



Research Report

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Putting Work to Bed:
Stressful Experiences on the Job
and Sleep Quality

Report 08-652
July 2008

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A version of this paper was presented at the Population Association of American and American Sociological Association meetings in 2008. Both authors were supported by grants from NICHD and NIA to the Population Studies Center, University of Michigan. We would like to thank David Featherman, James House, Yasamin Kusunoki, Jason Schnittker, Pam Smock, and the University of Wisconsin Center for the Demography of Health and Aging Seminar for helpful feedback. Correspondence should be directed to the first author at: University of Michigan, Department of Sociology, 500 South State Street, Ann Arbor, MI 48109-1382, Phone: 734.615. 9538, Fax: 734.763.6887, E-mail: burgards@umich.edu.

ABSTRACT

Most adults spend one third of every day sleeping and another third of most days at work. However, there is little analysis of the possible connections between common workplace experiences and sleep quality. This study uses the nationally-representative American's Changing Lives study, a prospective sample of U.S. adults, to examine whether and how common conditions and experiences at work may "follow workers home" and impinge on their quality of sleep. We also explore how competing stressful experiences at home may influence sleep quality, and whether these are more relevant than work experiences. Results from longitudinal logistic regression and fixed and random effects models show that frequently being bothered or upset at work is associated with changes toward poorer sleep quality, and the association is not explained by stressful experiences at home. These new findings are discussed in relation to the sociological literatures on stress and emotion.

INTRODUCTION

Most adults spend about one-third of most 24 hour days in paid employment, and another third of those 24 hours sleeping, but our understanding of the links between experiences at work and sleep quality is limited. Biomedical studies have suggested an association between workplace conditions and sleep, but have focused on specific employee populations, mainly shift workers. In the social scientific literature, there is substantial evidence that stressful working conditions are linked to poorer health, while paid employment involving positive aspects like autonomy and creativity are associated with better health and functioning (House 1987; Kohn and Schooler 1982; Kohn and Schooler 1983; Lennon 1994; Link, Lennon, and Dohrenwend 1993; Mirowsky and Ross 2007). With only a handful of exceptions (e.g., Arber, Hislop, Bote, and Meadows 2007; Hochschild and Machung 2003), however, sociologists have all but ignored the importance of the work role and experiences in the workplace for sleep. This is a major shortcoming because poor sleep quality may act as a sensitive marker of the consequences of stressful experiences in major macrosocial systems like the workplace or at home. A better understanding of the work-sleep relationship in the general population is needed because sleep is a basic human need and inadequate sleep has costs for individuals, in terms of their health and safety, and for society, in the form of lost productivity and medical care costs (Lamberg 2004). This study uses a nationally-representative, prospective sample of United States workers to examine whether and how common conditions and experiences at work may “follow workers home” and impinge on their quality of sleep, and how this may vary for those who are married or cohabiting and/or have children, compared to those without these family characteristics.

Extant research has generally neglected the range of stressors that are prevalent in the contemporary workplace environment, focusing mainly on the sleep consequences of night shift and particularly rotating shift work (for reviews, see Akerstedt 2003; National Center on Sleep Disorder Research 1999). Shift work makes it difficult to achieve a typical sleep schedule, disrupting sleep duration, timing, and the circadian rhythm. While understanding the consequences of shift work is important, a focus solely on this exposure limits our understanding of the range of mechanisms by which the work role may influence individuals' lives outside of work hours. Other, more common occupational stressors could exert their effects on sleep via very different means. Perceived low control on the job, perceived job insecurity, and negative emotional experiences at work may create or indicate stress responses that raise hormonal levels

and make it difficult for workers to “unwind” at the end of the day. However, unlike rotating shift work, which is likely to present significant objective obstacles to achieving adequate sleep for most who perform it, common psychosocial stressors like low control or perceived job insecurity may not affect all who experience them, but only those who appraise them as threatening.

Another serious limitation of most existing studies is that they rely on cross-sectional data, limiting researchers’ ability to understand how reverse causality, spurious association, or selection mechanisms may influence the relationship. Sleepy workers may have a more negative view of their working conditions than the well-rested, for example, rather than or in addition to troubles at work acting to reduce sleep quality. Also, workers are not randomly selected into jobs with negative working conditions, and the same characteristics that make them more likely to face low control or other negative experiences on the job could be the underlying causes of poor sleep quality. For example, healthier people are more likely to be selected into employment and into particular kinds of jobs than their less healthy counterparts (Pavalko, Gong, and Long 2007), and healthier people may have better workplace experiences that could promote an existing advantage in sleep quality. Moreover, when studying self-reported occupational stressors like perceived job insecurity and also using self-reported measures of sleep outcomes, as is typically done in survey-based studies, an underlying negative reporting style could lead to a spurious association that can best be addressed if longitudinal data are available (Brief, Burke, George, Robinson, and Webster 1988). Our study uses longitudinal models with repeated measures of working conditions and sleep to eliminate the impact of stable individual characteristics, and we include baseline measures of respondents’ negative reporting style and health, to provide more robust estimates of the association. Thus, we may find little association between low control, job insecurity, and/or negative emotional experiences at work and sleep quality once personality and other potentially confounding characteristics are taken into account and longitudinal models applied.

This study thus has several strengths. First, we add to the very limited empirical analysis of the importance of common experiences at work for sleep quality in the general population. We examine three stressful experiences at work that have engaged sociologists and others interested in the ways social structure influences individuals, and that are associated with other aspects of well-being. Importantly, we are able to address critical shortcomings of prior studies of sleep

quality by using nationally-representative prospective data from a U.S. sample followed for up to 7.5 years. This study appears to be the first using U.S. data to do so, as existing nationally-representative longitudinal studies of sleep quality have been conducted on samples of European or Japanese workers, where working conditions and employment contexts may differ.

Additionally, we explore potentially competing stressors in the home domain, including financial, spousal/partner, and child-related strains, to explore how important these experiences are, and how workers with different family characteristics are influenced by their experiences in the workplace. Everybody sleeps, and most people will spend the major part of their adult life working, so improving understanding of the connection between the two is vitally important for understanding of the way that major social institutions and roles structure individual experiences and well-being.

BACKGROUND

What predicts poor sleep quality and why does it matter?

Inadequate sleep has serious consequences ranging from increased risk for traffic accidents (National Highway Traffic Safety Administration 2006), health problems (Moore, Adler, Williams, and Jackson 2002), chronic disease (Tasali, Leproul, Ehrmann, and Van Cauter 2008) and mortality (Ferrie, Shipley, Cappuccio, Brunner, Miller, Kumari, and Marmot Forthcoming). Moreover, given the high prevalence of troubled sleep – a recent report suggests that 50 to 70 million Americans chronically suffer from a disorder of sleep and wakefulness (Colten and Altevogt 2006) – a better understanding of its predictors could improve the well-being of a broad segment of the population. The majority of research on the predictors of sleep quality has been biomedical or psychological in nature and has focused on proximate risk factors, such as health conditions (Kutner, Bliwise, and Zhang 2004), personality dispositions (Espie 2002), or other individual or behavioral causes. Psychological stress and reactivity to stress also have been implicated in the development of insomnia, one of the major diagnosed conditions that indicates poor sleep quality (Espie 2002; Morin, Rodrigue, and Ivers 2003). The stress response increases neurological arousal that involves the release of key neurotransmitters (such as adrenaline and noradrenaline) and neuron-effective hormones (such as cortisol). The presence of cortisol, in particular, can interfere with a worker's ability to "switch off" at the end of the work period and could also lead to depressed mood or enduring agitation or anxiety about

the day's events, all of which could prevent adequate sleep (Linton 2004). While not intrinsically harmful, the stress responses that lead to a poor nights' sleep could become maladaptive if they occur chronically (House 2002; Pearlin, Menaghan, Morton, and Mullan 1981). Thus, people who are more likely to encounter psychologically stressful experiences, and/or those who are more likely to appraise given conditions as threatening, may be at greater risk of poor sleep quality. This suggests that beyond individual-level risk factors, social structure is also important for sleep quality. Specifically, we argue that social stratification across jobs and within workplaces leads to variation in the negative experiences individuals encounter at work, and determines exposure to the chronic psychological stressors that could lead to poor sleep quality.

Paid employment is a major social role for most adults in the contemporary United States, so psychologically stressful experiences at work are likely to have implications for sleep quality. Work-related stress is frequently cited by workers themselves as a cause of sleeping difficulties (Henry, McClellan, Rosenthal, Dedrick, and Gosdin 2008; Linton 2004), but since researchers have examined different working conditions and generally have not considered a variety of potentially stressful experiences in the same models, there is limited understanding of which common working conditions have robust associations with sleep quality (but see, as exceptions, Knudson, Ducharme, and Roman 2007; Ribet and Derriennic 1999; Sekine, Chandola, Martikainen, Marmot, and Kagamimori 2006). We focus on three common workplace experiences – perceived low control, perceived job insecurity, and feeling bothered or upset on the job – that are likely to be perceived as stressful by a substantial fraction of individuals who experience them.

Workplace experiences and sleep quality

Low control over tasks and decisions on the job has received considerable attention from social scientists, psychologists, and epidemiologists interested in the consequences of stratification in the workplace. Longitudinal studies have shown that occupational self-direction enhances self-directed personality orientations, increasing the overall sense of control (Kohn and Schooler 1982) and lowering the risk for depression, psychological distress, and anxiety (Kohn and Schooler 1982; Kohn and Schooler 1983; Link, Lennon, and Dohrenwend 1993). By contrast, low control prevents an individual from resolving problems on the job or exercising autonomy or creativity, and the stress and frustration of these experiences could be carried home

after work. A few studies have shown that low control at work is linked with poor sleep quality, though prior studies have examined workers outside the U.S. (Kalimo, Tenkanen, Harma, Poppius, and Heinsalmi 2000) and/or used cross sectional data (Knudson, Ducharme, and Roman 2007; Sekine et al. 2006), so further assessment of the association is needed.

Perceived job insecurity can involve anticipating problems associated with a job loss, experiencing the mental strain of being in a powerless position, and/or feeling ambiguity about what the future might hold and what actions would be most appropriate to reduce the strain (Heaney, Israel, and House 1994; Joelson and Wahlquist 1987). We have found no studies that directly examined the association between perceived job insecurity and poor sleep quality as we measure it here, though prior studies have found links between impending job loss and short or long sleep duration among British male civil servants (Ferrie, Shipley, Marmot, Stansfeld, and Smith 1998a) and have noted sleep disturbance among Swedish male shipyard workers in the midst of major industrial reorganization (Mattiasson, Lindgarde, Nilsson, and Theorell 1990). Another study found that workers who actually lost jobs during a major economic recession in Finland experienced an increase in level of insomnia (Hyypä, Kronholm, and Alanen 1997). Perceived job insecurity also has been linked to depressive symptoms and physical health indicators that reflect the impact of stress (Burgard, Brand, and House 2006; Ferrie, Shipley, Marmot, Stansfeld, and Smith 1995; Ferrie, Shipley, Marmot, Stansfeld, and Smith 1998b), so it is plausible to anticipate a prospective link with sleep quality.

We have found no prior studies that directly examine the association between being bothered or upset at work and sleep quality. A cross-sectional study of Australian nurses suggested, however, that psychologically stressful experiences reflecting negative emotional load and poor relations with coworkers, as well as other psychological demands, were much more strongly related to poor sleep quality than the physical demands of nursing (Winwood and Lushington 2006). A longitudinal study of 47 U.S. men and women also found that daytime interpersonal conflict was associated with poor sleep quality that night (Brissette and Cohen 2002). Interpersonal conflict or negative emotional load could contribute to feeling bothered or upset at work, but without prior empirical evidence for the measure we use in this study, we rely on related theoretical and empirical findings about emotion in the workplace. Sociologists have examined how workers express emotions (Lively and Powell 2006) and face challenges in regulating their emotions in the workplace (Hochschild 1983), and how stressful emotional

experiences at work may spill over into life at home, influencing family interactions (Menaghan 1991). These and other prior studies lead us to argue that being bothered or upset at work indicates a negative emotional experience linked to psychological stress that could influence sleep quality.

Importantly, unlike our other two measures of stressful experiences at work, feeling bothered or upset is an explicit measure of emotional reaction to conditions at work, rather than a measure of simply being exposed to specific working conditions. As such, it is a more direct measure of stress and arousal, because all workers who report it have necessarily appraised their conditions as threatening or disturbing. This means that being bothered or upset at work may have a stronger or more consistent relationship with sleep quality than reports of low control or perceived job insecurity, which may or may not be viewed as threatening by a given individual. On the other hand, underlying stable personality characteristics may more completely explain emotional reaction to working conditions, so our controls for those characteristics may explain any link with sleep quality, leaving no remaining association in longitudinal models. Based on prior theoretical and empirical research on stressful experiences in the workplace, then, we arrive at a first research question:

Question 1: Are perceived low control, perceived job insecurity, and/or feeling bothered or upset at work prospectively associated with poor sleep quality?

Competing Stressful Experiences at Home

For the majority of adults, one third of the day is taken up with sleep, and another third with paid work, while the remaining hours are generally filled by family and home experiences and responsibilities. Home life could provide competing stressful experiences that may be as important, or more important, for sleep quality. After all, individuals who experience stress in interactions with a spouse or partner often share a bed with that person, which could make such experiences particularly salient for sleep quality. Additionally, time spent dealing with bills and financial issues or disciplining children may occur closer to bedtime than problems arising at work, making them more immediately relevant. Alternatively, stressful home lives could intensify the importance of negative experiences at work, as the total burden accumulates and as work-life conflict increases.

Stressful experiences at home and their salience for sleep could vary substantially depending on family structure. Individuals with a spouse and/or children may be more heavily influenced by home and family experiences than by experiences at work, compared to individuals who do not hold the competing roles of parent or spouse. Moreover, negative experiences in the workplace could influence the way individuals interact with their partners or children (Menaghan 1991), potentially creating interpersonal problems at home that negatively influence sleep quality. In this study we examine how competing stressful experiences in the home sphere may overshadow or explain the association between negative experiences at work and sleep quality for working-aged individuals who have a spouse/partner or who live with their children, compared to the sample of working individuals overall. While we recognize that work and home roles are strongly gendered in the United States, and thus could affect sleep differently for men and women, in this study we seek to first establish whether negative experiences at work and/or at home are associated with sleep quality among working adults overall.

Focusing on finances, a spouse or partner, and children as key sources of potential sleep-disrupting stress, we explore self reports of relatively objective conditions as well as direct measures of emotional response to negative experiences, to parallel our measures of working conditions and experiences. For example, we assess the association between poor sleep quality and reported difficulty paying bills (a more objective measure) as well as dissatisfaction with finances (better reflecting the appraised threat of one's financial situation). Among individuals living with a spouse or partner, we examine the association between poor sleep quality and the degree of negative hassles from the spouse/partner, as well as feeling bothered or upset by one's marriage or relationship. Among those with children in the home, we examine the importance of feeling bothered or upset as a parent for sleep quality. We explore three related research questions to assess whether and how negative experiences at home represent competing risks for poor sleep quality, compared to those at work:

Question 2: Are financial, spousal/partner, and/or child-related negative experiences prospectively associated with poor sleep quality?

Question 3: Are financial, spousal, and/or child-related negative experiences more strongly prospectively associated with poor sleep quality than workplace experiences?

Question 4: Do financial, spousal, and/or child-related negative experiences explain the association between workplace experiences and poor sleep quality?

DATA AND METHODS

Data

We use the American's Changing Lives study (ACL) and include respondents who were working at least twenty hours per week at baseline to focus on those among whom exposure to negative working conditions is likely to be substantial, and because information about low control is available only for individuals working at least this much. The ACL is a stratified, multi-stage area probability sample of 3,617 non-institutionalized adults 25 years and older living in the United States in 1986, with over sampling of adults 60 and older and of African Americans. Sample weights designed to adjust for oversampling of special populations and sample non-response or non-coverage at baseline, as well as loss to follow-up due to attrition or death, will be used in all appropriate descriptive statistics and multivariate models. Excluding ACL respondents who did not work at least twenty hours per week in 1986 ($N = 1,930$), the vast majority of whom were already retired or not working for pay, those who were not present for the 1989 interview ($N = 297$), and cases missing on covariates ($N = 60$), 1,330 individuals are eligible for inclusion in analyses using information on working conditions in 1986. We focus for most multivariate analyses on two subsamples of these respondents: (a) those who were working for pay for at least 20 hours per week in both 1986 and 1989 ($N = 1,101$), and (b) those working for pay for at least 20 hours per week in both 1986 and 1989 who reported on their sleep quality in the third wave of ACL in 1994 ($N = 993$). In some analyses we use subsamples of respondents who were married and working for pay in 1986 and 1989 ($N = 670$) and those who had children 18 years old or younger living in the home and were working for pay in both 1986 and 1989 ($N = 435$).

Sleep Quality

Poor sleep quality is typically measured in surveys with indicators of delayed, disrupted, and/or nonrestorative sleep. We measure perceived poor sleep quality with a global item obtained from the Center for Epidemiologic Studies Depression Scale, or CES-D (Radloff 1977): "During the past week my sleep was restless: most of the time, some of the time, or hardly ever." We dichotomize the responses so that 0 = hardly ever, while 1 = some or most of the time, because this denotes as exposed those respondents who reported troubled sleep for at least some meaningful fraction of the last week, and also because only a small percentage of respondents

reported the response “most of the time” (about 10% in 1986 and 1994 and 7% in 1989).¹ This item was dichotomized similarly in a prior study of social factors and sleep quality (Kutner, Bliwise, and Zhang 2004).

Working Conditions

Perceived low control is derived from three items based on Karasek and Theorell’s measure of decision latitude (Karasek and Theorell 1990; Karasek 1979), including: “I get to do a variety of different things in my work,” “I have a lot to say about what happens in my work,” and “I have very little chance to decide how I do my work (reverse coded).” Response categories are: strongly agree = 1, agree somewhat = 2, disagree somewhat = 3, and strongly disagree = 4, and we create a measure of low control by summing all items (range 3 – 12). To measure perceived job insecurity, respondents were asked: “How likely is it that during the next couple of years you will involuntarily lose your main job – not at all likely = 1, not too likely = 2, somewhat likely = 3 or very likely = 4?” To capture negative emotional experiences at work we use a single item: “In general, how often do you feel bothered or upset in your work – almost always = 5, often = 4, sometimes = 3, rarely = 2 or never = 1?” For each working condition measure, we also create an indicator of change over follow up by subtracting the value for 1986 from the value for 1989. A positive value on the change score means that the negative exposure worsened over time, while a negative value indicates that it lessened.

Home Conditions

Measures of financial strain include a self report of difficulty paying bills (not difficult = 1, slightly difficult = 2, somewhat difficult = 3, very difficult = 4, extremely difficult = 5) and an indicator of dissatisfaction with the respondent’s present financial situation (completely satisfied = 1, very satisfied = 2, somewhat satisfied = 3, not very satisfied = 4, not at all satisfied = 5). ACL investigators created a negative hassles index referring to the respondent’s spouse or live-in partner using the items: “How much do you feel (he/she) makes too many demands on you?” and “How much is (he/she) critical of you or what you do?” Response categories for each were: “a great deal, quite a bit, some, a little, or not at all,” and reverse coded values for the two items were averaged and the index standardized. The spouse/partner negative hassles index ranges from -1.3 (least hassles) to 2.9 (most hassles). To capture negative emotional experiences with

family members, respondents were asked how often they felt bothered or upset (a) by their marriage/relationship, and/or (b) as a parent, with response categories coded so that almost always = 5, often = 4, sometimes = 3, rarely = 2 or never = 1. Change scores were created for each of these measures of negative experiences at home by subtracting the 1986 value from the 1989 value, with positive values on the change measure indicating conditions that worsened over time.

Other Predictors

To explore whether the association between working conditions and sleep quality is spurious, we adjust for neuroticism and health at baseline, as well as adjusting for prior poor sleep quality. Neuroticism is a relatively stable underlying personality trait that may mark a negative reporting style, and we use a neuroticism index based on four questions from the Eysenck Personality Inventory (Eysenck and Eysenck 1975), such as “Are you a worrier?” The standardized scale ranges from -1.2 (least neurotic) to 2.2 (most neurotic). Self-rated health, a general indicator used to distinguish respondents who may have health conditions that influence their ability to sleep, is measured with a single item: “How would you rate your health at the present time: 1 = poor, 2 = fair, 3 = good, 4 = very good, or 5 = excellent?” We also control for obesity, a risk factor for sleep apnea, which could negatively impact sleep quality. Using self-reported weight and height, obesity is coded so that 0 = body mass index less than 30, while 1 = body mass index 30 or above.

In multivariate analyses we also adjust for baseline sociodemographic characteristics that are predictive of sleep quality, working conditions, or both. Age is measured in years, and a squared term for age is included in multivariate models to adjust for nonlinearities in the association between age and sleep. Respondent’s race is coded so that 0 = white, 1 = African American, and 2 = other race, and is treated categorically in multivariate analyses. Sex is coded so that 0 = female and 1 = male, and marital status is coded so that 0 = married or living with a partner and 1 = unmarried/not living with a partner. Educational attainment at baseline is coded as 0 = some college or more and 1 = high school graduate or less. We also include a measure of household income, reported in Table 1 in 2007 dollars, but transformed for multivariate analysis by adding a small positive constant (\$500) before taking the log so that individuals with a score of zero on the measure are retained. Work hours at the respondent’s main job are measured as

average hours per week. Employment status in 1989 and 1994 (0 = not employed, 1 = employed) are included in Table 1 to indicate the loss of respondents from the paid labor force over time and across analytic samples, and an indicator of employment status in 1994 is included in longitudinal models of sleep quality in 1994 to differentiate those respondents whose exposure to working conditions has ceased.

Analytic Strategy

We first examine bivariate associations between negative experiences at work and home and poor sleep quality. We then estimate logistic regression models to explore the association between negative working conditions and sleep quality cross-sectionally and longitudinally. In longitudinal models we consider the association between working conditions in 1986, change in working conditions between 1986 and 1989 and poor sleep quality in 1989 and 1994. Models predicting poor sleep quality in 1989 control for sleep quality in 1986, while models predicting poor sleep quality in 1994 control for sleep quality in 1989. In the 1994 models, then, all changes in working conditions occur temporally prior to any measured changes in sleep quality, providing a stronger test of the causal directionality of the association.² To provide additional tests of the robustness of the association, we test fixed effects and random effects logistic regression models using the same predictors. However, because low control and job insecurity were not measured in 1994, we are able to include only the measure of being bothered or upset at work in fixed and random effect models using three waves of data from 1986, 1989, and 1994. Due to this limitation of the data, we return to the standard logistic regression models to explore the competing risks of negative experiences at home for sleep quality in 1989. In this last set of models, we use different subsamples to target those respondents who were at risk of particular exposures. We explore the importance of financial strain for all respondents, while models that examine spousal/partner strain include only respondents who were married or lived with a partner at both waves, and those that examine child-related strain are restricted to respondents living with their children under age 18 at both waves.³ Attrition of respondents is always a concern when using longitudinal samples. All prospective multivariate models use wave two or wave three survey weights, as appropriate, which adjust for survey attrition, while cross-sectional figures use baseline sampling weights. All analyses are conducted using Stata 10SE software.

RESULTS

Descriptive Results

Means and standard deviations or percentages for all variables used in the analysis are presented in Table 1, separately for the three analytic samples described above. Characteristics are presented for all respondents working at baseline in the first column, for the sample working in 1986 and 1989 and reporting on their sleep in 1989 in the middle column, and for the sample working in both 1986 and 1989 and reporting on their sleep in 1994 in the rightmost column. Comparison across columns shows that sample means are very similar on most characteristics, suggesting that attrition due to leaving the paid labor force by 1989 or leaving the study by 1994 is not likely to influence our results.

As shown in Table 1, about half of the ACL respondents reported poor sleep quality at baseline in 1986, about 48% did so in 1989, and of those who responded in 1994, about 42% reported poor sleep quality. By comparison, a study of U.S. workers using data from the 2002-2003 National Employee Survey showed that about 58% reported at least some trouble falling asleep in the past month and about 56% reported at least some trouble staying asleep (Knudson, Ducharme, and Roman 2007), suggesting that our figures are reasonable. Turning to negative working conditions at baseline, respondents average a low control score of 5.1, close to the bottom of the possible range. The average response on perceived job insecurity is about 1.7, closer to “not too likely” than to “not at all likely”, and average score for being bothered or upset at work is 2.6 to 2.7 across samples, which is closer to “often” than “sometimes” on this measure. The average amount of change was very close to zero on all three working conditions, but tabulations not shown indicate that only about one third of respondents had the same low control score in 1986 and 1989, while about half reported no change in job insecurity or being bothered or upset at work. About one-quarter to one-third of respondents showed improvement over this period, while the remainder reported worsened working conditions.

Respondents report scores of about 1.9 on difficulty paying bills, close to the value for “somewhat difficult,” and average dissatisfaction scores are about 2.8, closer to “somewhat” than to “very satisfied.” Average scores for spouse/partner negative hassles are close to zero, as this index is standardized, while scores for being bothered or upset by the respondent’s marriage/relationship are about 2.0-2.1, or “rarely.” Average scores for being bothered or upset as a parent are higher at 2.7, closer to “sometimes.”

Table 1. Descriptive Statistics for Dependent and Independent Variables by Analytic Samples, ACL Respondents.

	Working in 1986 and Responded in 1989		Working 1986 & 1989 and Responded in 1989		Working 1986 & 1989 and Responded in 1994	
	Mean / %	Std. Dev.	Mean / %	Std. Dev.	Mean / %	Std. Dev.
Poor sleep quality 1986	49.5%		49.0%		49.6%	
Poor sleep quality 1989	48.1%		48.0%		47.6%	
Poor sleep quality 1994 ^a	42.0%		41.6%		41.7%	
Perceived Low Control						
1986	5.10	(2.00)	5.06	(2.01)	5.07	(2.01)
Change 1986-1989	n.a.		-0.08	(1.95)	-0.08	(1.95)
Perceived Job Insecurity						
1986	1.73	(0.859)	1.73	(0.852)	1.73	(0.848)
Change 1986 - 1989	n.a.		-0.03	(0.967)	-0.02	(0.959)
Bothered/Upset at Work						
1986	2.62	(0.829)	2.62	(0.812)	2.65	(0.811)
Change 1986 - 1989	n.a.		0.06	(0.950)	0.06	(0.953)
Difficult to Pay Bills						
1986	1.93	(1.012)	1.93	(0.990)	1.94	(0.998)
Change 1986 - 1989	n.a.		-0.12	(0.973)	-0.13	(0.962)
Dissatisfaction with Finances 1986						
1986	2.79	(0.993)	2.79	(0.962)	2.80	(0.956)
Change 1986 - 1989	n.a.		-0.05	(0.963)	-0.06	(0.949)
Spouse/Partner Negative Hassles ^b						
1986	0.04	(0.955)	0.05	(0.959)	0.04	(0.938)
Change 1986 - 1989	n.a.		0.09	(0.870)	0.09	(0.868)
Bothered/Upset by Marriage/Relationship ^b						
1986	2.03	(0.819)	2.05	(0.812)	2.04	(0.804)
Change 1986 - 1989	n.a.		0.02	(0.792)	0.02	(0.788)
Bothered/Upset as Parent ^c						
1986	2.68	(0.869)	2.69	(0.861)	2.72	(0.849)
Change 1986 - 1989	n.a.		-0.07	(0.912)	-0.07	(0.928)
Neuroticism Score 1986	-0.093	(0.947)	-0.116	(0.933)	-0.118	(0.939)
Self-Rated Health 1986	4.01	(0.871)	4.04	(0.846)	4.05	(0.843)
% Obese (BMI 30 or higher) 1986	13.5%		13.6%		13.8%	
Age (years) 1986	40.5	(11.3)	39.6	(10.4)	39.5	(10.3)
% Male	56.4%		58.4%		58.7%	
Race						
% White	85.1%		84.7%		86.3%	
% African American	9.7%		9.6%		8.9%	
% Other	5.2%		5.6%		4.8%	
% Unmarried 1986	22.9%		21.8%		21.2%	
% High School or less Education 1986	45.8%		43.9%		42.7%	

(Note: Table 1 continued below.)

Table 1, continued. Descriptive Statistics for Dependent and Independent Variables by Analytic Samples, ACL Respondents.

	Working in 1986 and Responded in 1989		Working 1986 & 1989 and Responded in 1989		Working 1986 & 1989 and Responded in 1994	
Household Income 1986 in 2007 \$	69,231	(43,799)	70,660	(43,576)	71,015	(43,010)
Work Hours per Week 1986	44.0	(11.7)	44.6	(11.7)	44.5	(11.5)
% Employed in 1989	91.9%		100.0%		100.0%	
% Employed in 1994 ^a	83.5%		87.5%		87.6%	
N	1330		1101		993	

Note : Figures are weighted using 1986 sampling weight, column totals unweighted.

a. Sample size of respondents reporting on characteristics for 1994 differs from those reported due to attrition between 1989 and 1994; for those working in 1986, N = 1155 in 1994, for those working in 1986 and 1989, the N = 993 in 1994.

b. Reports about spouses only collected from those who are married; for those working in 1986 N = 873, for those working in 1986 and 1989 and reporting on sleep in 1989 N = 670 (married in 1986 and 1989); for those working in 1986 and 1989 and reporting on sleep in 1994 N = 616 (married in 1986 and 1989).

c. Reports about children only collected from those who have children; for those working in 1986 N = 693, for those working in 1986 and 1989 and reporting on sleep in 1989 N = 435 (children in 1986 and 1989); for those working in 1986 and 1989 and reporting on sleep in 1994 N = 406 (children in 1986 and 1989).

As for the working conditions measures, the average amount of change in these indicators of negative home experiences was close to zero, but calculations not shown indicate that only about half the sample showed no change in their ratings on these items between 1986 and 1989. About one quarter of respondents showed improvement on these indicators, while 20 to 25% showed worsening reports over the period.

ACL respondents averaged “very good” self rated health at baseline and were about 40 years old, on average, with a higher fraction of males in the sample (56-59%). Most are white, almost four out of five were married at baseline, and close to half had high school education or less. These respondents (who all worked at least twenty hours per week in 1986) worked about 44-45 hours per week on average, and a large majority was still working in 1994.

Table 2 presents bivariate associations between stressful experiences at work or at home and sleep quality. The first column shows the percentage of respondents reporting poor sleep quality in 1986 for each category of the exposure variables in 1986 (low control at work and spouse negative hassles are presented categorically here for ease of interpretation, but used as linear terms in multivariate models), while the second and third columns show the percentages reporting poor sleep quality in 1989 and 1994, respectively. P-values for chi-square tests of

difference are presented for the low control and spousal hassles comparison groups, and for nonparametric tests of trend for comparisons across categories of the other measures. Results in Table 2 suggest that before adjusting for any individual characteristics, respondents reporting negative experiences at work or at home were significantly more likely to report poor sleep at all survey waves. The only exceptions were for the comparison of sleep quality in 1989 across categories of low control and spousal/partner hassles.

Multivariate Results

Table 3 presents odds ratios and 95% confidence intervals obtained from logistic regression models predicting poor sleep quality, with sample sizes and tests of model fit presented at the bottom of the table for each model. Model 1 examines the simple association between negative working conditions and poor sleep quality in 1986, adjusting only for age, age-squared, and sex. Model 2 adds controls for all other independent predictors available at baseline, including sociodemographic characteristics (race, marital status, educational attainment, household income, and hours worked per week) and neuroticism score, self-rated health and obesity. Taken together, the cross sectional Models 1 and 2 suggest that perceived job insecurity and feeling bothered or upset at work are most strongly linked to poor sleep quality for ACL respondents at baseline.

Turning to longitudinal models of change in poor sleep quality, Model 3 examines the impact of 1986 working conditions and change in working conditions between 1986 and 1989 on poor sleep quality in 1989, controlling for all predictors used in Model 2 and adding a measure of poor sleep quality in 1986. The results for Model 3 show that only being bothered or upset at work predicts poor sleep quality in 1989 (net of sleep quality in 1986). Both being bothered in 1986 and increases in being bothered or upset by 1989 are independently associated with subsequent poor sleep quality. To further clarify the temporal ordering of events, Model 4 predicts change in sleep quality between 1989 and 1994 as a function of 1986 working characteristics and changes in these working characteristics between 1986 and 1989. The results are very similar to those obtained from Model 3: each added increment in being bothered or upset in 1986 increases the odds of poor sleep quality in 1994 by about 56%, while each increment of increase between 1986 and 1989 increases the odds by an additional 28%.

Table 2. Percentage of Respondents Reporting Poor Sleep Quality in 1986, 1989 or 1994 by Categories of Stressful Work or Home Conditions, ACL Respondents Working in 1986.

	% Poor Sleep Quality	% Poor Sleep Quality	% Poor Sleep Quality
Low Control 1986			
Control at or above median	45.9%	48.1%	38.0%
Control below median	55.0%	48.2%	48.2%
p-value for difference	0.001	0.254	<.001
Perceived Job Insecurity 1986			
Job Loss Not at all likely	45.3%	44.4%	38.4%
Not too likely	48.9%	48.9%	42.9%
Somewhat likely	61.2%	60.8%	51.1%
Very likely	65.0%	44.3%	47.8%
p-value for trend	<.001	0.002	0.002
Bothered/Upset at Work 1986			
Never	37.1%	39.8%	44.7%
Rarely	40.2%	41.7%	31.0%
Sometimes	55.6%	51.4%	47.3%
Often	62.8%	63.4%	56.1%
Almost always	77.0%	61.8%	66.7%
p-value for trend	<.001	<.001	<.001
How Difficult to Pay Bills 1986			
Not difficult	47.1%	44.0%	36.1%
Slightly difficult	48.9%	47.9%	44.2%
Somewhat difficult	50.5%	53.2%	46.6%
Very difficult	62.1%	53.0%	46.9%
Extremely difficult	68.2%	73.5%	77.9%
p-value for trend	<.001	<.001	<.001
Dissatisfaction with Finances 1986			
Completely satisfied	37.4%	34.8%	32.8%
Very satisfied	44.9%	42.8%	31.6%
Somewhat satisfied	50.6%	50.5%	46.0%
Not very satisfied	56.9%	49.2%	53.4%
Not at all satisfied	65.3%	71.7%	52.3%
p-value for trend	<.001	<.001	<.001
Spouse/Partner Negative Hassles 1986^a			
Hassles below median	46.5%	45.2%	36.4%
Hassles at or above median	51.4%	51.3%	49.1%
p-value for difference	0.073	0.212	0.010
Bothered/Upset by Marriage/Relationship 1986^a			
Never	44.6%	40.3%	37.1%
Rarely	46.3%	48.9%	40.9%
Sometimes	57.7%	52.8%	49.1%
Often	65.3%	70.2%	72.4%
Almost always	60.8%	68.0%	46.5%
p-value for trend	0.001	<.001	0.001
Bothered/Upset as Parent 1986^b			
Never	0.371	0.333	0.396
Rarely	0.412	0.429	0.341
Sometimes	0.512	0.447	0.433
Often	0.593	0.520	0.535
Almost always	0.921	0.808	0.557
p-value for trend	<.001	0.006	0.007

Note: P-values obtained from chi-square or nonparametric tests for trend across ordered categories.

a. Only respondents who were married/living with a partner reported on that person.

b. Only respondents with children reported on them.

Table 3. Odds Ratios and 95% Confidence Intervals from Logistic Regression Models of Poor Sleep Quality in 1986, 1989 or 1994, ACL respondents.

	Model 1: Poor Sleep Quality 1986		Model 2: Poor Sleep Quality 1986		Model 3: Poor Sleep Quality 1989		Model 4: Poor Sleep Quality 1994	
	O.R.	(95% C.I.)						
Low Control 1986	1.05	(0.990- 1.109)	1.03	(0.969- 1.094)	0.99	(0.918- 1.077)	1.07	(0.985- 1.170)
Change 1986-89	--		--		1.02	(0.945- 1.108)	1.03	(0.945- 1.123)
Job Insecurity 1986	1.27 ***	(1.110- 1.445)	1.21 **	(1.052- 1.386)	1.10	(0.904- 1.333)	1.00	(0.808- 1.230)
Change 1986-89	--		--		1.04	(0.875- 1.228)	0.94	(0.785- 1.136)
Bothered/Upset at Work 1986	1.56 ***	(1.359- 1.796)	1.40 ***	(1.202- 1.624)	1.39 **	(1.121- 1.721)	1.56 ***	(1.224- 1.982)
Change 1986-89	--		--		1.29 **	(1.091- 1.532)	1.28 *	(1.060- 1.537)
Age (years)	0.98	(0.915- 1.052)	0.98	(0.905- 1.052)	0.86 **	(0.782- 0.942)	1.01	(0.914- 1.125)
Age ² (years)	1.00	(0.999- 1.001)	1.00	(0.999- 1.001)	1.00 **	(1.001- 1.003)	1.00	(0.999- 1.001)
Male	0.92	(0.740- 1.156)	0.99	(0.773- 1.255)	1.01	(0.766- 1.326)	1.01	(0.743- 1.360)
African American	--		0.98	(0.662- 1.451)	1.31	(0.848- 2.037)	1.58 †	(0.980- 2.544)
Other Race	--		1.87 *	(1.099- 3.191)	1.31	(0.774- 2.226)	1.72	(0.924- 3.199)
Unmarried	--		1.00	(0.737- 1.344)	0.99	(0.705- 1.382)	0.68 *	(0.470- 0.991)
High School or less	--		1.32 *	(1.027- 1.695)	0.81	(0.612- 1.080)	1.49 *	(1.092- 2.024)
Household Income	--		0.97	(0.797- 1.191)	1.07	(0.854- 1.351)	1.01	(0.787- 1.302)
Hours/Week	--		1.00	(0.993- 1.014)	0.99	(0.981- 1.004)	0.99	(0.980- 1.007)
Neuroticism Score	--		1.45 ***	(1.268- 1.659)	1.31 **	(1.120- 1.525)	1.28 **	(1.083- 1.510)
Self-Rated Health	--		0.74 ***	(0.645- 0.856)	0.85 †	(0.728- 1.000)	0.92	(0.773- 1.091)
Obese	--		1.44 *	(1.025- 2.029)	0.90	(0.613- 1.309)	1.28	(0.849- 1.931)
Poor Sleep 1986	--		--		2.83 ***	(2.169- 3.685)	--	
Poor Sleep 1989	--		--		--		3.63 ***	(2.727- 4.835)
Working in 1994	--		--		--		0.86	(0.543- 1.368)
N	1330		1330		1101		993	
LR Chi ²	66.6***		151.8***		153.5***		184.7***	

Note : ***p<.001, **p<.01, *p<.05, †p<.10.

To further test the robustness of these findings, Table 4 presents results from fixed and random effects models of poor sleep quality. The first set of models (Models 5 and 6) is estimated using information from 1986 and 1989, and the second set considers working conditions and sleep quality in 1986, 1989 and 1994 (Models 7 and 8). As noted above, low control and perceived job insecurity were not measured in 1994, so we focus on the measure of being bothered or upset at work for the three wave Models 7 and 8.

Table 4. Odds Ratios and 95% Confidence Intervals from Fixed and Random Effect Logistic Regression Models of Poor Sleep Quality, ACL respondents Working in 1986 and 1989 or in 1986, 1989 and 1994.

	Two Survey Waves: 1986 and 1989				Three Survey Waves: 1986, 1989 and 1994			
	Model 5: Fixed Effects		Model 6: Random Effects		Model 7: Fixed Effects		Model 8: Random Effects	
	O.R.	(95% C.I.)	O.R.	(95% C.I.)	O.R.	(95% C.I.)	O.R.	(95% C.I.)
Low Control 1986	1.03	(0.922- 1.147)	1.03	(0.968- 1.100)	na		na	
Job Insecurity 1986	1.14	(0.930- 1.407)	1.13 †	(0.980- 1.304)	na		na	
Bothered/Upset at Work 1986	1.19	(0.967- 1.477)	1.51 ***	(1.302- 1.760)	1.21 *	(1.035- 1.413)	1.49 ***	(1.314- 1.692)
Age (years)	0.91	(0.699- 1.171)	0.88 **	(0.810- 0.951)	0.89 †	(0.794- 1.006)	0.88 ***	(0.826- 0.945)
Age ² (years)	1.00	(0.998- 1.004)	1.00 **	(1.000- 1.002)	1.00	(0.999- 1.002)	1.00 **	(1.000- 1.002)
Male	--		0.86	(0.648- 1.134)	--		0.87	(0.681- 1.117)
African American	--		1.02	(0.750- 1.394)	--		1.18	(0.897- 1.554)
Other Race	--		1.84 †	(0.938- 3.626)	--		2.04 *	(1.114- 3.732)
Unmarried	1.18	(0.607- 2.299)	1.00	(0.745- 1.345)	1.24	(0.812- 1.898)	0.99	(0.769- 1.280)
High School or less	--		1.17	(0.876- 1.556)	--		1.28 †	(0.993- 1.650)
Household Income	1.34	(0.845- 2.134)	1.05	(0.851- 1.290)	1.18	(0.868- 1.594)	1.02	(0.850- 1.217)
Hours/Week	1.00	(0.980- 1.021)	1.00	(0.988- 1.012)	1.00	(0.984- 1.010)	1.00	(0.988- 1.007)
Neuroticism Score	--		1.67 ***	(1.436- 1.952)	--		1.59 ***	(1.396- 1.820)
Self-Rated Health	0.83	(0.647- 1.055)	0.69 ***	(0.600- 0.803)	0.74 ***	(0.620- 0.873)	0.70 ***	(0.623- 0.794)
Obese	1.33	(0.652- 2.704)	1.24	(0.880- 1.746)	1.17	(0.703- 1.951)	1.24	(0.931- 1.642)
N (observations)	750		2202		1507		3042	
N (individuals)	375		1101		532		1101	
LR Chi-square	10.6		139.1***		30.3***		174.2***	
Hausman test (Chi ²)	17.5 (p=0.064)				33.7 (p<.001)			

Note : ***p<.001, **p<.01, *p<.05, †p<.10.

At the bottom of the table we include information about the number of cases used to estimate the models, and present Hausman test results to guide interpretation of the comparison across fixed and random effects results. A Hausman test statistic of $p < .05$ suggests using fixed effects results, while a $p > \text{or} = .05$ suggests using random effects results. Fixed effects estimates are very conservative because they are obtained by differencing values of all independent and dependent variables between two survey waves; this removes the impact of all unmeasured characteristics from the estimates. However, as evident from inspection of the number of cases used, all respondents whose values do not change are dropped, lowering the efficiency of fixed effects models. Random effects estimates are more efficient but do not provide the same level of adjustment for unmeasured confounding characteristics and selection effects.

The results presented in Table 4 support for our findings in Table 3. Hausman test values suggest that random effects estimates from Model 6 are preferred to fixed effects estimates from Model 5, while the fixed effects estimates from Model 7 are preferred to random effects estimates in Model 8. In Models 6 and 7, feeling bothered or upset at work is associated with significantly higher odds of reporting poor sleep quality. Model 6 also shows that perceived job insecurity is associated with marginally higher odds of poor sleep at follow up, a finding not apparent in longitudinal models in Table 3. While results from these fixed and random effects models suggest that being bothered or upset at work may be causally linked to sleep quality, these models may be too conservative when only two or three waves of data are available. We thus return to standard logistic regression models for the remainder of the analysis.

Table 5 presents models designed to test the robustness of the associations between negative experiences at work and poor quality sleep when competing stressful experiences at home are also assessed. Models 9 through 11 examine poor sleep quality in 1989 and include all predictors from Model 3 in Table 3, though we present only the focal odds ratios because values for other predictors do not change substantively. We progressively add indicators of baseline and change score values for difficulty paying bills and dissatisfaction with financial situation (Model 9), negative spousal hassles and being bothered or upset by one's relationship (Model 10), or being bothered or upset as a parent (Model 11). While indicators of negative financial experiences are included in all three models because they are available for the entire analytic sample, we include information about spousal/partner negative experiences only in Model 10 and child-related negative experiences only in Model 11, to preserve as many cases as possible.

Table 5. Odds Ratios and 95% Confidence Intervals from Logistic Regression Models of Poor Sleep Quality in 1989 with Adjustment for Indicators of Work and Life Stressors, ACL respondents Working in 1986 and 1989.

	Model 9: Financial Stress		Model 10: Spousal/Partner		Model 11: Child Stress	
	O.R.	(95% C.I.)	O.R.	(95% C.I.)	O.R.	(95% C.I.)
Low Control 1986	0.99	(0.909- 1.069)	1.00	(0.898- 1.114)	1.11	(0.962- 1.273)
Change 1986-89	1.02	(0.941- 1.106)	1.01	(0.911- 1.126)	1.11	(0.971- 1.269)
Job Insecurity 1986	1.06	(0.874- 1.296)	1.06	(0.817- 1.381)	1.43 *	(1.006- 2.042)
Change 1986-89	1.01	(0.854- 1.203)	0.95	(0.760- 1.179)	1.08	(0.795- 1.454)
Bothered/Upset at Work 1986	1.34 **	(1.080- 1.664)	1.42 **	(1.062- 1.900)	1.06	(0.708- 1.591)
Change 1986-89	1.25 *	(1.055- 1.489)	1.38 **	(1.093- 1.750)	1.35 †	(0.989- 1.845)
Difficult to Pay Bills 1986	0.96	(0.793- 1.174)	0.90	(0.691- 1.165)	1.01	(0.731- 1.406)
Change 1986-89	1.01	(0.845- 1.201)	0.86	(0.672- 1.109)	1.15	(0.851- 1.543)
Dissatisfaction with Finances 1986	1.38 **	(1.108- 1.718)	1.35 *	(1.003- 1.813)	1.35	(0.908- 1.992)
Change 1986-89	1.27 *	(1.055- 1.537)	1.29 †	(0.997- 1.658)	1.22	(0.868- 1.701)
Spouse/Partner Negative Hassles 1986	--		1.11	(0.883- 1.396)	--	
Change 1986-89	--		1.14	(0.905- 1.441)	--	
Bothered/Upset by Marriage/Relationship 1986	--		1.09	(0.825- 1.447)	--	
Change 1986-89	--		1.21	(0.931- 1.574)	--	
Bothered/Upset as Parent 1986	--		--		0.98	(0.681- 1.404)
Change 1986-89	--		--		1.09	(0.777- 1.523)
N	1101		670		435	
LR Chi ²	165.4***		106.1***		97.5***	

Note : ***p<.001, **p<.01, *p<.05, †p<.10. Models adjust for all covariates included in Model 3, Table 3.

Results presented in Table 5 show that while dissatisfaction with finances in 1986 and an increase in dissatisfaction between 1986 and 1989 are independently and significantly associated with poor sleep quality in 1989 (Models 9 and 10), these and the other additional controls do not alter the main findings from Table 3. Being bothered or upset at work is still the only negative experience at work prospectively associated with change toward poorer sleep quality in Models 9 and 10. In the select subsample of ACL respondents living with their children in both 1986 and 1989 (Model 11), results differ somewhat, such that perceived job insecurity in 1986 is significantly associated with poor sleep quality and being bothered or upset at work in 1986 is no longer a significant predictor, though an increase in feeling bothered or upset at work remains marginally significant. Perceived job insecurity was also significantly associated with poor sleep quality in the cross-sectional Model 2 and was marginally significant in the random effects Model 6, and thus may deserve further exploration in future studies. Being bothered or upset as a parent is not associated with sleep quality in Model 11, so the differences in the results observed among those living with their children compared to the sample overall are probably partially due to the reduction in sample size and to factors not measured here. Future research should use larger samples of workers living with their young or adolescent children to focus on whether and how negative experiences impact differently on their sleep.

In models not shown in Table 5, we also examined poor sleep quality in 1994 as the outcome, and found that none of the negative experiences at home were significantly associated with subsequent poor sleep quality, but other results were very similar to those presented here.

Sensitivity Analyses

We conducted additional analyses to explore the robustness of our results given the relatively exploratory nature of our study; all are available from the authors on request. First we re-estimated models using dichotomized versions of measures of low control, perceived job insecurity, and feeling bothered or upset at work. Results were consistent with those shown here, except that change in feeling bothered or upset between 1986 and 1989 was no longer a statistically significant predictor of poor sleep quality. This difference is likely because of the restricted range of the recoded variable, where possible values only range from -1 to 1 because of dichotomization. We also examined the differences between respondents with intermittent versus persistent exposure to the working conditions of interest. We summed the number of times respondents reported a particular exposure (0, 1, or 2) over the two survey waves, after

dichotomizing exposures, and found that respondents who reported feeling bothered or upset at one survey wave showed significantly greater risk of change in sleep quality between 1986 and 1989 (similar to results from Model 3), while the odds ratio for persistently exposed individuals was large but not statistically significant. In models examining change in sleep quality between 1989 and 1994 (i.e., Model 4), feeling bothered or upset in both 1986 and 1989 was most strongly associated with poor sleep quality (and marginally statistically significant). These results are quite supportive of the findings presented here, given that only 3% of ACL respondents reported being bothered at both waves, based on the dichotomized measure.

We also tested other potentially relevant predictors and examined possible differences across major social categories in the influence of working conditions on sleep quality. First, negative experiences at work may be making it difficult for individuals to get enough sleep, thereby leading them to report poor quality sleep. We added a categorical measure of sleep duration in 1986 (6 hours or less per night, 7 to 8 hours (optimal), and 9 or more hours) and found that short sleep in 1986 predicted poor sleep quality in 1986. There were no associations between sleep duration and subsequent sleep quality in longitudinal models, however, and the added predictor did not alter the conclusions presented here. Second, repeated exposures to chronic work role-related stressors like low control could increase their risk for depressive symptoms (Link, Lennon, and Dohrenwend 1993).⁴ While we already control for neuroticism, a characteristic strongly associated with depressive symptoms, we also re-estimated our models after eliminating respondents in the top quartile of depressive symptoms at baseline. The results were very similar to those presented here, except that the odds ratio associated with change between 1986 and 1989 in feeling bothered or upset at work is reduced in magnitude and loses statistical significance when predicting poor sleep quality in 1994. Third, we examined other relevant health behaviors as potential competing causes of poor sleep quality, including measures of smoking status, alcohol use, and an index of physical activity. Measures of these behaviors in 1986 and of changes in behaviors between 1986 and 1989 were not associated with sleep quality in many cases, and did not change the results presented here. Finally, we tested for differential associations between negative experiences at work and poor sleep quality, by adding interaction terms between the working conditions indicators and the respondent's sex, educational attainment, and occupational status. There were a few, scattered significant interaction terms, but no strong pattern of social differences emerged.

DISCUSSION

While for past generations of workers, the strain of physical effort on the job tended to push them toward physical fatigue and restorative sleep, emerging research appears to show that common psychosocial stressors at work exert the opposite effect, making it more difficult for individuals to achieve restful sleep (Linton 2004; Ota, Masue, Yasuda, Tsutsumi, Mino, and Ohara 2005; Winwood and Lushington 2006). Most of the prior evidence, however, is based on cross-sectional data or samples of workers who have unusually difficult work conditions (such as rotating shift work). Improving on the few extant studies, we used a nationally-representative, prospective sample of U.S. workers to examine the way that common negative experiences at work may “follow workers home” and impinge on their quality of sleep.

We explored four research questions; first, we asked whether perceived low control, perceived job insecurity, and/or being bothered or upset at work are prospectively associated with poor sleep quality. Second, we asked if financial, spousal/partner, and/or child-related negative experiences are independently associated with subsequent poor sleep quality. Our third and fourth research questions asked if negative experiences at home were stronger predictors than negative experiences at work, and if they explained the impact of workplace experiences on sleep quality. The results showed mixed support for our first hypothesis, some support for the second, and no support for the others; below we discuss each in turn. Most centrally, our results show that frequently being bothered or upset at work predicts changes toward poorer sleep quality over periods of 2.5 and 5 years. This association was evident even in stringent fixed and random effects models. By contrast, perceived low control was not significantly associated with change in sleep quality in longitudinal models, while there was some evidence that job insecurity may be associated with changes toward poorer sleep quality (Models 6 and 11), but it was relatively inconsistent.

Why does being bothered or upset at work show the most robust prospective association with poor sleep quality, when compared to the other measures of stressful experiences at work and at home that were explored here? One possibility is that low control and job insecurity as measured here reflect an individual’s perceptions of their objective working conditions, but do not necessarily capture his or her appraisal of how threatening or disturbing these conditions may be. Thus, while perceived job control or job insecurity may lead to a negative stress response, being bothered or upset at work is a direct measure of emotional response to working conditions.

Moreover, frequently being bothered or upset may indicate that an individual has to take direct action to remediate the bothersome or upsetting experiences, while direct action is not required by the other working conditions examined here. For these reasons, being bothered/upset on the job may be the most salient influence on ability to wind down at the end of the day and achieve good quality sleep.

Building on these new findings, future research could more deeply explore how negative emotional experiences in the workplace are linked to sleep quality. For example, it would be useful to examine specific working conditions or worker characteristics that predict reports of being bothered or upset on the job frequently. The sociological literature on emotions in the workplace suggests that power and status differentials in the workplace (Lively and Powell 2006; Lovaglia and Houser 1996), and the difficulties of managing emotions, particularly for those working in the service economy (Hochschild 1983) would be fertile directions to explore. In a related hypothesis, some have suggested that poorer sleep quantity or quality may help explain why individuals of lower socioeconomic status have poorer health (Moore, Adler, Williams, and Jackson 2002). Our analyses did not reveal clear patterns of educational difference in the association between working conditions and sleep, but larger samples and more extensive tests should be pursued. Future research could also examine how other aspects of personality, beyond neuroticism, condition the findings we observed in our study.

Among the indicators of negative experiences at home studied here, we found that only dissatisfaction with one's financial situation was significantly independently associated with subsequent poor sleep quality in 1989, and that association did not extend to sleep quality in 1994. Moreover, the magnitude of the associations showed that negative experiences at home are not more strongly associated with sleep quality than workplace experiences, and do not explain the impact of negative emotional experiences at work. Moreover, by including multiple measures of feeling bothered or upset (i.e., at work, with one's marriage/relationship, as a parent) we show that feeling bothered or upset at work does not simply reflect a general reporting tendency, but appears to have a domain-specific association with sleep quality. The only subsample that showed distinct patterns was workers living with their children, and this group deserves further study with larger samples.

Why would negative experiences at home and in other aspects of life outside of paid work not be as salient for poor sleep quality as negative emotional experiences on the job? We

may not have adequately specified stressful experiences associated with the spousal/partner or parental roles; other measures and mechanisms should be proposed and explored in future work. Moreover, future work should examine carefully the potential for gender differences in these patterns and explanatory mechanisms, because combining the roles of employee and parent have different meanings for women and men. However, some research has suggested that working conditions may have measurable impacts on the intellectual flexibility and psychological well being of male and female workers, regardless of their responsibilities and perceived roles at home (Miller, Schooler, Kohn, and Miller 1979). Our unexpected findings for context-specific effects of stressful experiences in these different domains thus deserve attention in future research on sleep.

Several other limitations should be considered when assessing these results. First, it could be useful to have more objective evidence on negative emotional episodes in the workplace. Such measures would help to clarify whether it is necessary to appraise conditions as stressful for them to have an impact on sleep quality, as we have proposed here.⁵ Other objective measures and self-reported working conditions, and more direct measures of their appraised threat to the individual, deserve attention in future studies. Larger samples of workers and additional waves of survey data also would be helpful for isolating associations within subgroups and more carefully investigating the temporal ordering of changes in exposures and outcomes. It would also be useful to know more about the reasons that worker's ratings of their working conditions change or do not change between survey waves.

Despite these limitations, our results provide strong and unique new evidence for a link between stressful experiences at work and poor sleep quality among U.S. workers. Our conclusions are strengthened by our access to up to three waves of data on workers from across the occupational spectrum, and results were consistent even when we applied fixed and random effects specifications. Controls for neuroticism and baseline health in our longitudinal models and for all stable, unobserved characteristics in the fixed effects models mean that our findings are not likely unduly affected by negative reporting styles or selection into particular jobs on the basis of health. Future research is needed, however, to substantiate these results and further explore the factors that could buffer workers from these negative conditions or interventions that could break the link between conditions on in the workplace and maintenance of healthy sleep patterns.

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NOTES

¹ Models not shown here indicate that results obtained when only those reporting “most of the time” are classified as poor sleepers are similar, though not surprisingly weaker, than those obtained here.

² Results do not differ whether we control for sleep quality in 1986 or in 1989 for models predicting poor sleep quality in 1994.

³ Fixed effects models only include cases who experienced changes between waves, so the subsamples of married individuals and those with children became extremely small when we used fixed effects models, and none of these models were globally significant.

⁴ The reciprocal associations between depression and poor sleep quality have been noted in the biomedical and psychological literatures, and the relationship may be self-reinforcing. For example, if workers with low control develop depressive symptoms that make it more difficult to achieve high quality sleep, they may come to work fatigued and subsequently have more difficulty on the job, reinforcing their depressive symptoms and creating a vicious cycle leading to longer term insomnia (Espie 2002).

⁵ More objective measures may show little connection with sleep quality. In models not shown here we examined outside-rater assigned measures of low control, using information from the Dictionary of Occupational Titles linked to the respondent’s three digit census occupation code. We found no association between the DOT-based measure of low control in 1986, or change in the DOT measure between 1986 and 1989, and sleep quality in 1989 or 1994.



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