Int.J. Behav. Med. (2016) 23:102–111
DOI 10.1007/s12529-015-9482-2

Workplace Stress and Working from Home Influence Depressive Symptoms Among Employed Women with Young Children

Megan Shepherd-Banigan[1] · Janice F. Bell[1,2] · Anirban Basu[1,3,4] · Cathryn Booth-LaForce[5] · Jeffrey R. Harris[1]

Published online: 18 April 2015

Abstract
Background Poor balance between work and family can be a major stressor for women with young children and have a negative impact on emotional well-being. Family-friendly workplace attributes may reduce stress and depressive symptoms among this population. However, few studies have analyzed the role of specific workplace attributes on mental health outcomes among women with young children because available data are limited.
Purpose This study examines the impact of workplace attributes on changes in depressive symptoms among working women with young children between 6 and 24 months of age.
Method This study uses data from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD) collected between 1991 and 1993 to examine the effects of work intensity, work schedule (night/day/variable), schedule flexibility, working from home, and work stress on changes in depressive symptoms among a national US sample of 570 women who returned to work within 6 months after childbirth. Depressive symptoms were assessed using the CES-D score. Treatment effects were estimated using fixed effects regression models.
Results Working from home and work stress predicted within-individual changes in depressive symptoms between 6 and 24 months postchildbirth. Women who worked from home reported a statistically significant decrease in depression scores over time (β=−1.36, SE=0.51, p=0.002). Women who reported a one-unit increase in job concerns experienced, on average, a 2-point increase in depression scores over time (β=1.73, SE=0.37, p<0.01). Work intensity, work schedule, and schedule flexibility were not associated with changes in depressive symptoms.
Conclusions This study is one of the few to use longitudinal data and causal-inference techniques to examine whether specific workplace attributes influence depressive symptoms among women with young children. Reducing stress in the workplace and allowing women to work from home may improve mental health among women who transition back to work soon after childbirth.

Keywords Workplace policies · Maternal employment · Workplace stressors · Maternal depressive symptoms

✉ Megan Shepherd-Banigan
msb23@uw.edu

[1] Health Services Department, School of Public Health, University of Washington, 1959 NE Pacific Street, Magnuson Health Sciences Center, Box 357660, Seattle, WA 98195, USA

[2] Betty Irene Moore School of Nursing, University of California Davis, Sacramento, CA 95817, USA

[3] Department of Pharmacy, School of Public Health, University of Washington, Seattle, WA 98195, USA

[4] Department of Economics, University of Washington, Seattle, WA 98195, USA

[5] Family and Child Nursing Department, School of Nursing, University of Washington, Seattle, WA 98195, USA

Introduction

In the USA, almost 60 % of employed first-time mothers return to work within 12 weeks after childbirth [1, 2]; however, studies indicate that women may need 1 to 2 years postpartum to fully recover physically and emotionally from the birth of a child [1–3]. Maternal employment can have a beneficial impact on the mental health of women with young children through improved access to financial resources, social support, and perceived personal competency [4–7]. However, these effects may depend on whether work-related attributes support

family life once women transition back to work [8–10]. A major struggle for working women is the balance between work and family, and for many, difficulty coping with this stress can lead to depression [3, 8, 10, 11]. Depression among mothers with young children can have serious consequences, including disturbed mother-infant relationships and impaired infant cognitive and emotional development [12].

Family-friendly employment attributes—including flexible, day-time work schedules, paid leave (maternity leave, paid sick leave), and financial assistance (health care insurance, childcare subsidies) [12]—have been shown to improve the well-being of working parents globally [9, 13]. Specifically, studies suggest that family-friendly workplace attributes ease a woman's transition back to work and are associated with better mental health outcomes among some new mothers by decreasing work-life conflict and reducing stress associated with balancing multiple roles [3, 8, 10, 11, 13, 14]. Positive attributes, such as workplace flexibility in the form of flex-time (i.e., working from home or schedule flexibility), job-sharing, and working standard schedules, may be associated with reduced work-family conflict and improved employee well-being [14–17]. Negative attributes may be associated with harmful consequences for mental health. For example, lack of schedule control is associated with higher degrees of psychological distress among women with young families [13, 18, 19]. Working a nonstandard schedule and high work intensity can contribute to poor mental health outcomes through increased family conflict because parents may have more difficulty coordinating family schedules and participating in family activities and events [19]. Non-standard schedules may also directly contribute to psychological distress through distorted sleeping and eating patterns and disruption of the circadian rhythm [20]. Stressful work environments place high psychological demands on workers resulting in high levels of strain that can manifest in negative mental health outcomes, such as depression, for employed women with young children [13, 18, 21]. Maternal employment can also have important consequences for child health. For example, working outside the home after birth is associated with lack of initiation and earlier cessation of breastfeeding [21], but breastfeeding outcomes may be improved by supportive workplace environments and policies [22].

Pearlin's stress process theory [23] guides this analysis and has been used in other studies investigating maternal depression [17]. This model posits that mental well-being is a complex process that is influenced by sources of stress that manifest in negative outcomes, such as depressive symptoms [23]. Sources of stress involve adverse stressful life events and ongoing life pressures, such as negative employment conditions [17]. In this analysis, employment attributes, including work intensity, job stress, lack of flexibility, work schedule, and the inability to work from home, are examined as potential sources of stress for women with young children.

Few studies have analyzed the role of specific workplace attributes on mental health outcomes among women with young children because available data are limited. There are only a few datasets globally that contain information about employment and mental health outcomes among women with young children. Further, existing analyses used cross-sectional designs, had small samples, or did not follow women for more than a year [3, 8, 24, 25]. Finally, to our knowledge, only one other study has used causal inference methods to produce estimates of the relationship between specific maternal employment attributes and depressive symptoms among women with young children [18]. This study is motivated by the need to address gaps in the existing literature and to better understand the effect of workplace attributes over time on the mental health outcomes of women with young children. We use a rich, longitudinal dataset with a relatively large sample of employed mothers and consider the effects of workplace attributes on mental health outcomes among women 2 years postbirth. Further, we apply causal inference techniques to address unobserved confounding and minimize bias inherent in studies that apply traditional analytical methods to understand complicated health and social relationships.

This analysis used longitudinal fixed effects regression to investigate whether specific workplace attributes influence maternal depression scores between 6 months and 2 years after birth. Employment-related attributes, including non-daytime work schedule, schedule inflexibility, high work intensity, inability to work from home, and a work-related stress, are hypothesized to be sources of stress that increase depressive symptoms among women with young children. The results from this study could inform the development and implementation of family-friendly workplace policies in the USA.

Methods

Data Source

This analysis used data collected from months 1 to 24 postbirth from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD) dataset, a longitudinal survey designed to explore the effects of non-maternal child care on child health and development outcomes. The SECC YD recruited 1364 children born in 1991 in ten different US cities and followed them from 1 month of age until they reached 15 years of age [25]. The sample was similar to the population of families with young infants residing in the recruitment catchment areas. Mother-newborn dyads were recruited from 24 hospitals within the ten US cities; a total of 8986 families were screened. Twenty-four-hour birthing intervals were selected for each hospital, and all babies born during

those intervals were included in the screening process. Two weeks after birth, eligible families were contacted by phone, and families were officially enrolled in the study if they completed all data collection through the 1-month interview. Subject retention was high; only 9.6 % of families had dropped out of the study by the end of phase I. This analysis was deemed exempt from institutional review by the University of Washington Institutional Review Board.

Sample

The analysis sample included all women in the NICHD SECC YD phase I (n=1364) who were employed and at work (i.e., not on leave) at 6, 15, and 24 months after birth (n=570)—thus including women employed part-time but excluding those who were students only. This focus ensured that all women in the sample were exposed to work-related attributes at all time points.

Variables

Outcome Variable

The primary outcome, depressive symptoms among women who were employed when their study child was 6 to 24 months old, was measured continuously using the Center for Epidemiologic Studies Depression Scale (CES-D) scores obtained at months 1, 6, 15, and 24. The CES-D is a 20-item instrument that asks respondents how they felt in the past week using a Likert scale ranging from 0 to 3. Total scores ranged from 0 to 60 with higher scores indicating the presence of more depressive symptoms. The CES-D has been shown to reliably detect depressive symptoms among numerous populations [26].

Predictor Variables

Maternal workplace attributes, based on self-reported employment information gathered through household interviews with employed mothers at months 6, 15, and 24, were examined as follows:

1. Average number of self-reported hours worked per week was categorized into low part-time (1–19 h), high part-time (20–34 h), low full-time (35–49 h), and high full-time (<50 h) to account for non-normality. The US Census Bureau and the American Community Survey define part time work as 1–34 h per week [27].
2. Work schedule categorized as "dayshift" (7 a.m.–7 p.m., reference), "not dayshift" (7 p.m.–7 a.m.), or "variable schedule".
3. Schedule flexibility based on the item "how flexible are your work hours?" and categorized as "very flexible" (reference), "fairly flexible," "minimally flexible," and "not flexible."
4. Job stress assessed using the Job Role Quality Scale [28], a 21-item measure that captured women's positive and negative experiences at work, including opportunity for advancement, recognition, and supervisor support. The potential range for this scale was +3 to −3 with more positive values indicating higher levels of job stress. The scale demonstrated high internal consistency (Cronbach's alpha=0.8) and validity [29]. Job stress at months 15 and 24 was included in the models as a continuous variable. Job stress at month 6 was collected but was not included in the available dataset.
5. Average number of hours worked from home per week was not normally distributed and was subsequently categorized into a binary variable (works from home/does not work from home) and alternatively examined as a categorical variable to yield a dose-response measure—"1" (1–8 h per week, reference), "2" (9–16 h per week), "3" (17–24 h per week), "4" (25–32 h per week), and "5" (more than 32 h per week). The alternative classification of working from home was intended to capture the number of typical work-length days during the week that an individual spent working from home and was used in models restricted to those women who worked from home (n=132, 23 % of sample).

Other Covariates

Time-varying covariates were determined a priori and selected based on a review of the literature.

- Family income-to-needs ratio. Continuous measure of all household-level income sources divided by the poverty threshold for that household size. Included as a categorical variable defined by quartiles to account for non-normal distribution.
- Maternal employment changes associated with work-related reasons (yes/no).
- Partner employment status. Defined as "partner/spouse employed," "partner/spouse not employed," and "not partnered" (reference).
- Average number of hours worked per week by a partner. Included as a continuous variable and coded "0" if the mother was not partnered or if the partner did not work.
- Partnership status. Captured as the reference category for the partner employment and partner satisfaction variables.
- Sources of life and parenting stress not related to employment [30]. Modeled continuously.
- Number of children living in the home. Modeled continuously.

- Infant and maternal health status. Originally measured in four categories (excellent/good/fair/poor) but dichotomized for this analysis (excellent or good/fair or poor) to account for small subgroup samples.
- Both parents live in household (yes/no).
- One-period time lag for depression. Accounts for reverse causality or the possibility that changes in workplace attributes were the result of depressive symptoms at the prior time-point.

Time-fixed, baseline variables and socio-demographic variables, such as race/ethnicity, age, and education, were not included in the models as they drop out of fixed effects models (see section below).

Enhancing Causal Inference

Causal inference techniques, such as fixed effects models, attempt to address unobserved heterogeneity that occurs in most observational studies due to the inability to measure all confounding factors [31–33]. In this instance, it is likely that unobserved time-fixed factors that influence a woman's choice of employment may be associated with mental health. For example, the inability to cope with chronic sleep deprivation (unobserved in dataset) may increase depressive symptoms and prompt a woman to seek a workplace that has a flexible and supportive environment. In the presence of unobserved heterogeneity, ordinary least squares regression may produce biased estimates. In relatively short longitudinal studies, such as the present analysis, individual fixed effects regression can produce unbiased estimates of how changes in the predictor influence changes in the outcome by differencing out all observed and unobserved time-fixed, individual-level characteristics, such as gender, personality, and family characteristics, leaving only the covariates that change over time by individual [34]. This method assumes that all individual-level time-varying confounders are accounted for in the analysis [34]. The fixed effect parameter represents the within-individual effect or the average change in the outcome due to the treatment observed in an individual over time. While other methods, such as random effects models, can be used to measure changes over time, these methods do not produce pure within-individual effect estimates and therefore cannot assess the effect of workplace policies on within-individual changes in depression score among employed mothers with young children.

Statistical Analysis

All analyses used STATA IC 13. Respondent characteristics are described using standard descriptive statistics. Missing data were minimal (less than 1 % for most covariates and approximately 10 % for five covariates) and were addressed by imputing values collected in subsequent waves for variables with high within-individual correlation or by imputing the median sample value of that variable for each time point for variables with low within-individual correlation. There was minimal evidence suggesting that participant characteristics contributed to missing data patterns. All models were repeated without imputation for missing observations and with multiple imputation methods using chained equations on ten separate datasets accounting for the variables containing more than 10 % missing observations. Covariate correlations and univariate and bivariate trajectories were examined. The data were also examined for outliers, and visual inspections of model residuals were conducted. One outlier variable (income-to-needs ratio at month 15) was identified and determined to be a data-entry error based on the income-to-needs ratio values for the respondent at other time-points. This observation was corrected in the dataset.

Fifty percent of the variance in depression was attributable to between cluster variation (ICC=0.50). Sixty-seven to 50 % of the variance in the workplace attribute exposure variables was attributable to between cluster variation (ICC=0.67–0.50). In other words, 50–33 % of the variance of these covariates was due to individual-level changes across time indicating the need to account for individual-level clustering. Therefore, linear fixed effects models were used to assess whether individual-level changes in employment attributes from 6 to 24 months postbirth resulted in changes in depressive symptoms over time.

The relationships between each predictor and depression score were analyzed separately in models that included the same covariate vector specified above. In three models, we also controlled for workplace attributes which could be theoretically justified to confound these relationships. These exceptions included (a) the workplace flexibility predictor model controlled for work intensity and work from home, (b) the work from home predictor model controlled for work intensity, and (c) the job stress predictor model controlled for work intensity, schedule flexibility, and work from home. Significance for all treatment effects was defined at $\alpha<0.01$ and $\alpha<0.05$.

Mean depression score was not normally distributed (skew=1.6, kurtosis=6.1) resulting in heteroscedastic errors. Therefore, sensitivity analysis models were run using generalized least squares (GLS) models for longitudinal data to account for heteroscedastic error terms. This method relaxes the assumption of normality for the outcome variable [34].

Results

The socio-demographic characteristics of the study sample are summarized in Table 1. Compared with the general population of US women in 1991, the study sample included more non-

Table 1 Participant demographics at baseline (6 months)

Socio-demographic characteristics	
	Mean (SD); range
Maternal age	29.6 (4.7); 18–43
Child's birth weight in grams	3505 (523.4); 2000–5200
Number of children in household	1.8 (1.0); 1–13
	Mean; median
Total family income at baseline	$59,346; $50,000
Maternal race/ethnicity	Percentage (100 %)
White	85
Black	8
Hispanic	3
Other	4
Maternal education	
Less than high school	2
Completed high school only	17
More than high school	81
Partner employment status	
Partner employed	89
Partner unemployed	3
Not partnered	8
Maternal health	
Good	92
Fair	8
Child health	
Good	87
Fair	13

$n=570$

Hispanic White women (85 vs. 75 %) and fewer Hispanic (3 vs. 9 %) and non-Hispanic Black women (8 vs. 12 %) [35]. On average, mean household income was slightly higher compared with the general US population in 1991 (average US household income 1991 was $43,056 [36]) which is expected as this sample comprises approximately 65 % of families from dual income households (vs. 59.1 % in the general population in 1991 [37]). Also, sample participants had higher levels of education compared with working women aged 25–64 in the general US population in 1991 [37].

Table 2 shows the means and proportions of depression scores and workplace attributes at each time-point. The summary statistics for all variables remained fairly consistent, except for family income-to-needs ratio and depression score. Depression scores increased slightly over time but were highest at month 1 possibly due to the effects of hormonal changes and sleep deprivation.

Table 3 reports the correlations between maternal depression and each workplace attribute across time. For the most part, intercorrelations between variables were relatively low; correlations within variables across time were higher.

Table 4 reports average effects of changes in workplace attributes between 6 and 24 months postbirth on changes in depressive symptoms within women. The within-individual effect coefficients show that moving from not working from home to working from home decreased an individual's depression score by a mean of 1.36 points, a 0.19 change in the standard deviation of the overall sample depression score. One unit increase in job stress increased depression score by a mean of 1.73 points in this sample; this is equivalent to a 0.24 change in the standard deviation of the sample depression score. Changes in hours worked per week, work schedule, schedule flexibility, and number of hours an individual worked from home were not associated with changes in depression score at $\alpha=0.05$.

Sensitivity analyses using generalized least squares (GLS) models to account for heteroscedastic errors produced lower standard errors but similar inferences for most models compared with the fixed effects models. The results between the two sets of models did not differ except that, in the GLS models, working from home 1–2 days, 2–3 days, and more than 4 days per week was associated with a significant 1-point increase in depression score compared with the reference (working from home less than 1 day per week) among women who spent any time working from home ($p<0.001$). The results from the GLS models are not reported in tables. All models were also run using complete case analysis and imputed analytical techniques; no substantive differences relative to the reported findings were found, and therefore, the results from the complete case analysis and multiple imputation models are not reported in tables.

Discussion

We investigated whether workplace attributes were predictive of depressive symptoms among women with young children using causal inference methods. In accordance with Pearlin's theory, we conclude that some workplace attributes may be sources of stress that negatively influence mental well-being among this subpopulation. Specifically, our results show that job stress may worsen depressive symptoms and that working from home may improve depressive symptoms among working women with young children.

The effect of job stress is consistent with what has been shown in previous research—lower schedule autonomy [18, 19, 38], psychological demands [17], and lack of perceived control [17], all components of a stressful work environment, negatively influence the mental health of women with young children. The results from our study contradict findings from past studies that found no association between working from home and depressive symptoms [18]. We found that working from home lowered depressive symptoms; this suggests that working from home may provide tangible time benefits for

Table 2 Comparison of depression, workplace attributes, and modifying factors by time

	Time				
	Baseline (month 1)	6 months	15 months	24 months	Average
Maternal depression (mean, SD)	10.0, 8.4	7.8, 7.0	8.1, 7.4	8.6, 7.5	8.2, 7.3
Hours worked per week (mean, SD)		33.9, 13.2	35.1, 12.9	34.8, 12.4	34.6, 12.8
Work schedule (%)	–				
Day shift		80	80	80	80
Not day shift		11	10	9	10
Variable		9	10	11	10
Schedule flexibility (%)	–				
Very flexible		26	21	22	23
Fairly flexible		39	44	40	41
Minimally flexible		31	32	35	33
Not flexible		4	3	3	3
Work from home (%)	–				
No		75	77	79	77
Yes		25	23	21	23
Job stress (mean, SD)	–	–	−1.2, 0.9	−1.1, 0.9	−1.1, 0.9

new mothers by reducing commutes and making more time available to spend with their children at home. Our results show no threshold effect of hours spent working from home on depressive symptoms, indicating that the critical component of working from home may be the ability to work from home when needed as opposed to the total number of hours spent working from home. We also considered the possibility of reverse causality—that depressed women may be more likely to choose to work from home. However, we included a one-period depression time lag in the models to account for this possibility. Further, our results dispute this potential hypothesis as working from home was associated with lower depression scores; if depressed women chose to work from home, we would have observed higher depression scores among these women.

Working a non-standard schedule is associated with work-family conflict [15], but our study is the first to consider the direct association between work schedule and mental health. Our results do not demonstrate a strong effect of work schedule on depressive symptoms. Extant research has also not considered the isolated effect of (paid) work intensity on depression score, though higher total paid and unpaid (i.e. household chores) workload is related to increased depressive symptoms among women 6 months after childbirth [18]. It is possible that unpaid versus paid workload is the element that influences mental health. These data were not contained in the SECCYD, and we were unable to test this hypothesis. We were also interested in how the number of children in the household changed the observed results. We generated an interaction term between the workplace policy variables and a binary one child versus more than one child variable. Working from home was less beneficial for women who only had one child (−0.66; 95 % CI −2.00, 0.69) compared with women who had more than one child (−2.16; 95 % CI −3.34, −0.98).

We used longitudinal GLS models to understand whether heteroscedastic errors across time influenced our findings. The results of the sensitivity analyses and the fixed effects analyses were similar suggesting that heteroscedastic errors probably did not bias our conclusions. However, the GLS estimates differed substantially from the fixed effects estimates for the number of hours worked from home model. This difference may be due to the fact that longitudinal GLS methods do not estimate pure within-individual effects. It is possible that when comparing different women, those who spend more time working from home exhibit more depressive symptoms than those who work from home fewer days per week. However, we did not observe this relationship within individuals over time.

This is one of the few studies to use longitudinal data and causal inference techniques to examine whether specific workplace attributes influence depressive symptoms for women with young children. Our analysis remedies some of the shortcomings in prior work by using information from a rich, longitudinal database that captures depression status, workplace characteristics, and a number of other life stressors at multiple time points after birth among a relatively large sample of employed women. Further, this dataset has not been previously used to analyze the effect of maternal employment on depressive symptoms.

Several limitations must be considered. The NICHD SECC YD dataset is not nationally representative. It contains a higher proportion of non-minority, employed mothers who

Table 3 Pairwise correlations between outcome and primary predictor variables

	Maternal depression 6	Maternal depression 15	Maternal depression 24	Work schedule 6	Work schedule 15	Work schedule 24	Flexibility 6	Flexibility 15	Flexibility 24	Work from home 6	Work from home 15	Work from home 24	Work intensity 6	Work intensity 15	Work intensity 24	Job stress 15	Job stress 24
Maternal depression 6	1.00																
Maternal depression 15	0.55	1.00															
Maternal depression 24	0.53	0.50	1.00														
Work schedule 6	0.05	0.06	0.01	1.00													
Work schedule 15	−0.01	0.07	0.01	0.53	1.00												
Work schedule 24	0.01	−0.01	−0.01	0.44	0.55	1.00											
Flexibility 6	0.06	0.06	−0.01	−0.12	−0.13	−0.13	1.00										
Flexibility 15	0.01	0.04	0.01	−0.10	−0.14	−0.16	0.55	1.00									
Flexibility 24	0.04	0.08	−0.01	−0.07	−0.13	−0.16	0.42	0.53	1.00								
Work from home 6	−0.04	0.04	0.01	0.14	0.16	0.10	−0.18	−0.19	−0.10	1.00							
Work from home 15	−0.04	−0.04	−0.04	0.13	0.14	0.18	−0.19	−0.23	−0.17	0.56	1.00						
Work from home 24	−0.03	0.01	0.01	0.13	0.14	0.23	−0.22	−0.21	−0.18	0.50	0.61	1.00					
Work intensity 6	0.11	0.05	0.09	−0.19	−0.24	−0.14	0.21	0.17	0.11	−0.07	−0.10	−0.10	1.00				
Work intensity 15	0.11	0.01	0.13	−0.21	−0.29	−0.16	0.23	0.26	0.19	−0.13	−0.07	−0.05	0.73	1.00			
Work intensity 24	0.08	−0.01	0.08	−0.14	−0.26	−0.22	0.18	0.20	0.28	−0.04	−0.08	−0.06	0.067	0.74	1.00		
Job stress 15	0.28	0.33	0.28	0.01	0.01	−0.03	0.17	0.18	0.11	−0.07	−0.06	−0.09	0.04	0.04	0.03	1.00	
Job stress 24	0.24	0.03	0.35	−0.01	0.01	0.01	0.12	0.09	0.06	−0.06	−0.04	−0.04	0.05	0.06	0.06	0.68	1

Table 4 Changes in within-individual depression score for a one unit change in predictor variables, adjusted analyses

Primary predictors	Fixed effects Change in depression score, β (SE)
Hours worked per week	
Low part-time 1–19 h (Ref)	–
High part-time 20–34 h	−0.52 (0.58)
Low full-time 35–49 h	−0.54 (0.64)
High full-time <50 h	1.14 (0.88)
Work schedule	
Day shift (Ref)	–
Not day shift	1.22 (0.67)
Variable	−0.20 (0.71)
Schedule flexibility	
Very flexible	0.23 (0.98)
Fairly flexible	0.19 (0.92)
Minimally flexible	0.18 (0.89)
Not flexible (Ref)	–
Work from home (binary)	
Yes	−1.36* (0.51)
Number of hours work from home[a]	
Less than 1 day (1–8 h)	–
1 to 2 days (9–16 h)	0.21 (1.25)
2 to 3 days (17–24 h)	−0.74 (1.81)
3 to 4 days (25 to 32 h)	−5.11* (2.44)
More than 4 days (+32 h)	−2.85 (2.52)
Job stress	1.73** (0.37)

*Statistical significance at $p<0.05$ and $p>0.001$; **statistical significant at $p<0.001$

[a] Sample only includes women who worked from home ($n=132$); partial F test was not significant ($p=0.23$)

have higher levels of education and family income than women in the general US population. Furthermore, we constrained our sample to women who were employed at 6, 15, and 24 months after birth which may limit the generalizability of our findings. Also, both the depression measure and workplace policies were based on self-report which may contribute to response bias.

Selection bias may be present which could also have implications for generalizability. Past depressive symptoms, predictive of future depressive symptoms, may influence the decision to return to work and the choice of work environment. Our sample may therefore contain fewer depressed women than in the general population. Also, there was minimal information about employment attributes during pregnancy making it impossible to assess whether some women self-selected out of a prior workplace or did not return to work because of negative employment attributes; thus, our sample may contain a higher proportion of new mothers exposed to more positive workplace attributes than those in the general population. The CES-D measure was not validated specifically for working women with young children and may less accurately capture depressive symptoms among this population [26]. Our results focus on changes in the number of depressive symptoms as measured by the CES-D within individuals over time. Therefore, changes in scores were small and we are unable to make any assertions about the clinical significance of workplace policies on depression.

The data were collected in 1991 and represent treatment effects at this time that may or may not represent current effects. There may have been changes in workplace stressors due to globalization, technology, organizational changes, or other factors that might influence the relationship between workplace policies and maternal depression. For example, technologies such as the Internet and email may have changed the experience of women who work from home by increasing the ease of performing workplace tasks offsite or by blurring the boundaries between work and home and increasing work/life conflict. Recent changes in organizational policies in some developed countries have given workers more flexibility but have also led to diminished role clarity and increased work-related demands and overlap between work and home life [39]. While these changes may increase work-related stress, studies have shown that individual-level life priorities and how an individual relates to work are key factors in determining whether work-related stress negatively affects health [39]. Our findings from 1991 data allude to these trends and may support the conclusions of studies using more recent data. Given the high demands of very young children, women with infants are likely to prioritize family-life and may perceive organizational policies that promote flexibility as positive and less stressful. In addition, the recent financial crisis may also have changed the external economic environment, but our study controls for family income-to-needs ratio and life stress which we hope will offset challenges to the generalizability of our findings caused by the 2008 recession. In general, political and social conditions have not changed dramatically since the early 1990s. Female participation in the large force surged in the 1970s and 1980s rising from 38 to 43 % but only increased 1.5 % between 1990 and 2010 [40]. Further, women remain employed in traditionally female-oriented occupations, such as dental assistants, secretaries, registered nurses, and elementary and middle school teachers [40]. The only substantial employment-related policy change that has occurred since 1991 was the enactment of the Family Medical Leave Act (FMLA), but fewer than 50 % of female workers actually receive protected unpaid leave benefits under this statute [41]. Finally, regardless of employment status, women today are still responsible for a larger proportion of family and household duties [42]. Therefore, it is likely that the results from this analysis are applicable today and given that so few datasets contain the information necessary to study the relationship between workplace attributes and mental

health; the results from this study represent an important contribution to the literature. Despite this, we must acknowledge that there may still be significant workplace changes, such as the nature of workplace stress that might make our results less applicable.

Finally, fixed effects models have limitations. The within-individual estimator is less efficient than estimators taking into account between-individual effects [34]; hence, our results are conservative estimates. The fixed effects approach also does not account for unobserved time-varying heterogeneity, including changes in maternal health or workplace policies, such as sick leave. However, we believe that this limitation is less relevant for our analysis as our study time horizon was relatively short (only 18 months), and we would expect fewer unobserved individual-level changes to occur during this shorter time period. Moreover, we were able to control for many potential sources of time-varying heterogeneity that are not often available in observational data, including infant health status and partner employment status [34]. Further, most employment attributes, such as work stress, flexibility, and work schedule, are not easily changed by individuals once they have elected to participate in a job, and change in employment status due to negative employment attributes was controlled for in all models. Therefore, we anticipate minimal bias to the reported estimates due to these potential limitations of the fixed effects approach.

Conclusion

Women face tremendous challenges after the birth of a child, and contextual factors, such as workplace attributes, may have important implications for mental health [9, 13]. Policy makers and employers should consider how to best support working mothers with young children by incorporating family-friendly attributes into the workplace environment. Such organizational policies could include flex-time, including working from home, and educating supervisors in techniques to decrease stressful working conditions and promote a supportive and flexible workplace culture for mothers with young children [43]. These elements may effectively support women who transition back to work shortly after birth and have important implications for improved mental well-being.

Acknowledgments This project was supported by Grant Number 1 T42 OH008433 from the National Institute for Occupational Safety and Health (OSHA) and Grant Number TL1 TR0042 from the National Institutes of Health, National Center for Advancing Translational Sciences (NCATS).

Informed Consent This study was deemed to be exempt from institutional review by the University of Washington Institutional Review Board.

Conflict of Interest Authors Shepherd-Banigan, Bell, Basu, Booth-LaForce, and Harris declare that they have no conflict of interest.

References

1. Dye JL. Fertility of American Women. Curr Popul Reports. 2005;20-555.
2. Shepherd-Banigan M, Bell J. Paid leave benefits of working mothers. Matern Child Health J. 2014;18(1):286–95.
3. Killien MG, Habermann B, Jarrett M. Influence of employment characteristics on postpartum mothers' health. Women Health. 2001;33(1–2):63–81. http://www.ncbi.nlm.nih.gov/pubmed/11523641.
4. Chen CH. Association of work status and mental well-being in new mothers. Kaohsiung J Med Sci. 2001;17(11):570–5. http://www.ncbi.nlm.nih.gov/pubmed/11852464.
5. Mayberry LJ, Horowitz JA, Declercq E. Depression symptom prevalence and demographic risk factors among U.S. women during the first 2 years postpartum. J Obstet Gynecol Neonatal Nurs. 2007;36(6):542–9. http://www.ncbi.nlm.nih.gov/pubmed/17973697.
6. Miyake Y, Tanaka K, Sasaki S, Hirota Y. Employment, income, and education and risk of postpartum depression: the Osaka Maternal and Child Health Study. J Affect Disord. 2011;130(1–2):133–7. http://www.ncbi.nlm.nih.gov/pubmed/21055825.
7. Stansfeld S, Candy B. Psychosocial work environment and mental health–a meta-analytic review. Scand J Work Environ Health. 2006;32(6):443–62. http://www.ncbi.nlm.nih.gov/pubmed/17173201.
8. Nichols MR, Roux GM. Maternal perspectives on postpartum return to the workplace. J Obstet Gynecol Neonatal Nurs. 2004;33(4):463–71. http://www.ncbi.nlm.nih.gov/pubmed/15346672.
9. Strazdins L, Shipley M, Broom D. What does family-friendly really mean? Well being, time and quality of parents' jobs. Aust Bull Labor. 2007.
10. Grice MM, Feda D, McGovern P, Alexander BH, McCaffrey D, Ukestad L. Giving birth and returning to work: the impact of work-family conflict on women's health after childbirth. Ann Epidemiol. 2007;17(10):791–8. http://www.ncbi.nlm.nih.gov/pubmed/17719242.
11. Grice MM, McGovern PM, Alexander BH, Ukestad L, Hellerstedt W. Balancing work and family after childbirth: a longitudinal analysis. Womens Health Issues. 2011;21(1):19–27. http://www.ncbi.nlm.nih.gov/pubmed/21185988.
12. Friedman DE. Employer supports for parents with young children. Future Child. 2001;11(1):62–77. http://www.ncbi.nlm.nih.gov/pubmed/11712457.
13. Frye NK, Breaugh JA. Family-friendly policies, supervisor support, work-family conflict, family-work conflict, and satisfaction: a test of a conceptual model. J Bus Psychol. 2004;19(2):197–220. doi:10.1007/s10869-004-0548-4.
14. Allen TD. Family-supportive work environments: the role of organizational perceptions. J Vocat Behav. 2001;58(3):414–35. doi:10.1006/jvbe.2000.1774.
15. Carlson DS, Grzywacz JG, Ferguson M, Hunter EM, Clinch CR, Arcury TA. Health and turnover of working mothers after childbirth via the work-family interface: an analysis across time. J Appl Psychol. 2011;96(5):1045–54. doi:10.1037/a0023964.
16. Joyce K, Pabayo R, Critchley JA, Bambra C. Flexible working conditions and their effects on employee health and wellbeing. Cochrane Database Syst Rev. 2010;2:CD008009. doi:10.1002/14651858.CD008009.pub2.

17. Dagher RK, McGovern PM, Alexander BH, Dowd BE, Ukestad LK, McCaffrey DJ. The psychosocial work environment and maternal postpartum depression. Int J Behav Med. 2009;16(4):339–46. http://www.ncbi.nlm.nih.gov/pubmed/19288209. Accessed July 25, 2012.
18. Dagher RK, McGovern PM, Dowd BE, Lundberg U. Postpartum depressive symptoms and the combined load of paid and unpaid work: a longitudinal analysis. Int Arch Occup Environ Health. 2011;84(7):735–43. http://www.ncbi.nlm.nih.gov/pubmed/21373878.
19. Staines GL, Pleck JH. Nonstandard work schedules and family life. J Appl Psychol. 1984;69(3):515–23. doi:10.1037//0021-9010.69.3.515.
20. Kolla BP, Auger RR. Jet lag and shift work sleep disorders: how to help reset the internal clock. Cleve Clin J Med. 2011;78(10):675–84. doi:10.3949/ccjm.78a.10083.
21. Lindberg L. Women's decisions about breasteeding and maternal employment. J Marriage Fam. 1996;58:239–51.
22. Johnston ML, Esposito N. Barriers and facilitators for breastfeeding among working women in the United States. J Obstet Gynecol Neonatal Nurs. 2007;36(1):9–20. doi:10.1111/j.1552-6909.2006.00109.x.
23. Pearlin LI, Lieberman MA, Menaghan EG, Mullan JT. The stress process. J Health Soc Behav. 1981;22(4):337–56. http://www.ncbi.nlm.nih.gov/pubmed/7320473.
24. McGovern P, Dowd B, Gjerdingen D, et al. Mothers' health and work-related factors at 11 weeks postpartum. Ann Fam Med. 2006;5(6):519–27. doi:10.1370/afm.519.
25. NICHD Early Child Care Research Network. Nonmaternal care and family factors in early development: an overview of the NICHD study of early child care. J Appl Dev Psychol. 2001;22:457–92.
26. Weissman MM, Sholomskas D, Pottenger M, Prusoff BA, Locke BZ. Assessing depressive symptoms in five psychiatric populations: a validation study. Am J Epidemiol. 1977;106(3):203–14. http://www.ncbi.nlm.nih.gov/pubmed/900119.
27. Davis J. School enrollment and work status: 2011. Washington, DC; 2012.
28. Marshall NL, Barnett RC. Work-family strains and gains among two-earner couples. J Community Psychol. 1993;21(1):64–78. doi:10.1002/1520-6629(199301)21:1<64::AID-JCOP2290210108>3.0.CO;2-P.
29. Barnett RC, Davidson H, Marshall NL. Physical symptoms and the interplay of work and family roles. Health Psychol. 1991;10(2):94–101. http://www.ncbi.nlm.nih.gov/pubmed/2055215.
30. Beck CT. Predictors of postpartum depression: an update. Nurs Res. 2001;50(5):275–85. http://www.ncbi.nlm.nih.gov/pubmed/11570712.
31. Pearl J. Causal inference in statistics: an overview. Stat Surv. 2009;3:96–146. doi:10.1214/09-SS057.
32. Shadish W, TD C, Campbell D. Experimental and quasi-experiemental designs for generalized causal inference. Boston: Houghton Mufflin; 2001.
33. Dowd B, Town R. Does X Really Cause Y?. Washington, DC; 2002. http://www.academyhealth.org/files/FileDownloads/DoesXCauseY.pdf.
34. Cameron A, Trivedi P. *Microeconomics Using STATA*. Revised. College Station: STATA Press; 2010.
35. Population Esimates Program PD. Resident Population Estimates of the United States by Sex, Race, and Hispanic Origin: April 1, 1990 to July 1, 1999 with Short-Term Projection to November 1, 2000. Washington, DC; 2001. http://www.census.gov/popest/data/national/totals/1990s/tables/nat-srh.txt.
36. US Census Bureau. Mediam Income for 4-Person Families, by State. Washington, DC; 2013. https://www.census.gov/hhes/www/income/data/statistics/4person.html.
37. BLS Reports. *Women in the labor force: a databook*. Washington, DC; 2013. http://www.bls.gov/cps/wlf-databook-2012.pdf.
38. Cooklin AR, Rowe HJ, Fisher JRW. Employee entitlements during pregnancy and maternal psychological well-being. Aust N Z J Obstet Gynaecol. 2007;47(6):483–90. doi:10.1111/j.1479-828X.2007.00784.x.
39. Allvin M, Aronsson G, Hagstrom T, Johannson G, Lundberg U. *Work without boundaries: psychological perspectives on the new working life*. Wiley; 2011. http://au.wiley.com/WileyCDA/WileyTitle/productCd-0470666137.html.
40. United States Census Bureau. *America's changing labor force: equal employment opportunity tabulation*.; 2013. http://www.census.gov/people/eeotabulation/.
41. Berger LM, Hill J, Waldfogel J. Maternity leave, early maternal employment and child health and development in the US. Econ J. 2005;115(501):F29–47. doi:10.1111/j.0013-0133.2005.00971.x.
42. Bureau of Labor Statistics. *American Time Use Survey-2013 Results*.; 2014. http://www.bls.gov/news.release/atus.nr0.htm.
43. Christensen K, Schneider B, Butler D. Families with school-age children. Future Child. 2011;21(2):69–90. http://www.ncbi.nlm.nih.gov/pubmed/22013629.