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Work–Family Conflict, Cardiometabolic Risk, and Sleep Duration in Nursing Employees

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We investigated associations of work–family conflict and work and family conditions with objectively measured cardiometabolic risk and sleep. Multilevel analyses assessed 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 examined work and family conditions in relation to: (a) validated, cardiometabolic risk score based on measured blood pressure, cholesterol, glycosylated hemoglobin, body mass index, and self-reported tobacco consumption and (b) wrist actigraphy–based sleep duration. In fully adjusted multilevel models, work-to-family conflict but not family-to-work conflict was positively associated with cardiometabolic risk. Having a lower level occupation (nursing assistant vs. nurse) was associated with increased cardiometabolic risk, whereas being married and having younger children at home was protective. A significant Age \times Work-to-Family Conflict interaction revealed that higher work-to-family conflict was more strongly associated with increased cardiometabolic risk in younger employees. High family-to-work conflict was significantly associated with shorter sleep duration.

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Working long hours and having 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 may pose threats to cardiometabolic health 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 health outcomes. Translating theory and 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, supervisor support, long work hours, cardiometabolic risk, sleep duration

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 and maintaining full-time employment may often be challenging (King et al., 2013). This challenge may be greater for women in low- and middle-wage jobs in which benefits are fewer and the 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 heightened 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 Scandinavia suggests that extensive social policies supporting working parents have benefits for both parents and children (Burström et al., 2010; Fritzell et al., 2012; Whitehead, Burström, & 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 (Johansson, 2002; Vingård et al., 2005). This suggests that social policies related to family leave may not be sufficient to improve well-being. Divisions of household responsibilities and less formal workplace practices, norms, and values may play additional critical roles (Bratberg, Dahl, & Risa, 2002; Lidwall, Marklund, & Voss, 2010). Women still bear the majority of home responsibilities, though changes have occurred over the last few years. Strained financial situations, low occupational grades, demanding jobs, and single motherhood may lead to particular vulnerabilities and strains, resulting in sickness absence (Casini, Godin, Clays, & Kittel, 2013; Josephson, Heijbel, Voss, Alfredsson, & Vingård, 2008; Vingård 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 policies, practices, and norms may well lead to patterns of strain and 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 showed (National Research Council [US] Panel on Understanding Divergent Trends in Longevity in High-Income Countries, 2011). The United States now ranks at the bottom of Organisation for Economic Co-operation

and Development (OECD) countries in life expectancy for women, whereas 40 years ago, the U.S. life expectancy for women ranked in the middle of industrialized OECD nations. Further, 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 United States (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 a result of the labor participation of women who also have responsibilities 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; Kossek, 2005; Kossek, Barber, & Winters, 1999; 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 in which 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 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 around the clock, 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, & Bamba, 2010; Karlsson, Knutsson, Lindahl, & Alfredsson, 2003). Work patterns that give a worker more choice or control are likely to have positive effects on work–family conflict (Hammer, Allen, & Grigsby, 1997) and health and well-being (Moen, Kelly, & Lam, 2013; Moen, Kelly, Tranby, & Huang, 2011).

The aim of this article is to describe associations between work–family conflict and worker health in nursing home employ-

ees. We were particularly interested in two dimensions of work–family conflict: 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, respectively). Additional conditions of interest included 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 several 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, cardiometabolic function, injuries, and mental health. Much of this foundational work has been conducted in Scandinavia. In the 1970s, Frankenhaeuser (Frankenhaeuser, 1989; Frankenhaeuser & Gardell, 1976; Frankenhaeuser & Johansson, 1986; Frankenhaeuser et al., 1989), Lundberg (Lundberg, Mårdberg, & Frankenhaeuser, 1994), Gardell (Gardell, 1982), Johansson (Johansson, 1989), and others building on stress theories developed decades earlier by Cannon (Cannon, 1932) developed a biopsychosocial approach to work–life issues (Frankenhaeuser, 1989). During virtually the same time, Karasek (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 affect 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, p. 748). This work led to the Swedish Work Environment Act, effective since 1977, which is related to adapting working conditions and job redesign. The Work, Family & Health Network study rests on this body of work recognizing that job redesign and how work is organized are central to the health and well-being of workers. The United States lags far behind many European countries in both labor policies and practices and, in fact, in epidemiologic research in this area. Further, other epidemiologists and behavioral and social scientists—prominently Orth-Gomér (Orth-Gomér, 2007), Lundberg (Berntsson, Lundberg, & Krantz, 2006; Lundberg et al., 1994), and 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 hypothalamic–pituitary–adrenal axis responses and perceptions of symptoms to acceleration of coronary disease progression. Orth-Gomér and colleagues, in particular, have made notable advances to the understanding of cardiovascular risks in women (Orth-Gomér, 2012; Orth-Gomér et al., 2000, 2009). Orth-Gomér’s work indicates that women may have different psychosocial risks than do men. Specifically, marital stress may be more central to cardiovascular disease for women than is job strain (Orth-Gomér et al., 2000).

The Work, Family & Health Network study has added to the rich history in this area by incorporating biomarkers of cardiometabolic risk and sleep duration in a study of U.S. nursing home employees, most of whom were low- and middle-wage working women. These analyses have linked work and family exposures to directly measured cardiometabolic and sleep risks from an occupational sample of nursing home employees (Bray et al., 2013; King et al., 2013). Our present 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 study 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 a larger, more comprehensive study of direct-care workers in nursing homes.

Specifically, we conducted multilevel regression analyses of the associations between work–family conflict and health. We did 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 Work, Family & Health Network study. Measured cardiometabolic risk was 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 was assessed from wrist actigraphy monitoring and was recently validated (Marino et al., 2013), and it was related to workplace conditions for extended-care workers (Berkman et al., 2010). Sleep has been related to wellness outcomes in multiple workplace studies of direct-care workers (Buxton et al., 2012; Sorensen et al., 2011) and the personal safety of medical interns and their patients (Barger et al., 2005; Landrigan, Lockley, & Czeisler, 2005; Landrigan et al., 2004, 2010), and it 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—specifically, long work hours, schedule control, family supportive supervisor behaviors (FSSBs), and having young children living at home. We included demographic, socioeconomic, and job strain (job demands and decision authority) characteristics in our analyses to be sure that there was no 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). 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 well-being of employees, especially those with fewer social or economic resources.

Specific theories of work–family conflict extend and specify further the just-reviewed macrotheories. 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 demands. In a measure of work–family conflict developed by Netemeyer (Netemeyer, Boles, & McMurrian, 1996), conflict can occur from work to family or from family to work. For women especially, who even today fulfill larger 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 fulfilling 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 return to these opposing theories in the Discussion section 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, 1979; Karasek & Theorell, 1990; Siegrist, 1996) suggests 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; Kivimäki et al., 2012; Landsbergis & Schnall, 2013) and influence 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 included demand and decision authority in our analyses to make sure that we were not conflating work–family strain with straightforward job strain. Further, 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., FSSBs) adds a new dimension to general measures of supervisor support (Frye & Breugh, 2004; Hammer, Kossek, Bodner, & Crain, 2013; Thomas & Ganster, 1995).

Building on these theories and frameworks, we hypothesized the following:

1. Employee reports of work–family conflict, including both work-to-family conflict and family-to-work conflict, would be positively associated with cardiometabolic risk and negatively associated with actigraphically measured sleep duration. We hypothesized that these associations would be independent of a wide range of other sociodemographic and work-related conditions.

2. On the basis of our earlier findings, supervisor behaviors, measured in this study by FSSBs, would be associated with our two outcomes of interest: cardiometabolic risk and sleep duration. Higher levels of FSSBs would 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—would influence employee health. Further, working parents with children at home would exhibit increased cardiometabolic risk and shorter sleep duration.

Method

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 article, we report baseline results from employees in the extended-care (nursing home) industry (Hammer, Kossek, Anger, Bodner, & Zimmerman, 2011; Kelly & Moen, 2007; Kelly, Moen, Oakes, & Fan, in press; Kossek, Hammer, Kelly, & Moen, 2014). Our primary goal 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 in participating.

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

Study Participants

All employees who were direct-care workers with at least 22-hr work weeks and were not exclusively night workers were invited to participate (Bray et al., 2013). Excluded from our study were employees in custodial, kitchen, food preparation, and clerical roles 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 shared many working conditions with workers in other health care sectors. Further, they constituted a low- and middle-wage workforce often neglected in work–family studies. Although employees who worked only night shifts were excluded, those who worked some day and night shifts were included in the study.

Measures

Trained field interviewers administered survey instruments and health assessments, as described elsewhere (Bray et al., 2013). Computer-assisted personal interviews covered demographics, socioeconomic status, family demographics, respondent's work en-

vironment, physical health, mental health, and family relationships and took about 50 min to administer; health assessments took an additional 20 min. All participants provided written informed consent. Participants received up to \$60 for completing all study components. Physical health outcomes were measured, including the primary biomarker outcomes of cardiometabolic disease risk and sleep. Sleep duration was assessed on the basis of wrist actigraphy. Cardiovascular/metabolic risks included blood pressure, HbA1c, cholesterol (total and high-density lipoprotein), BMI, and smoking status (for a full description, see Bray et al., 2013). We describe variables from three domains: (a) sociodemographic conditions, (b) work–family conflict and other work conditions, and (c) health.

Sociodemographic Conditions of Employees

Employee age was analyzed in 1-year intervals, and gender was coded as male or female. Employees were asked two separate questions about their race and ethnicity. Responses to these were used to construct a race/ethnicity variable: non-Hispanic White, non-Hispanic Black, Latino, and other. In addition, 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, certified nurse assistant (CNA), or other. Annual household income was assessed in \$5,000 increments up to \$60,000. 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: $>300\%$ of poverty threshold or less.

Number of children in household under or equal to 18 years of age 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 interrole 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 (WTFC; Netemeyer et al., 1996) measure. Employees were asked five questions regarding conflict in each direction. Responses were coded from 1 (*strongly disagree*) to 5 (*strongly agree*) and averaged to create a continuous measure, with higher scores reflecting greater conflict ($\alpha = .90$ [WTFC] and $.80$ [family-to-work conflict]).

FSSBs were assessed by employee appraisals of supervisor’s behavior related to integrating work and family (Hammer et al., 2011; Hammer, Kossek, Yragui, 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 measure of FSSBs derived from four items from Hammer et al. (2013), rated on a scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) and averaged to generate an overall score, with higher scores reflecting greater FSSBs ($\alpha = .90$).

Schedule control was used to measure employees’ control over the hours that they worked. We used a shortened, eight-item version of Thomas and Ganster’s scale (Thomas & Ganster, 1995). Items included how much choice employees had over when they took vacation or days off, when they took off a few hours, when they began and ended work days, and total number of hours worked per week. Responses were made on a scale ranging from 1 (*very little*) to 5 (*very much*) and were averaged, with higher scores reflecting greater schedule control ($\alpha = .70$).

Long work hours were assessed with items 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 that he or she had an additional job to obtain total hours worked per week across all jobs.

Assessment of psychological job demands and decision authority were based on the work of Karasek and colleagues (Karasek & Theorell, 1990; Karasek, Brisson, Kawakami, Houtman, Bongers, & Amick, 1998; 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 disagree*, *disagree*, *neither*, *agree*, and *strongly agree* (1–5, respectively). These ordinal responses were averaged separately and analyzed continuously ($\alpha = .60$ for both psychological job demands and decision authority).

Site-level measures of workplace organization, WTFC, FSSBs, 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 on the basis of modifiable risk factors in the widely used Framingham risk score metric (e.g., age- and sex-specific strata used different score calculations). This 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 BMI, blood pressure, and HbA1c. Seated blood pressure readings were collected three times at least 5 min apart during the interview and before blood sampling, using wrist blood pressure monitors (HEM-637; Omron Health Care, Bannockburn, IL). BMI (height/weight^2) was calculated on the basis of height (Seca 213/214 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 Health Care 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 dried blood spots (DBS) to serum equivalents (Samuelsson et al., 2015). Interviewers also collected a 1- μl blood droplet for immediate measurement of HbA1c levels (DCA Vantage Analyzer, Siemens Health Care Diagnostics; Frimley, England). Tobacco

consumption was self-reported. In the CRS, employees were categorized as smokers or nonsmokers.

Sleep was assessed by a week of wrist actigraphy (Spectrum, Philips/Respironics; Murrysville, PA) capturing single-axis wrist movements and light levels in 30-s 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 participant's sleep watch were analyzed using manufacturer's software (Actiware Version 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 was constant false activity (a device malfunction) or there were irretrievable data. Reasons for invalid days within a recording included watch error, such as false activity, and participant noncompliance. Diaries were not used because of participant 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 was valid and the number of valid days, and all scorers used the same cut time to define 24-hr days. Sleep periods differing by 15 min in length, total sleep time, and wake after sleep onset 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 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 they included a site-specific intercept allowing for random variation as a result of unobserved or unmeasured site-level characteristics.

Results

Results are presented in three major areas: (a) the characteristics of the sample, (b) multilevel analyses related to cardiometabolic risk, and (c) 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 and 118 men, for a response rate of 85%; Bray et al., 2013). These employees were classified as direct-care workers, including such occupations as nurse, certified nursing assistant, and administrator (a small number of the latter).

Demographic characteristics are shown in Table 1. The vast majority of men and women in our sample were CNAs. Both genders reported a high level of job demands ($M_s = 3.7$ for men vs. 3.8 for women on a 1–5 scale) and FSSBs ($M_s = 3.8$ for men vs. 3.7 for women on a 1–5 scale).

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

Multilevel Analyses of Work–Family Conflict and Effects of Work–Family Factors on Cardiometabolic Risk and Sleep Duration

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

Cardiometabolic risk. Estimates and significance levels for cardiometabolic risk in a multilevel regression model including both individual- and site-level characteristics are shown in Table 2.

There was a significant positive association between 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). These analyses revealed no significant association between family-to-work conflict and CRS, nor did the FSSBs predict the CRS. In these analyses, women, married employees, and foreign-born employees had reduced risks. We also observed that occupational status was negatively associated with risk in that nurses had lower risks than CNAs, who were more disadvantaged.

Because age is strongly associated with cardiometabolic risk (Marino et al., 2014), we tested for interactions of age and work–family conflict. We found a statistically significant Age \times WTFC interaction (coefficient for the interaction term was -0.03 , [95% confidence interval {CI} $\{-0.05, -0.01\}$]), with increasing WTFC associated with increasing CRSs for younger employees (see Figure 2).

We also found a statistically significant interaction between employee age and having children ≤ 18 years of age in the household on cardiometabolic risk (coefficient for interaction term was -0.16 , 95% CI $[-0.21, -0.10]$); having no children ≤ 18 years of age in the household exacerbated the CRS associated with age (see 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.

Multilevel analysis of work–family conflict and work–family factors and sleep duration. The results of a multilevel analysis of the same work–family conditions with sleep duration are shown in Table 2. Our findings indicate that FTWC is associated with shorter sleep duration. For every one-unit difference in FTWC score, employees had about 8 min (95% CI $[-14.8, -1.3]$) less sleep. WTFC was actually associated with increased sleep duration, on the order of 5 min. In addition, long work hours and having a child under age 18 living at home were 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 min per night shorter duration of sleep. In fully adjusted models, for every 10 hr of work per week (across all jobs), employees slept almost 5 min less per night. The relationship between sleep duration and working hours for an average participant in the study is shown in Figure 4.

As expected, age and gender were associated with sleep duration. Sleep duration was longer for women than for men, and, as age increased, sleep duration decreased. Employees who were White had significantly longer sleep durations than did those in all

Table 1
*Sociodemographic and Health Characteristics by Gender and Baseline Cohort of
 Extended-Care Workers*

Variable	Male (<i>n</i> = 118)		Female (<i>n</i> = 1406)	
	<i>M</i> or %	<i>SD</i>	<i>M</i> or %	<i>SD</i>
Sociodemographics				
Age (years)	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%	
Postsecondary education	73%		61%	
Poverty level: <300% of 2011 poverty threshold	55%		62%	
Kids ≤18 in HH	31%		48%	
Total hours worked per week (all jobs up to two jobs)	43.6	11.7	39.6	10.5
Work characteristics				
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				
Sleep duration (hours/day)	7.0	1.0	7.6	1.0
Cardiometabolic score (10-year 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 (kg/m ²)	28.8	5.8	29.5	7.1
HbA1c (% glycosylated)	5.5	0.7	5.5	0.6
Smoker	25%		31%	
Total cholesterol (mg/dL)	161.2	26.0	150.6	25.8

Note. Age: *N* = 1,404 (female); race: *N* = 1,405 (female); occupation: *N* = 1,404 (female); education: *N* = 1,405 (female); poverty: *N*s = 115 for (male) and 1,367 (female); total hours worked: *N*s = 117 (male) and 1,403 (female); job demands: *N*s = 118 for (male) and 1,405 (female); decision authority: *N*s = 118 (male) and 1,393 (female); work-to-family conflict: *N*s = 118 (male) and 1,402 (females); family supportive supervisor behaviors: *N*s = 118 (male) and 1,392 (female); smoking: *N*s = 118 (male) and 1,404 (female); blood pressure: *N*s = 117 (male) and 1,394 (female); body mass index (BMI): *N*s = 115 (male) and 1,386 (female); total cholesterol: *N*s = 111 (male) and 1,353 (female); HbA1c: *N*s = 110 (male) and 1,343 (females); cardiometabolic score: *N*s = 106 (male) and 1,306 (females); sleep: *N*s = 85 (male) and 1,134 (female). RN = registered nurse; LPN = licensed practical nurse; HH = household; FSSB = family-supportive supervisor behaviors.

other race/ethnic groups. As shown in Table 2, about 3% of the variation in sleep for these employees was attributable to the worksite.

Discussion

Findings from the Work, Family & 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 study 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 (e.g., Krieger, 2011). Evidence from our nursing home employees partially supports specific WTFC theories but also suggests that current theories do not fully explain dimensionality with regard to types of

work–family interaction per se or the specificity of the outcomes that we observed. A simple integration 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, the present findings indicate that more theoretical refinement is needed. For instance, as noted by Baruch and Barnett (1986) and Grzywacz and Marks (2000), most integrating theories of the work–family interface have focused on conflict. Our findings suggest the risks associated with conflict, but we also observed associations with some positive outcomes. For example, sleep duration was positively associated with WTFC. This may indicate that work roles, even as they have negative spillover to family life, 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

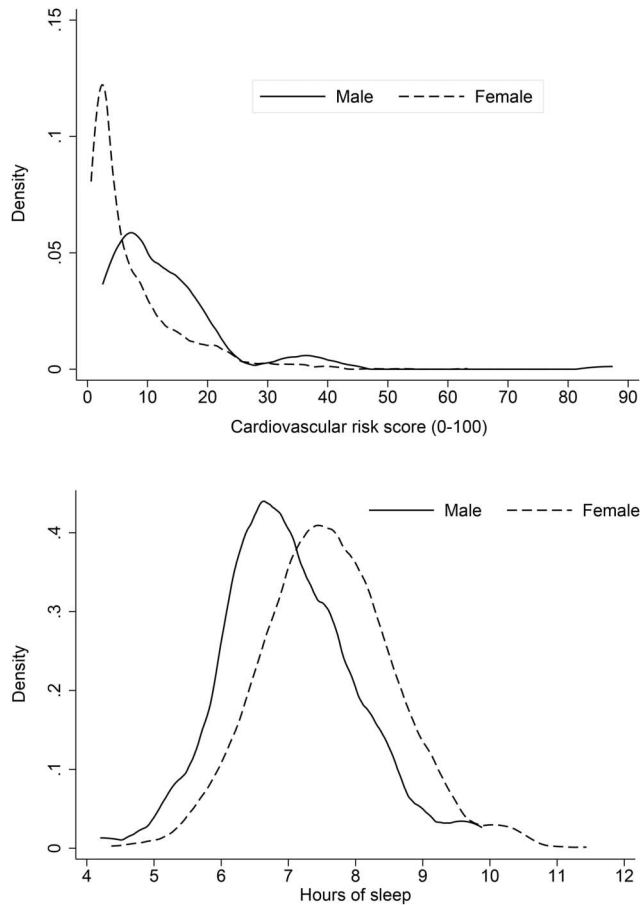


Figure 1. Distributions of outcomes by gender in the study cohort of extended-care health workers.

suggest that cardiometabolic risk and sleep duration are both associated with work–family conflict. Confirming theories related to role conflict, cardiometabolic risk was associated with high WTFC, and shorter sleep duration was associated with high levels of family-to-work conflict. Incorporation of 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 the current study.

Our second hypothesis related to the positive impact of social support from supervisors and was not supported; FSSBs were not associated with cardiometabolic risk or 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—namely 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 cardiometabolic risk or sleep outcome. 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 affect both outcomes. Employees who were foreign born had lower cardiometabolic risk. These findings are consistent with reports that first-generation immigrants from a number of sending countries to the United States have lower rates of tobacco and alcohol consumption (Blue & Fenelon, 2011; Lopez-Gonzalez, Aravena, & Hummer, 2005). Participants who identified as Black or other race had shorter sleep durations. These findings suggest that 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-Gomér, 2000), and, in the same study, work stress was unrelated to cardiovascular disease (Orth-Gomér et al., 2000), as we observed. Because we had a predominantly female workforce in our study, our findings support earlier work by Orth-Gomér (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 female ones (Backé, Seidler, Latza, Rossnagel, & Schumann, 2012), whereas marital stress is more important for women (Orth-Gomér et al., 2000). For sleep, socioeconomic conditions related to neighborhood and other family factors and 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 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 they 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, & Huang, 2011) Some of our associations, however, are different from those obtained using objectively measured outcomes reported in an earlier study of nursing home employees (Berkman et al., 2010). We discuss these differences in some detail because there are important reasons why we might have observed these differences. First, the 30 nursing homes in this study were affiliated with one company with common practices, whereas the first study identified a number of nursing homes with distinctly different corporate characteristics (i.e., private and for profit, religiously affiliated, and nonreligiously affiliated). Perhaps most important from our perspective is the fact that supervisory support in this study was a measure on the basis of employee reports of supervisor support (FSSBs). In contrast, the earlier study based manager support scores on in-depth

Table 2

Associations Between Individual and Site-Level Characteristics With Mean Cardiometabolic Risk and Sleep Duration Baseline Cohort of Extended-Care Workers

Variable	Predicted 10-year cardiometabolic risk score (%)	Confidence interval	Sleep (min)	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. U.S.-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 ($\geq 300\%$ vs. $< 300\%$ /missing)	0.38	-0.26, 1.02	0.38	-7.95, 8.72
Children (≤ 18 years vs. > 18 years)	-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, 10.2)
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, 17.0	439.35	423.92, 454.78
Observations	1,338		1,154	
Number of groups	30		29	
df	23		23	
Log likelihood	-3,988		-6,241	
Variance component between nursing homes	0.38 ^a		83.76 ^b	
Variance component between individuals	22.61 ^c		3,219.12 ^d	
VPC	0.02*		0.03*	

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

^a SE = .27. ^b SE = 51.51. ^c SE = .89. ^d SE = 136.73.

* $p < .00$.

qualitative information provided by managers themselves and then linked that information with employee health outcomes. We suspect that such manager interviews may more accurately reflect actual implementation of family-friendly work practices. Second, in our

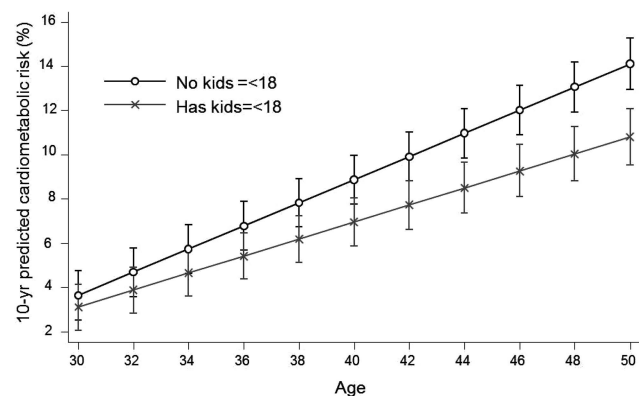


Figure 2. Adjusted, predicted 10-year cardiometabolic risk scores ($\pm 95\%$ confidence interval [indicated by error bars]) by respondent age and presence of children ≤ 18 years of age in household. The age interaction with presence of children figure shows the predictions for U.S.-born, low-income, Black female participants who were certified nurse assistants or other with individual and site-level psychological outcomes centered at zero.

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 we did not exclude 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 WTFC 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 studies of occupational cohorts also reported that when family demands, measured by the number of dependents, and job strain are coupled, 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 limitations and strengths based on our study design, sample selection, and measures. Because our study was

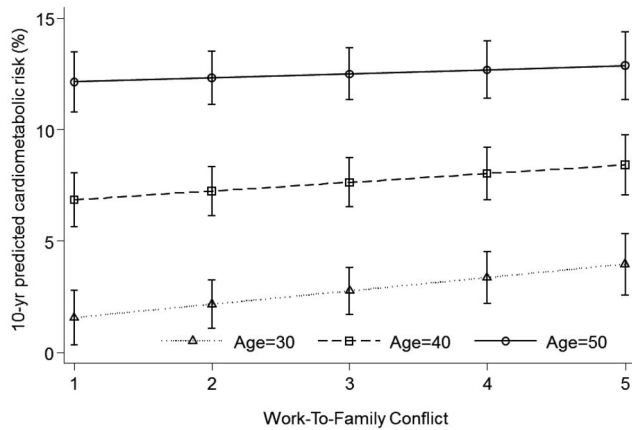


Figure 3. Adjusted, predicted 10-year cardiometabolic risk ($\pm 95\%$ confidence intervals [indicated by error bars]) showing interactions between individual-level work-to-family conflict and age. The age interaction with work-to-family conflict figure shows the predictions for U.S.-born, low-income, Black women with kids younger than 18 years of age who were certified nurse assistants or other with individual and site-level psychological outcomes centered at zero.

cross-sectional, we did 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, although our study was 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 confounded the associations between 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 WTFC 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 hr per night, on average) than might be expected from previous studies or national norms that place adult sleep levels at near 7.0 hr per night (Hale, 2005; National Sleep Foundation, 2005). This may in part have been a result of the exclusion of night workers, who have been shown to have shorter sleep durations in nursing home samples (Ertel et al., 2011).

Another limitation of our study is its location in a single company, albeit one with numerous facilities, in that employees may share more characteristics than would be found to be usual in a cross-section of total nursing homes in the study region. This is also a strength of the study, however, in that it provides a common set of policies and practices, thereby limiting exogenous forces that could affect outcomes. We also excluded employees who exclusively worked night shifts. But many of our participants worked split shifts, with some of them including evening shifts. We suspect that this limitation in enrollment had a conservative bias (if any) on the associations we have reported because we limited the experiences and variations in responses to employees (and nursing

home facilities) working under more similar conditions to each other than would have been the case if we had enrolled employees across a number of companies or employees 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 they 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 to incorporate examination-based biomarkers of cardiovascular, metabolic risks and sleep duration in an assessment 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 have shed light on work and family dynamics that influence early cardiometabolic risk by setting trajectories of predisease pathways in a 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 workforce, and many are raising children at the same time that they are taking care of elders (Neal & Hammer, 2007). This pattern of working while raising a family has increased over time, along with increase in reports of work–family conflict (Kelly, 2003). Further, increasing numbers of single parents may make this population even more vulnerable to strains at work. The United States lacks coherent work–family policies and practices that might protect these women (and men in similar positions). Divisions of household labor are

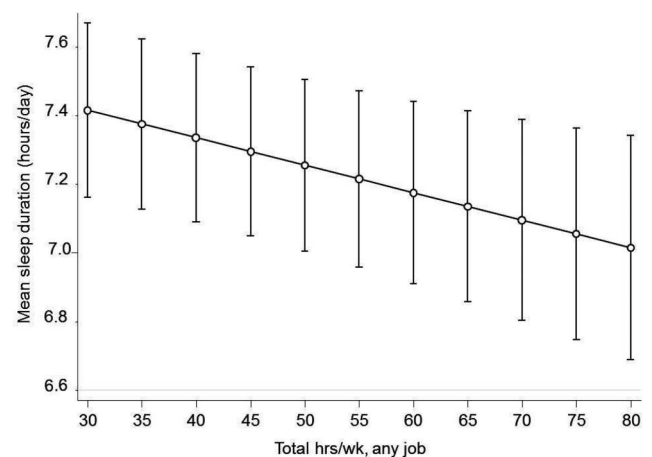


Figure 4. Total work hours per week across all jobs and adjusted, actigraphically measured mean sleep duration. Sleep figures show predictions for U.S.-born, low-income Black women with children ≤ 18 years old who were certified nurse assistants or other and mean centered for all individual-level and worksite-level psychological characteristics.

also unequal, leading to the “second-shift” phenomenon for women. Informal practices, norms, and values that 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 relevant theoretical frameworks. A fuller incorporation of ecosocial frameworks, as expressed by Krieger (2011), and ecological theory in relation to the work–family nexus, as articulated by Grzywacz and Marks (2000), are logical launching points. Our next steps are to assess whether the Work, Family & Health Network worksite intervention, designed to improve working conditions in these domains, will improve health and well-being for hardworking employees and their families.

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