulfill the largest obligations with regard to unpaid home care, added roles in the labor force may lead to exhaustion and illness (Arber, Gilbert, & Dale, 1985). Both work and family roles represent core components of adult identity for many men and women and thus strains in fulfilling one of these roles influenced by commitments to the other role are hypothesized to cause a host of stress-related outcomes and are in part mediated by risk related health behaviors (Frone, Russell, & Cooper, 1997; Grzywacz & Marks, 2000; Hammer & Sauter, 2013). In direct contrast to these theories in which multiple roles produce strains are theories of role enhancement. Such theories posit that multiple roles are fulfiling and may be health promoting for a number of reasons. Martikainen (1995) and Barnett have proposed ways in which multiple work and family roles may enhance well being (Barnett & Baruch, 1985). We will return to this these opposing theories in the discussion as we evaluate our findings in light of our primary hypotheses which rest on the models in which work family conflict will lead to poor health outcomes.

A related theory of job strain developed by Karasek, Theorell and others (Karasek & Theorell, 1990; Karasek, 1979; Siegrist, 1996) suggest that job strain influences health through a number of mechanisms from increasing physiological stress responses to influencing risky behaviors. Further additions to the model suggest that low supervisor and/or coworker support is a third dimension of job strain influencing health and well-being. Job strain theories indicate that such workplace exposures may directly alter cardiovascular disease (CVD) risk, (Choi, Schnall, Ko, Dobson, & Baker, 2013; Kivimaki et al., 2012; Landsbergis & Schnall, 2013) as well as influencing behaviors such as tobacco consumption, diet, and physical activity, which in turn affect CVD risk. As such, they are relevant to work and family conflict. We include demand and decision authority in our analyses to make sure we are not conflating work-family strain with straightforward job strain. Furthermore, we have developed a work-family job strain model in which social support may reduce cardiometabolic and other health risks (Berkman & O'Donnell, 2013). Supervisor support related to work–family issues [i.e., FSSB] adds a new dimension to general measures of supervisor support (Frye & Breaugh, 2004; Hammer, Kossek, Bodner, & Crain, 2013; Thomas & Ganster, 1995).

Building on these theories and frameworks, we hypothesize that

1. Employee reports of work-family conflict including both Work-To-Family Conflict as well as Family-To-Work Conflict will be positively associated with cardiometabolic risk and negatively associated with actigraphically measured sleep duration. We hypothesize that these associations will be independent of a wide range of other sociodemographic and work-related conditions.
2. Based on our earlier findings, supervisor behaviors, in this study measured by Family Supportive Supervisor Behaviors (FSSB) will be associated with our two outcomes: cardiometabolic risk and sleep duration. Higher levels of FSSB will be associated with lower cardiometabolic risk and longer sleep duration.
3. Working conditions that strain home life – including long work hours, low schedule control, high job demands and low decision authority – will influence employee health. Furthermore, working parents with children at home will exhibit increased cardiometabolic risk and shorter sleep duration.

METHODS

Study Design

This study is part of a large research network effort to understand the ways in which modification of workplace practices and policies improves the health of employees, their families, and the industries in which they work (Bray, et al., 2013; King, et al., 2013). In this paper we report baseline results from employees in an extended care (nursing home) industry. (Hammer, Kossek, Anger, Bodner, & Zimmerman, 2011; Kelly & Moen, 2007; Kelly, Moen, Oakes, & Fan, Accepted; E. E. Kossek, Hammer, Kelly, & Moen, 2014). Our primary goal here is to present the work and family conditions in relation to two primary outcomes, cardiometabolic risk and sleep duration in a sample of employees in one firm.

Research Site

Our corporate partner, a company we refer to by the alias “Leef”, was identified after sending letters to several potential companies with appropriate characteristics including a large number of facilities with geographic proximity, and stability and willingness to participate and to donate work time for respondents’ participation. After several meetings with the regional CEO, heads of units related to human resources and clinical care, and regional directors, Leef leadership confirmed its interest to participate.

Of the 56 facilities at Leef at study launch, 30 were selected from the New England region of Leef. Facilities were excluded if they were in a very isolated setting, if there were fewer than 30 direct patient-care employees, or if facilities were recently acquired. One facility was excluded due to ongoing participation in another study. None of the 30 facilities declined.

Study Participants

All employees who were direct care workers with at least 22 hours work /week and not exclusively night-workers were invited to participate (Bray, et al., 2013). Excluded from our

study were employees in custodial, kitchen and food preparation, clerical and other employees who had no direct patient care duties with residents. We selected direct care workers for participation in this study because they had a common set of policies, regulations and work activities, and share many working conditions with other health care sectors. Furthermore, they constitute a low and middle-wage work force often neglected in work-family studies. Employees who worked only night shifts were excluded from this study; however, employees who worked some day and night shifts were included.

Measures

Trained field interviewers administered survey instruments and health assessments as described elsewhere (Bray, et al., 2013). Computer-assisted personal interviews spanned demographics, socioeconomic status, family demographics, respondent's work environment, physical health, mental health, and family relationships and took about 50 minutes to administer and health assessments an additional 20 minutes. All participants provided informed written consent. Employees received up to $60 for completing all components. Physical health outcomes were measured, including primary biomarker outcomes of cardiometabolic disease risk and sleep. Sleep duration is based on wrist actigraphy. Cardiovascular/metabolic risks included blood pressure, HbA1c, cholesterol (Total and HDL), BMI, smoking status (see Bray et al 2013 for full description). We describe variables from three domains: 1. sociodemographic conditions, 2. work-family conflict and other work conditions and 3. health.

Sociodemographic conditions of employees—Employee age was analyzed in one-year intervals and gender was coded as male or female. Employees were asked two separate questions about their race and ethnicity. These responses were used to construct a race/ethnicity variable: Non-Hispanic White, Non-Hispanic Black, Latino and other. Additionally, employees indicated whether they were born in the United States for foreign-born status (yes/no). Marital/partner status was categorized as currently married or living with a partner (yes/no).

Occupation was assessed by asking official job titles, and coded as registered nurse or licensed practical nurse (RN/LPN), certified nurse assistant (CNA) and other. Household income (annual) was assessed in $5,000 increments up to $60K. The number of people in household was measured by report of household census. These responses were categorized in relation to U.S. Poverty Thresholds for 2011 (U.S. Census Bureau, 2011). For these analyses, we use a dichotomized version, greater than 300% of poverty threshold or less.

The number of children less than or equal to 18 in household was assessed through a household census and dichotomized (none, one or more).

Measures of work-family conflict and other work and family conditions—Work/family conflict is a form of inter-role conflict in which role pressures from work and family domains are not compatible (Greenhaus & Beutell, 1985). This construct is bidirectional in nature (family-to-work and work-to-family) and was operationalized here using Netemeyer's validated Work-Family Conflict, or WTFC (Netemeyer, et al., 1996). Employees were asked five questions regarding conflict in each direction. Responses were

coded 1-5 (strongly disagree to strongly agree) and averaged to create a continuous measure in which higher scores reflect greater conflict (alpha for WTFC=0.9 and alpha for FTWC =0.8).

Family-supportive supervisor behaviors (FSSB) assessed employee appraisals of supervisor's behavior related to integrating work and family (Hammer, et al., 2011; Hammer, Kossek, Yrgaui, Bodner, & Hanson, 2009). Employees were asked about family-related supervisory support in four domains: emotional support, instrumental support, role modeling and creative management. We used a short form of FSSB derived from four items (Hammer, et al., 2013), categorized 1-5 (strongly disagree to strongly agree) and averaged to generate an overall score, with higher scores reflecting greater FSSB (alpha=0.9).

Schedule control was used to measure employees' control over the hours that they work. We utilized a shortened, 8-item version of Thomas and Gansters' scale (Thomas & Ganster, 1995). Items included how much choice employees have over: when they take vacation or days off, when they take off a few hours, when they begin and end work days, total number of hours worked/week. Responses were coded 1-5 (very little to very much) and averaged with higher scores reflecting greater schedule control (alpha=0.7).

Long work hours were assessed from an item saying "About how many hours do you work in a typical week in this job?" and "On average, how many hours per week do you work at this other job(s)?" and summed if the respondent indicated he/she has an additional job to obtain total hours worked/week across all jobs.

Psychological Job Demands and Decision Authority were based on the work of Karasek and colleagues (Karasek & Theorell, 1990; Theorell et al., 1998). Employees were asked about having enough time to get work done and working very fast and hard (psychological job demands) as well as freedom to decide how to do work and having a say about what happens on the job (decision authority). Response categories were strongly disagreed, disagreed, neither, agreed or strongly agreed (1-5, respectively). These ordinal responses were averaged separately and analyzed continuously (alpha=0.6 and alpha=0.6 for psychological job demands and decision authority respectively).

Site-level measures of work place organization, work-to-family conflict, FSSB and other measures were created by aggregating individual-level responses, centered at the mean and entered as continuous variables.

Health measures of employees—A cardiometabolic risk score (CRS) was created based on modifiable risk factors in the widely-used Framingham risk score (e.g., age- and sex-specific strata use different score calculations). The score has been independently validated using the Framingham (offspring) data to predict subsequent cardiovascular event risk (Marino et al., 2014). Biomarkers measured as previously described (Bray, et al., 2013) included height and weight to calculate body mass index (BMI), blood pressure, and HbA1c. Seated blood pressure readings were collected three times at least 5 minutes apart during the interview, and before blood sampling, using wrist blood pressure monitors (HEM-637, Omron Healthcare, Bannockburn, IL). Body mass index (height/weight^2) was calculated

based on height (Seca213/214 stadiometers, Seca North America, Hanover, MD) and weight (Health-O-Meter 800KL, Jarden Corporation, Rye, NY) assessment. Up to five blood spots were collected on bar-coded filter paper (903 Protein Saver Paper, GE Healthcare Bio-Sciences Corp., Piscataway, NJ) as previously described (Ostler, Porter, & Buxton, 2014), air-dried, and sealed in a plastic bag for room-temperature shipment with desiccant for storage at −86°C until assay for cholesterol as specifically validated for this study from serum to DBS equivalents (Samuelsson et al., Under Review). Interviewers also collected a 1 microliter blood droplet for immediate measurement of HbA1c levels (DCA Vantage Analyzer, Siemens Healthcare Diagnostics, Frimley, Camberley, UK). Tobacco consumption was self-reported. In the cardiometabolic risk score employees are categorized as smokers or non-smokers.

Sleep was assessed by one week of wrist actigraphy (Spectrum, Philips/Respironics, Murrysville, PA) that captures single-axis wrist movements and light levels in 30-sec epochs, and, via induction, an “on-wrist” indicator of compliance. Measures of sleep quantity were scored using a standard algorithm recently validated (Marino et al., 2013) and included average daily (24-hr) *sleep duration* (in hours).

Data from each subjects’ sleep watch was analyzed using manufacturers software (Actiware v 5.61, Philips/Respironics) by at least two members of the scoring team as previously described (Olson et al., 2013) using the manufacturer’s ‘medium density algorithm as recently validated against polysomnography (Marino et al., 2013). A recording was deemed invalid if there is constant false activity (a device malfunction), or for irretrievable data. Reasons for invalid days within a recording include watch error, such as false activity, and subject non-compliance. Diaries were not used due to subject burden, recall bias, and low response rates in previous studies, e.g., (Lauderdale et al., 2006). Concordance was assured between at least two scorers for whether the recording is valid or not, number of valid days, and all scorers have used the same cut time to define 24-hr days. Sleep periods differing by 15 minutes in length, Total Sleep Time (TST) or Wake After Sleep Onset (WASO) were rescored with all final adjudications by a coauthor.

Analyses

Gender-stratified, unadjusted means are described initially. We then used multilevel models to examine factors influencing cardiometabolic risk score (CRS) and sleep. The multilevel models account for the hierarchical structure of the data with level 1 units (i.e., employees) nested within level 2 units (i.e. nursing homes), and included a site specific intercept allowing random variation due to unobserved, or unmeasured site-level characteristics.

RESULTS

Results are presented in three major areas: 1) the characteristics of the sample, 2) multilevel analyses related to cardiometabolic risk and 3) multilevel analyses related to sleep duration.

Sample characteristics and distribution of work related conditions

Overall, of 1,783 total eligible employees, we enrolled 1,524 employees [1,406 women, 118 men, a response rate of 85% (Bray, et al., 2013)]. These employees were classified as direct

care workers, including such occupations as nurses, certified nursing assistants, and a small number of administrators.

Demographic characteristics are shown in Table 1. The vast majority of men and women in our sample are CNA's. Both genders report a high level of job demands (mean=3.7 for men vs. 3.8 for women on a scale of 1-5) and family supportive supervisory behavior (mean=3.8 for men vs. 3.7 for women on a scale of 1-5).

We identified two primary health outcomes of our study: cardiometabolic risk and sleep duration. The distributions of cardiovascular risk and sleep duration for men and women are depicted in Figure 1. Men and women averaged 7.0 and 7.6 hours of sleep per night, respectively.

Multi-level analyses of work-family conflict and work-family factors on cardiometabolic risk and sleep duration

We use multilevel models at the individual and facility level to assess the potential health risks associated with work-family conflict (both directions), family composition and specific job characteristics of schedule and job control, supervisor support and long work hours. Our aim here is to assess both compositional and contextual factors that are associated, in the cross-section, with cardiometabolic risk and actigraphically-assessed sleep duration.

Cardiometabolic risk—Table 2 shows the estimates along with significance levels for cardiometabolic risk in a model including both individual- and site-level characteristics in a multilevel regression model.

There is a significant positive association between work-to-family conflict (WTFC) and cardiometabolic risk; a one-unit increase in self-reported WTFC score was associated with an increase of half a percentage point of CRS risk. These analyses reveal no significant association between family-to-work conflict and cardiometabolic risk score; nor does the FSSB predict the cardiometabolic risk score. In these analyses, women, married employees, and foreign-born employees have reduced risks. We also see that occupational status is negatively associated with risk, in that nurses have lower risks than certified nursing assistants who are more disadvantaged.

Because age is strongly associated with cardiometabolic risk (Marino et al., 2014), we tested for interactions of age with work-family conflict. We found a statistically significant interaction between age and WTFC (coefficient for interaction term is −0.03, 95% CI=-0.05, −0.01) where increasing WTFC was associated with increasing CRS score among younger aged employees (Figure 2).

We also found a statistically significant interaction between employee age and having children ≤18 years in the household on cardiometabolic risk (coefficient for interaction term is −0.16, 95% CI=−0.21, −0.10); having no children ≤18 years in the household exacerbated the cardiometabolic risk score associated with age (Figure 3).

After adjusting for individual and worksite-level characteristics, 2% of the total variance in cardiometabolic risk found in this sample was attributable to the nursing home.

Multi-level analysis of work-family conflict and work-family factors and Sleep duration—Table 2 shows the results of a multilevel analysis of the same work-family conditions with sleep duration. Our findings indicate Family-To-Work Conflict is associated with shorter sleep duration. For every one unit difference in Family-To-Work Conflict score, employees have about 8 (95% CI: −14.8, −1.3) minutes less of sleep. Work-to-family conflict is actually associated with increased sleep duration, on the order of 5 minutes. In addition, long work hours and having a child under 18 living at home are both strongly associated with shorter sleep durations. In full models controlling for all covariates, employees with children under 18 in the household had an average of almost 11 minutes per night shorter duration of sleep. In fully adjusted models, for every 10 hours of work per week (across all jobs), employees slept almost 5 minutes/night less. Figure 4 shows the relationship between sleep duration and working hours for an average participant in the study.

As expected, age and gender were associated with sleep duration. Sleep duration is longer for women than men, and, as age increases, sleep duration decreases. Employees who were white had significantly longer sleep durations than all other race/ethnic groups. As shown in table 2, about 3% of the variation in sleep for these employees is attributable to the worksite.

DISCUSSION

Findings from the Work, Family and Health Network Study in nursing homes illustrate the ways in which work-family conflict is associated with some of the most important health risks to which workers are exposed. This work shows that occupational conditions related to the social environment may take a toll on health, as posited generally by the biopsychosocial and ecosocial frameworks developed by Frankenhaeuser and Krieger (Krieger, 2011). Evidence from our nursing home employees partially supports specific Work- Family conflict theories but also suggests that the current theories do not fully explain the dimensionality with regard to type of work/family interaction per se nor the specificity of the outcomes that we observe. A simple integrating theory that consistently predicts a set of outcomes does not capture the richness and complexity of our findings. Should they be replicated in future studies, they indicate that more theoretical refinement is needed. For instance, as noted by Barnett (1996) and Grzywacz and Marks (2000), most integrating theories of work family interface have focused on conflict. Our findings suggest risks associated with conflict, but we also observe associations with some positive outcomes. For example, sleep duration is positively associated with work-to-family conflict. This may indicate that work roles, even as they have negative spillover to family life, may nonetheless confer advantages related to role accumulation (Martikainen, 1995). Findings in this cross-sectional study of an occupational sample of direct care workers in nursing homes suggest that cardiometabolic risk and sleep duration are both associated with work-family conflict. Confirming theories related to role conflict, cardiometabolic risk is associated with high work-to-family conflict and shorter sleep duration is associated with high levels of family-to-work conflict. Incorporating a full understanding of the multidimensionality of the construct of work-family conflict and the specificity of associations with outcomes flows from the evidence from this current study.

Our second hypothesis related to the positive impact of social support from supervisors was not supported in our study; family supportive supervisor behaviors (FSSB) was associated with neither cardiometabolic risk nor sleep duration. Our third set of hypotheses was partially supported. Long work hours and having young children at home while maintaining full-time paid work were directly related to shorter actigraphically assessed sleep. This cluster of family conditions related to having young children at home and high levels of family conflict spilling over to work may create an environment in which sleep is more precarious. In addition, other work conditions, notably working long hours, socioeconomic disadvantage, lower occupational status and family conditions including being single and having young children at home, are associated with at least one of these cardiometabolic risk or sleep outcomes. These findings suggest that more general theories about stress drawing on biopsychosocial frameworks are central to understanding health in vulnerable populations. Sociodemographic characteristics are associated with cardiovascular risk and sleep duration. Age and gender impact both outcomes. Employees who are foreign-born have lower cardiometabolic risk. These findings are consistent with reports that first generation immigrants from a number of sending countries to the U.S. have lower rates of tobacco and alcohol consumption (Blue & Fenelon, 2011; Lopez-Gonzalez, Aravena, & Hummer, 2005). Participants who identified as black or “other race” race had shorter sleep duration. These findings suggest that the socioeconomic profiles for health vary by outcome, and that health risks faced by such disadvantaged populations are not completely contained in the work measures we included here. Lower occupational status has been shown in women to be associated with increased cardiovascular risk independent of decision authority or demand-control (Wamala, Mittleman, Horsten, Schenck-Gustafsson, & Orth-Gomer, 2000), and, in the same study, work stress was unrelated to cardiovascular disease (Orth-Gomer, et al., 2000), as we observed. Since we have a predominantly female workforce in our study, our findings support the earlier work by Orth-Gomer (Kiecolt-Glaser, Glaser, Cacioppo, & Malarkey, 1998; Orth-Gomer, et al., 2000) and others on the importance of marriage for women. Recent systematic reviews suggest that work stress-related cardiovascular risk is more consistently observed in male samples than in women (Backe, Seidler, Latza, Rossnagel, & Schumann, 2012) whereas marital stress is more important for women (Orth-Gomer, et al., 2000). For sleep, socioeconomic conditions related to neighborhood and other family factors as well as overall job insecurity could well shape patterns of risk of short sleep duration for many people in lower socioeconomic positions (Bartley, 2005; Bartley & Ferrie, 2001; Beatty et al., 2011; Ertel, Berkman, & Buxton, 2011; Hurtado, Sabbath, Ertel, Buxton, & Berkman, 2012; Okechukwu, El Ayadi, Tamers, Sabbath, & Berkman, 2012).

Comparison to other Work, Family Network findings: integrating similar and divergent findings

Our findings are consistent with many of the findings of work-family conflict related to other health outcomes in earlier studies (King, et al., 2013) and make an important contribution by adding directly assessed biomarkers of cardiometabolic risk and sleep duration. Earlier findings from other industries in our network suggest that flexible schedules and interventions aimed at improving employee control over work family issues and schedule control have positive impacts on self-reported health outcomes. (King, et al.,

2013; Moen, Kelly, Tranby, et al., 2011) Some of our associations however are different from those using objectively-measured outcomes that we reported in an earlier study of nursing home employees (Berkman, et al., 2010). We discuss these differences in some detail since there are important reasons why we might observe these differences. First, the 30 nursing homes in this study are affiliated with one company with shared common practices while the first study identified a number of nursing homes with distinctly different corporate characteristics (private and for profit, religiously affiliated and non-religiously affiliated). Perhaps most important from our perspective is that supervisory support in this study was a measure based on employee reports of supervisor support (FSSB). In contrast, the earlier study based manager support scores on in-depth qualitative information provided by managers themselves and then linked with employee health outcomes. We suspect that such manager interviews may more accurately reflect actually implementation of family friendly work practices. Second, in our earlier work (Berkman, et al., 2010), we studied a variety of work groups within each nursing home and including night workers, not just those in direct patient care and excluding night workers.

Why might different work family risks be related to specific outcomes in our study?

We suspect that cardiometabolic risk develops over a longer period of time than do patterns of work-related sleep disruption. Therefore, associations between many components of cardiometabolic risk and work-to-family conflict may reflect longer term exposures. Sleep duration however is quite susceptible to short term and acute experiences. Therefore long work hours and having young children at home and family-to-work conflict may well influence sleep duration acutely. Earlier reports in occupational cohorts have also reported that when family demands, measured by the number of dependents, and job strain are coupled together, they are strongly associated with longitudinal increases in sickness absence related to both physical and psychiatric causes (Melchior, Berkman, Niedhammer, Zins, & Goldberg, 2007; Sabbath, Melchior, Goldberg, Zins, & Berkman, 2012).

Limitations and strengths

Our study has both limitation and strengths based on our study design, sample selection and measures. Because our study is cross sectional, we do not have the ability to interpret directionality or causation and it may be that cardiometabolic risks also shape work experiences and patterns of psychological functioning.

Both health-related outcomes were assessed from biological markers of the outcome: actigraphy monitors to assess sleep duration and blood samples, well-calibrated measures of blood pressure, HbA1c, cholesterol and measured BMI contribute to cardiometabolic scores. Thus, while our study is cross-sectional, our two indicators of health outcomes were not influenced by reporting bias. Therefore, it is less likely that psychosocial measures or other common sources of reporting biases confound the associations between these risk factors and indicators of family and work strain. Response rates were high in this study but it is conceivable that those with the highest degree of work-to-family conflict may not have agreed to or been able to participate. We also note that, surprisingly, the measure of sleep duration in this mostly female working population was much higher (7.6 hrs/night, on average) than might be expected from previous studies, or national norms that place adult

sleep near 7.0 hrs/night (Hale, 2005; National Sleep Foundation, 2005). This may be in part due to the exclusion of night workers who have been shown to have shorter sleep duration in nursing home samples (Ertel, et al., 2011).

Another limitation of our study is its basis in a single company albeit with numerous facilities in that employees may share more characteristics than is usual in a cross section of total nursing homes in the region. This is also strength of the study, however, in that it provides a common set of policies and practices, thereby limiting exogenous forces that may affect outcomes. We also excluded employees who exclusively work night shifts. But many of our participants worked split shifts, with some of them including evening shifts. We suspect this limitation in enrollment has a conservative bias (if any) on the associations we report since we have limited the experiences and variation in responses to employees and nursing home facilities who all work under more similar conditions to each other than would be if we had enrolled employees in a number of companies or who worked only night shifts. These and other longitudinal studies (e.g., (Jacobsen, Reme, Sembajwe, Hopcia, Stiles, et al., 2014; Jacobsen, Reme, Sembajwe, Hopcia, Stoddard, et al., 2014)) demonstrate a longitudinal association between sleep deficiencies and increased cardiometabolic risk in the long-term, and highlight areas for future research, and workplace interventions.

Our study has many strengths in both design and measurement. This is one of the first studies incorporating examination-based biomarkers of cardiovascular, metabolic risks and sleep duration in a study of work-family conflict in health care workers in the United States, though there is a long research tradition in Scandinavia and much of Europe in this area. By drawing on biomarkers as well as nursing facility level characteristics, we can shed light on work and family dynamics that influence early cardiometabolic risk by setting trajectories of predisease pathways in this primarily female and low and middle-wage workforce.

Conclusion

American women lag in life expectancy behind women in virtually all other industrialized countries (Meara, Richards, & Cutler, 2008; Montez, et al., 2011; Montez & Zajacova, 2013a, 2013b; National Research Council (US) Panel on Understanding Divergent Trends in Longevity in High-Income Countries, 2011). The vast majority of these women are in the work force and many are raising children at the same time they are taking care of elders (Neal & Hammer, 2007). This pattern of working while raising a family has increased over time along with the increase in reports of work-family conflict (Kelly, 2003). Furthermore, the increasing number of single parents may make this population even more vulnerable to strains at work. The US lacks coherent work-family policies and practices that may protect these women, and men in similar positions. The division of household labor is also unequal leading to the “second shift” phenomena for women. Informal practices, norms and values which do not lead to balance between work and family may further exacerbate stresses. We may be observing the consequences of these demanding situations, especially for those in low and middle wage jobs who have little flexibility. Our findings inform current work family theories and challenge us to integrate the specificity and dimensionality of work and family dynamics into an expansion of the theoretical frameworks. A fuller incorporation of ecosocial frameworks as expressed by Krieger and ecological theory in relation to the work

family nexus as articulated by Grzywacz and Marks are logical launching points. Our next steps are to assess whether The Work, Family and Health Network worksite intervention designed to improve working conditions in these domains will improve health and well-being for these hardworking employees and their families.

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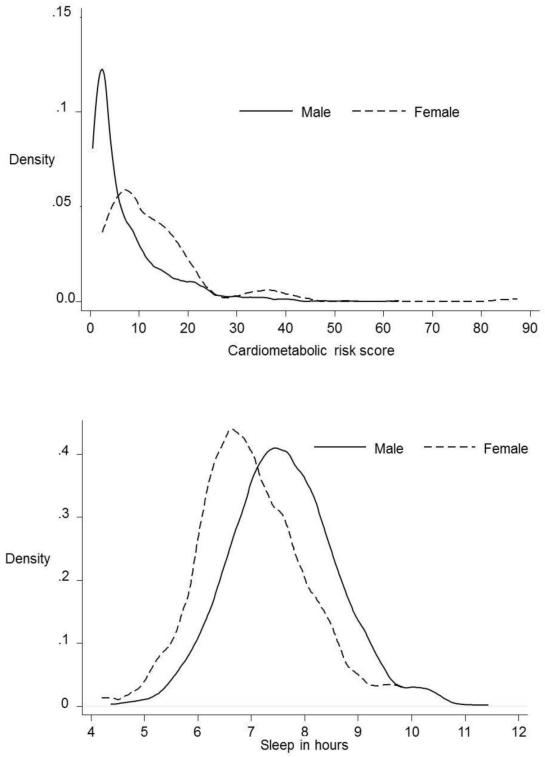

Figure 1. Distributions of outcomes (cardiometabolic risk, left; actigraphically-measured sleep duration, right) by gender in the Leef cohort of extended care healthworkers

Solid lines: males, dashed lines, females.

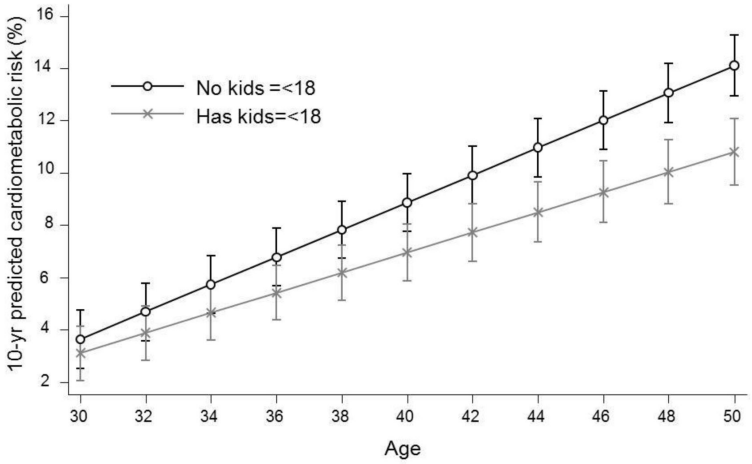

Figure 2. Adjusted, predicted 10-yr cardiometabolic risk score (±95% CI) interacts with respondent age and presence of children ≤ 18 years in household

[c]Age interaction with presence of children figure shows the predictions for US-born, low-income Black females who are CNAs/Other with individual and site-level psychological outcomes centered at zero.

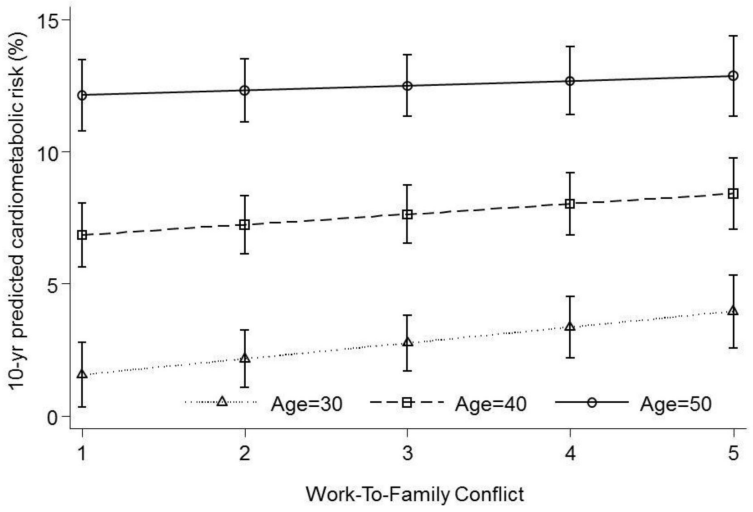

Figure 3. Adjusted, predicted 10-yr cardiometabolic risk (±95% CI) showing interaction between individual-level work-to-family conflict and age

[d]Age interaction with work-to-family conflict figure shows the predictions for US-born, low-income Black females with kids less than 18 who are CNAs/Other with individual and site-level psychological outcomes centered at zero.

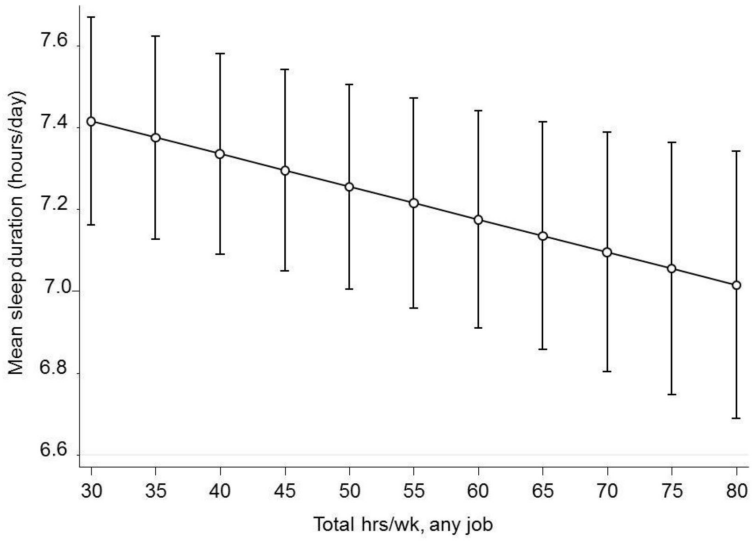

Figure 4. Total work hours per week across all jobs, and adjusted, actigraphically-measured mean sleep duration

[e]Sleep figure shows the predictions for US-born, low-income Black females with kids<=18 years old who are CNAs/Other who are mean centered for all individual-level and worksite-level psychological characteristics.

Table 1

Sociodemographic and health characteristics by gender, Leef baseline cohort of extended care workers.[a]

	Males (n=118)		Females (n=1406)	
	Mean or %	**SD**	**Mean or %**	**SD**
Sociodemographics				
Age (mean, standard deviation)	36.4	(9.5)	38.7	(12.7)
Married/ Partnered (%)	53		64	
Caregiver (%)	26		30	
Race/Ethnicity (%)				
White	44		67	
Black	32		12	
Hispanic	12		14	
Other	12		8	
Foreign-born (%)	43		25	
Occupation - RN/LPN (%)	24		28	
Post-secondary education (%)	73		61	
Poverty level: < 300% of 2011 poverty threshold (%)	55		62	
Kids <=18 in HH (%)	31		48	
Total hrs work / wk (all jobs up to two jobs)	43.6	(11.7)	39.6	(10.5)
Work characteristics (mean, standard deviation)				
Decision authority	3.5	(0.7)	3.4	(0.8)
FSSB	3.8	(0.8)	3.7	(0.9)
Job demands	3.7	(0.8)	3.8	(0.7)
Schedule control	2.7	(0.8)	2.6	(0.7)
Work-to-family-conflict	2.6	(0.9)	2.8	(0.9)
Health conditions (mean, standard deviation)				
Sleep duration (hrs/day)	7.0	(1.0)	7.6	(1.0)
Cardiometabolic score (% 10-yr risk)	13.0	(11.1)	7.3	(7.7)
Blood pressure (mmHg): Systolic	122.6	(11.7)	114.1	(13.0)
Blood pressure (mmHg): Diastolic	79.3	(9.6)	71.8	(9.1)
BMI	28.8	(5.8)	29.5	(7.1)
HbA1c	5.5	(0.7)	5.5	(0.6)
Smoker (%)	25		31	
Total cholesterol (mg/dL)	161.2	(26.0)	150.6	(25.8)

[a] Age:N=1404 for females; Race: N=1405 for females; Occupation: 1404 for females; Education: 1405 for females; Poverty: N=115 for males and 1367 for females; Total hours worked: N=117 for males and 1403 for females; Job demands: N=118 for males and 1405 for females; Decision authority: N=118 for males and 1393 for females; WTFC: 118 for males and 1402 for females; FSSB: 118 for males and 1392 for females; Smoking: N=118 for males and 1404 for females; Blood pressure: N=117 for males and 1394 for females: BMI: N=115 for males and 1386 for females; Total cholesterol: N=111 for males and 1353 for females; HgA1C: N=110 for males and 1343 for females: Cardiometabolic score: N=106 for males and 1306 for females; Sleep: N=85 for males and 1134 for females

Table 2

Associations between individual and site-level characteristics with mean cardiometabolic risk and sleep duration, Leef Baseline Cohort of extended care workers.

	Predicted 10-yr Cardiometabolic risk score (%)	Confidence Interval	Sleep in minutes	Confidence Interval
Age (centered at mean)	**0.52**	(0.50, 0.54)	**− 0.32**	(−0.62, −0.03)
Female vs. Male	**− 6.97**	(-7.97, −5.97)	**30.52**	(17.293, 43.743)
Married vs Unmarried	**− 0.77**	(-1.33, −0.20)	1.24	(−6.03, 8.52)
Race/ethnicity, Black vs White	−0.09	(−1.14, 0.95)	**− 20.15**	(−34.39, −5.91)
Race/ethnicity, Hispanic vs White	−0.06	(−1.02, 0.91)	−12.32	(−24.84, 0.20)
Race/ethnicity, other vs White	−0.12	(−1.11, 0.87)	**− 17.31**	(−30.11, −4.51)
Foreign-born vs US-born	**− 1.75**	(−2.55, −0.95)	−9.16	(−19.69, 1.38)
Occupation, RN vs CNA/Other	**− 0.99**	(−1.64, −0.33)	−7.06	(−15.57, 1.45)
Poverty, ≥ 300% vs <300% / missing	0.38	(−0.26, 1.02)	0.38	(−7.95, 8.72)
Children, ≤ 18 y vs > 18 y	**− 1.31**	(−1.88, −0.73)	**− 10.08**	(−17.44, −2.71)
Total hours employment (all jobs)	**− 0.03**	(−0.05, 0.00)	**− 0.48**	(−0.81, −0.15)
Job psychological demands	**− 0.41**	(−0.79, −0.03)	−2.52	(−7.35, 2.31)
Decision authority	−0.09	(−0.48, 0.31)	2.52	(−2.63, 7.67)
Work to Family Conflict	**0.39**	(0.04, 0.74)	**5.67**	(1.07, 10.27)
Family to Work Conflict	−0.06	(−0.58, 0.45)	**− 8.06**	(−14.83, −1.29)
Schedule control	0.00	(−0.40, 0.39)	0.6	(−4.49, 5.68)
Family Supportive Supervisory Behavior	0.04	(−0.29, 0.36)	−1.1	(−5.23, 3.03)
Constant	15.89	(14.71, 17.02)	439.35	(423.92, 454.78)
Observations	1,338		1,154	
Number of groups	30		29	
df	23		23	
Log likelihood	−3988		−6241	
Variance component btw nursing homes	0.38	(SE= 0.27)	83.76	(SE= 51.51)
Variance component btw individuals	22.61	(SE= 0.89)	3219.12	(SE= 136.73)
VPC [a]	**0.02**		**0.03**	

[a] VPC= (level-2 variance/ (level-1 variance + level-2 variance)) = proportion of variance in outcome attributed to differences between sites. All models also adjusted for work-site level psychological job demands, decision authority, work-to-family conflict, family-to-work conflict, schedule control and family supervisory behavior.

Bold values = p<0.0