Published in final edited form as:

Work Employ Soc. 2008 March ; 22(1): 67–87. doi:10.1177/0950017007087417.

Shift Work and Child Behavioral Outcomes

Wen-Jui Han

Columbia University New York, USA

Abstract

Using a large, contemporary U.S. dataset, the National Longitudinal Survey of Youth–Child Supplement, this paper explores the relationship between maternal shift work and the behavioral outcomes of children aged 4 to 10. Special attention was given to subgroups of children (e.g., based on family type, family income, and mother’s occupation and working hours) and the patterns of parental work schedules and work hours. Regression results suggest that maternal shift work may contribute to more behavioral problems. Of all children whose mothers worked non-day shifts, the strongest associations were found for children who lived in single-mother or low-income families, whose mothers worked in cashier or service occupations, and whose mothers worked non-day shifts full-time. Implications for future research are discussed.

Keywords

behavior problems shift work

To provide the conveniences of a growing 24-7 economy, employees often find themselves working at hours that are not between 6 A.M. and 6 P.M. The United States Census reports that about 15% of the labor force (approximately 15 million people) work evenings (between 2 P.M. and midnight), nights (between 9 P.M. to 8 A.M.), rotating shifts (schedules change periodically from days to evenings), or irregular schedules or hours (Bureau of Labor Statistics, 2005). In the European Union, the percentages of all those employed who work at these hours range from a low of 10% in France to a high of 20% in Greece, with Denmark, Finland, and the United Kingdom all close to 20% (as cited in Presser, 2003). Presser’s (2003) research on work-family issues has consistently revealed that individuals who are African American, less educated, or low skilled are more likely than others to work non-day shift schedules. Moreover, single mothers and parents in families with young children under age 6 are also more likely to have shift schedules (Presser, 2003).

Numerous empirical studies on work and occupations have shown the negative effects of shift work on adults’ psychological, physical, and sociological well-being (Costa, 2003; Gold et al., 1992; Gordon et al., 1986; Presser, 2000). These findings raise concerns about the impacts that parental shift work can have on children’s well-being (La Valle et al., 2002). In their research into this issue, sociologists and psychologists have begun to expand the classical definition of job quality (e.g., wages, benefits, on-the-job stress, etc.) to include aspects of the job, such as the type of work schedule, that have effects on home life. For instance, Presser (2003) broke new ground by looking at the impact of shift work on employees’ health and family relationships. More recently, a handful of studies (e.g., Han, 2005; Starazdins et al., 2006) have extended that line of research to consider how the quality of employment affects other family members, particularly children. This study adds to that

growing literature, which is of increasing policy relevance as greater numbers of low-income mothers are moving into poor-quality jobs that usually require shift schedules.

Using a large, national dataset from the US, the National Longitudinal Survey of Youth–Child Supplement (NLSY-CS), this paper explores the implications that maternal shift work may have for one aspect of family life: the behavioral outcomes of 4- to 10-year-old children. Drawing on literature on maternal employment, child outcomes, and shift work, this paper also examines how such associations differ across various sociodemographic contexts, with particular attention to family type, family income, mother’s occupation and working hours, and the patterns of parental shift work.

Theoretical and Empirical Perspectives on the Association between Parental Shift Work and Child Outcomes

The concern about the possible influence of parental shift work on child well-being stems from Bronfenbrenner’s ecological theory (2005) and the literature on work-family balance (e.g., Nock & Kingston, 1988; Presser, 2003) and is primarily based on the understanding that children’s well-being is fostered by close and positive parent-child relationships, which in turn are promoted by parents spending time with their children. A shift schedule is not only likely to reduce this time, but also the amount of physical and mental energy parents have to cultivate positive relationships with their children (Presser, 2003).

However, we know relatively little about the relationship between parental shift work and child development. We do know that some mothers choose to work such shifts in order to spend the day with their young children (Garey, 1999), whereas for others working non-day shifts is a job requirement (Presser & Cox, 1997). In the former case, any physical or mental stress from working non-day shifts might be overridden by the mother’s satisfaction with her ability to spend time with and take care of her child (Garey, 1999). In the latter case, individual psychological factors (e.g., stress, parental depression), sociological factors (e.g., marital instability), and physiological tolls (e.g., fatigue, interrupted sleep patterns) (Bohle & Tilley, 1998; Booth et al., 1984; Hertz & Charlton, 1989; Presser, 2000; Tapp & Holloway, 1981; White & Keith, 1990) could adversely affect the child’s well being (Heymann, 2000).

Whether shift work is a “voluntary” or “involuntary” choice appears to vary by occupation. The 2001 Current Population Survey (CPS) May Supplement, the only nationally representative data set in the US that includes information on work schedules *and* the primary reason for working a non-day shift, revealed that people working in service occupations were much more likely than their counterparts to work non-day shifts (e.g., 33% vs. 10% for people working in professional or managerial occupations and 20% for people working in sales) (author’s own calculations). Across all professions, slightly more than half of workers with non-day shifts reported that the primary reason they took the shift was because of a job requirement, whereas just over ten percent reported doing so out of personal preference. By profession, cashiers and service providers were less likely than professionals and managers to report having taken their non-day shift out of personal preference (11% vs. 16%, respectively) and more likely to have taken it because they “could not get any other job” (6% vs. 2%).

These patterns varied by demographic groups as well, and were particularly pronounced for mothers who were less educated, unmarried, aged 18-34, and who had children younger than 6. This trend has been occurring for some time. Data from the 1991 CPS May Supplement showed that young, less educated, and unmarried mothers were more likely than their married counterparts to report working a non-day shift because it was a requirement of the

job (44% and 38%, respectively) (Presser & Cox, 1997). This suggests that unmarried mothers may be more likely than their counterparts to work non-day shifts “involuntarily.” Indeed, in the 1991 CPS, 52% of unmarried mothers reported that they worked non-day shifts because they either “could not get any other job” or because the job “required a non-day schedule” as compared to only 42% of married mothers. Similar patterns were found using the 2001 CPS May Supplement (author’s own calculations) as well as in a sample collected in the UK (La Valle et al., 2002).

All of this evidence suggests that, if there is any negative relationship between parental shift work and child well-being, it may be due to some combination of (a) the family situations common to individuals who tend to work non-day shifts (e.g., low income) and (b) the work conditions inherent in jobs that typically require such shifts. Existing research on both family and work contexts helps to shed some light on this potential interaction.

With respect to family contexts, studies have found a strong, positive relationship between family income and child development (e.g., Duncan & Brooks-Gunn, 1997; McCulloch & Joshi, 2001). Thus, if a mother’s employment brings in more income to the family, then working a non-day shift could have positive effects, via higher income, on children’s outcomes, particularly for low-income families. Similarly, the income generated by the mother’s employment may be more valuable, relative to the total household income, to families headed by unmarried mothers than it is to married-couple families. If so, the observed effects of maternal shift work might be more positive in single-mother families than in married-couple families. On the contrary, children may be affected more by shift work in low-income families due to the greater stress that these families experience from working non-day shifts (Costa, 1996; Heymann, 2000; Tepas & Price, 2001; Wedderburn, 2000). Indeed, the existing literature suggests that financial strain and hardship are negatively associated with parental psychological functioning, parenting behavior, and child well-being (Conger et al., 1992; Elder et al., 1992; Jackson et al., 2000; McLoyd, 1990; McLoyd et al., 1994). It is also important to note that the context of shift work in two-parent families may be different from that in single-mother families. In two-parent families, parents may intentionally take on different work schedules in order to take turns caring for their children, thus leading to more instead of less supervision (Deutsch, 1999). In contrast, single mothers who work non-day shifts might not necessarily have another adult available to share the responsibility of supervision. Given all of this, we are left with both positive and negative expectations about the relationship between maternal shift work and child outcomes in both families in general and low-income and single-mother families in particular.

In regard to the work context, research has identified work hours as an important factor in the relationship between parental employment and child outcomes. Specifically, children whose mothers work full-time (i.e., 30 or more hours per week) have been found to have lower cognitive scores and more behavioral problems than their counterparts in both U.S. (Han et al., 2001; Waldfogel et al., 2002) and U.K. samples (Ermisch & Francesconi, 2000; Gregg et al., 2003). The concern then becomes how the negative effects of full-time hours might combine with the effects of other aspects of employment, such as, for example, “involuntary” non-day shifts, to influence children’s outcomes. For instance, if a mother is required to work a full-time evening shift that infringes on her ability to spend time with and monitor her child, one might expect that mothers working long hours at a required shift schedule, coupled with the lack of parent-child interaction, could be negatively associated with the child’s behavioral outcome.

Only a handful of studies have specifically examined the associations between shift work and child outcomes. Six of the existing studies found negative associations between

mothers' shift schedules and children's cognitive or behavioral outcomes (Bogen & Joshi, 2002; Dosa et al., 2002; Han, 2005; Heymann, 2000; Strazdins et al., 2006; Strazdins et al., 2004), whereas two found no significant effects (Dunifon, Kalil, & Bajrachaya, 2005; Ross Phillips, 2002). Two of these studies (Bogen & Joshi, 2002; Han, 2005) were limited to pre-school age children, one (Heymann, 2000) was primarily qualitative, three (Bogen & Joshi, 2002; Dunifon et al., 2005; Ross Phillips, 2002) focused primarily on low-income families, two were based on samples from Canada (Strazdins et al., 2004; Strazdins et al., 2006), and the rest focused on the US. Among studies specifically looking at children's behavioral outcomes, Strazdins and her colleagues (2006, 2004), using a sample from Canada, found a strong negative association between parents working non-day shifts and children's socioemotional well-being (e.g., property offenses for 4- to 11-year-olds and physical and conduct aggression for 2- or 3-year-olds). Heightened parental depression and ineffective parenting behaviors due to working non-day shifts may have accounted, at least partially, for these negative associations (Strazdins et al., 2006). Similarly, Dosa and her colleagues (2002), using a sample from the US, found that children aged 4-12 were more likely to demonstrate behaviors that required counseling when both parents worked split shifts.

Overall, theory and empirical research suggest that the association between maternal shift work and child outcomes could be either positive or negative and that it is likely to vary by the family context (Menaghan & Parcel, 1995; Perry-Jenkins, Repetti, & Crouter, 2000), the "voluntary" nature of the shift (Presser, 2003), the work arrangements between couples (Barnett & Baruch, 1987; Coverman & Sheley, 1986; Davis & Sanik, 1991; Hertz & Charlton, 1989; Kitterød & Pettersen, 2006; Nock & Kingston, 1988; Pleck & Staines, 1985), and the number of hours worked per week (e.g., Han et al., 2001). Therefore, in the present analyses I examine whether the associations vary by factors such as family type, family income, mother's occupation and work hours, and the patterns of parental work schedules.¹

It is important to note that because an experimental design is not possible (i.e., we cannot randomly assign parents to specific shifts), the analyses can only establish an association rather than a true causal relationship. However, similar to the designs of recent studies (e.g., Han, 2005; Strazdins et al., 2006), the present study employs intricate statistical analyses of longitudinal data to address the relationships between parental shift work and child outcomes.

Data and Methods

Data

The sample consists of all the children in the NLSY-CS whose mothers had ever worked since the time of the child's birth and who could be followed longitudinally to age 10 with no missing data for the outcome variables.² Children were assessed at the ages of 4, 6, 8, and 10. The sample consists of 1,985 children born between 1982 and 1991 who were followed from birth to age 10, with five cohorts of data finishing in 1992, 1994, 1996, 1998, and 2000. Of this sample, 51% are non-Hispanic White, 29% are non-Hispanic African American, and 20% are Hispanic. The sample is not a random sample of all children, but represents children born in these years to women in the NLSY who were aged 16 to 34 at

¹In models examining both mothers' and fathers' shift work, only families where fathers were always present for the examined period of time (i.e., 10 years) were included in the analyses.

²Children who were not included in the analyses due to missing information on outcome variables ($n = 851$) tended to live in less advantageous homes (e.g., their mothers had lower cognitive scores, less education at the time of the child's birth, were younger, had a lower family income before birth, worked fewer hours per week on average, and had lower self-esteem). These characteristics are associated with higher likelihood of mothers working at non-day shifts; thus, the estimates presented here may be biased downwards.

the time of their child's birth. Consequently, although this NLSY sample includes births to a more representative sample of mothers than the samples used in most of the prior NLSY studies, it is not representative of all births and includes a larger share of children of younger mothers, who tend to have lower educational levels and incomes than mothers in general (Chase-Lansdale et al., 1991). (For more details about the NLSY data, please see McCulloch et al., 2000).

Measures

Behavioral problems—The Behavioral Problems Index (BPI; Peterson & Zill, 1986) measures six dimensions of behavior (antisocial behavior, anxiousness/depression, headstrongness, hyperactivity, immaturity, and dependency), which are grouped into two sub-scales, internalizing and externalizing behaviors. This measure has been widely used (mostly in the fields of psychology and public health) to evaluate children's behavior problems with good reliability and validity (see McCulloch et al., 2000, for a detailed description). In the present study, the total BPI score is used because, upon preliminary examination, the relationship between maternal shift work and behavioral problems did not differ by sub-scale. This measure was collected only for children aged 4 or older. The mean BPI score was 3.71 ($SD = 4.86$) for 4-year-old children, 5.51 ($SD = 5.98$) for 6-year-old children, 7.48 ($SD = 6.53$) for 8-year-old children, and 8.73 ($SD = 6.24$) for 10-year-old children.

Parental work schedules—The NLSY-CS collects very detailed data on work schedules. The shift usually worked by the respondent at her current or most recent job was reported every year starting in 1979 and every other year starting in 1994. Five choices were available: “day shift” (anytime between 6 A.M. and 6 P.M.), “evening shift” (anytime between 2 P.M. and midnight), “night shift” (anytime between 9 P.M. and 8 A.M.), “split shift” (consisting of two distinct periods each day), and “hours vary.” In 1986, 1987, 1988, and 1989, however, the beginning and end time (24-hour clock) for the shift at the current or most recent job was asked instead. Beginning in 1990, in addition to the specific start and end times, another question was asked to determine the “shift usually worked by the respondent at current or most recent job.” There were seven choices for this: “regular day shift,” “regular evening shift,” “regular night shift,” “shift rotates” (changes periodically from days to evenings or nights), “split shift,” “irregular hours,” and “other.”

For the present study, a variable representing the number of years a mother had worked non-day shifts by the assessment point was created. At each assessment point, women were coded as having had a non-day shift if they worked at hours other than “regular day shifts” (coded as 1 and 0 otherwise). Thus, this variable was the sum of the years a woman had worked at non-day shifts by the assessment point with a minimum of 0 and a maximum of 8 years by the assessment point when the child was 10 years old. A value of zero represents women who had *only* worked day shifts by the assessment point (i.e., if the woman at every interviewed year to date had worked regular daytime shifts between 6 A.M. and 6 P.M.).

More than two-thirds of working mothers had ever worked non-day shifts (approximately 67% when the children were age 4, rising to about 82% when the children were age 10). The mean number of years mothers had ever worked non-day shifts was about 2 when the children were 4 years old, about 3 when the children were 6 and 8 years old, and almost 4 when the children were 10 years old. It should be noted that the information on shift work was not collected on a monthly basis and was not available for weekends. Thus, the measures used here might undercount the occurrence of non-day shifts because some mothers might have worked weekends; additionally, some mothers might have switched into and then back out of a shift schedule in between data collection points. To the extent that

these undercounts occurred in the present sample, the associations between parental shift work and child outcomes would be under-estimated in this analysis. Spouses' work schedules were also available every year beginning in 1981 and every other year after 1994, and variables for spouses were created in a similar fashion. Over 80% of working spouses had ever worked non-day shifts. The mean number of years spouses had ever worked non-day shifts was about 2.9 when children were 4 years old and was comparable to the mothers' data thereafter. The term "father" is used loosely in this article to refer to the spouse residing in the home, even if he is not the child's biological father. This was done to more fully consider the contribution of shared supervision and monitoring. About 60% of the children in two-parent families in this sample lived with their biological fathers. For the remaining 40% of the children, the mother's spouse was either the child's step-father, adoptive father, or was not related.

Work hours—Variables were created to control for the average weekly hours a mother had worked by the assessment year. Thus, for 4-year-old children, the average of the mother's weekly working hours at ages 1, 2, 3, and 4 was calculated; for 6-year-old children, the average weekly working hours at age 1, 2, 3, 4, 5, and 6 was calculated, and so forth. The cumulative means for mothers' weekly working hours in this sample were 23.38 ($SD = 16.23$) when their children were 4 years old, 24.54 ($SD = 15.42$) when their children were 6, 25.95 ($SD = 14.72$) when their children were 8, and 27.19 ($SD = 14.10$) when their children were 10. Mothers who had only worked day shifts by the assessment year generally worked significantly more hours per week than did mothers who had ever worked non-day shifts (approximately 38 vs. 22 hrs/wk, $p < .001$ at all assessment years). Spouses' work hours were also available in every year starting in 1981 and every other year starting in 1994 and were created in a similar fashion. The cumulative mean working hours per week for spouses was about 43 hours at each assessment point.

Occupation—The respondent's occupation at her current or most recent job was collected at each interview year. Based on the demographic profile documented in Presser's work (2003), three groups of occupations were controlled for in the analyses: cashier and service jobs (e.g., waitresses, janitors, food service workers, nursing aids, attendants), sales positions (e.g., sales workers in retail and personal services), and professional or managerial jobs (e.g., chief executives, managers, engineers, computer systems analysts, physicians, registered nurses). Three variables were created to sum up the number of years women had been working in each of the three types of occupations by the assessment point. Using these three categories allows for an analysis of the trend noted in national datasets (e.g., the CPS May Supplement) that women in professional or managerial jobs tend to report working non-day shifts "voluntarily," while those in either sales or cashier and services tend to report working non-day shifts "involuntarily." In turn, this information may provide some insight into the relationship between maternal shift work and child outcomes (Garey, 1999). The mean number of years of working non-day shifts in professional or managerial jobs was 0.65 ($SD = 1.18$), in sales jobs was 0.16 ($SD = 0.52$), and in cashier or service jobs was 0.83 ($SD = 1.19$) when the children were 4 years old. The corresponding numbers were, in turn, 0.84 ($SD = 1.56$), 0.20 ($SD = 0.62$), and 1.02 ($SD = 1.55$) when the children were 6, 1.21 ($SD = 2.05$), 0.27 ($SD = 0.80$), and 1.35 ($SD = 1.96$) when the children were 8, and 1.53 ($SD = 2.51$), 0.36 ($SD = 0.96$), and 1.72 ($SD = 2.40$) when the children were 10. The raw data also show that, at every assessment point, mothers who had ever worked non-day shifts were significantly less likely to work professional or managerial jobs and more likely to work cashier or service jobs than were mothers who had only worked day shifts by the assessment year ($p < .001$).

Empirical Strategy

Women who work non-day versus day shifts may represent distinct groups. As noted earlier, empirical studies have shown that young, low-income, less educated, and single mothers are more likely than their counterparts to work non-day shifts (Presser, 2003). Hence, selection bias is a concern when estimating the effects of maternal shift work, and failing to control for maternal and family characteristics could lead to biased estimates. In fact, compared to mothers who had only worked day shifts, the raw data (shown in Appendix Table) reveal that mothers who had *ever* worked a non-day shift had different attributes (i.e., they tended to be younger and to have a lower family income, a higher likelihood of being poor by the assessment point, a greater number of years of welfare receipt by the assessment point, a greater number of years living in single-mother families, lower educational attainment, lower cognitive ability as measured by Armed Forces Qualification Test (AFQT), and a lower likelihood of having been married at the focal child's birth). Their children also tended to have more behavioral problems.

Including an extensive set of covariates helps to reduce the problem of selection bias (i.e., that observed factors not controlled for in the analyses may be associated with both maternal shift work and child outcomes) when using Ordinary Least Square (OLS) models.³ However, with OLS models, we would still face the problem of selection on unobserved characteristics; specifically, the effects of maternal shift work could be due at least in part to unobserved differences between mothers with different shifts, as well as between their children.

Child fixed-effect (CFE) models were used to more effectively deal with these problems. CFE models allow us to control for both measured and unmeasured characteristics that are constant over time for mothers and children and that may be correlated with both maternal shift work and children's outcomes. For instance, some mothers may be more interested in or skilled at providing care and stimulation for young children. If these women are more likely to both work non-day shifts and to have children who have better outcomes, failing to control for this unobserved maternal characteristic would overestimate the positive association between maternal shift work and children's outcomes in standard OLS models. The bias might also occur in the other direction. If mothers who work non-day shifts are less able to provide for or care for their children, both in terms of labor-market skills and child-rearing skills, then failing to control for these lower ability levels might lead us to overestimate the negative association between shift work and child outcomes. As for children's characteristics, if mothers of children with easy temperaments are both more likely to work non-day shifts and to have children who have better outcomes, failing to control for this unobserved child characteristic would overestimate the positive association between shift work and child outcomes. The estimation of fixed effects subtracts the variables of interest (i.e., the outcome variable and independent variables) from their own means over time to partial out any unobserved heterogeneity that is constant over time (Greene, 1997; Hsiao, 1986). It is important to acknowledge that the CFE models will be biased in cases where a mother's reason for working a non-day shift in one period and not another has an independent effect on child development (e.g., loss of a job with a day shift due to an economic shock or the development of a health problem).

Analyses were conducted on all children living in either two-parent or single-mother families to evaluate the associations between *maternal* shift work and child outcomes.

³Supplemental analyses controlling for the home environment and the type of child care were also performed (results not shown). The results were similar to those reported here: Estimates of maternal non-day shifts did not change (although the effects of the home environment were associated with significantly fewer behavior problems). This may be due to the fact that information on the type of child care is only available for the first three years of a child's life in the NLSY-CS.

Analyses were also conducted on just the children living in two-parent families (as shown in Table 2) to evaluate the associations between *both parents'* shift work and child outcomes.

Results

Descriptive Statistics

In results not shown (available upon request), mothers who had worked non-day shifts for some years (i.e., between two to seven years by various assessment points) tended to have different attributes than those who had worked such schedules for less than a year.⁴ Specifically, compared to the latter, the former group tended to have a lower family income before birth (\$27,000 vs. \$38,000), a lower level of maternal education at birth (12 vs. 13 years), and lower maternal AFQT scores (34 vs. 44); they also were more likely to be younger (24 vs. 26), to be poor (50% vs. 22%), to have spent more time living in single-mother families (about 3 years vs. about 1 year), and to have received welfare for a longer period of time (about 2.5 years vs. less than 1 year). Moreover, compared to mothers who had worked a non-day shift for only one year, mothers who worked non-day shifts for some years tended to work fewer hours per week (i.e., less than 20 hrs/wk), to have jobs that were not professional or managerial, and to have children with more behavioral problems. All of these differences were significant at the 0.1% level.

Is There an Association between Maternal Shift Work and Child Outcomes?

Table 1 presents the coefficients (and standard errors) for maternal shift work from the CFE model on behavioral outcomes for children aged 4 to 10.5. Because the effects of time-invariant factors were partialled out in the CFE analyses, only the time-varying variables were retained. The results indicate that, overall, children whose mothers worked non-day shifts had more behavioral problems. Children whose mothers worked in professional or sales occupations had significantly fewer behavioral problems than children whose mothers worked in other professions. Having lived more years in single-mother or welfare-reliant families was associated with significantly more behavioral problems. Results from the analyses using two-parent families (not shown) indicate that both mothers' ($b = 0.07$, $s.e. = 0.12$) and fathers' ($b = 0.20$, $s.e. = 0.12$) non-day shifts were associated with more behavioral problems, but this association was not statistically significant.

Additional analyses were conducted to see whether the association between maternal shift work and child outcomes differed by the specific type of non-day shifts: evenings, nights, and variable hours. The results (not shown) did not indicate that the association was stronger for any one type of non-day shifts.

Does the Association Vary by Different Contexts?

As discussed earlier, the association between maternal shift work and child outcomes may depend on various family background characteristics and the reason (i.e., “voluntary” vs. “involuntary”) for taking on a non-day shift. Table 2 presents the associations between maternal shift work and child behavioral outcomes by various contexts that proxy for these two considerations. Specifically, the number of years a mother worked non-day shifts was interacted with each of the contextual factors described above.

⁴Mothers always working non-day shifts for eight years are those with children age 10. These mothers had significantly better sociodemographic backgrounds than all other groups, which shows them to be a highly selected group.

⁵Analyses were also conducted using a dummy variable: mothers who had ever worked a non-day shift by the assessment year. Results indicate that children whose mothers had ever worked a non-day shift by the assessment year had significantly more behavior problems. The measure may, however, oversimplify the experiences of children whose mothers worked non-day shifts. For example, children of mothers who had worked only once a non-day shift over the assessment years may have experiences distinct from children of mothers working non-day shifts for many years, which may differentially affect their development.

In models where analyses were examined by family type, children were divided into three groups: those who had lived in a single-mother family for one-third of the time by the assessment year, those who had lived in a single-mother family for two-thirds of the time, and those who had almost always lived in a single-mother family, with the reference group being children who had never lived in a single-mother family by the assessment year. The advantage of using a set of dummy variables is that both linear and non-linear effects can be detected if present.

Table 2 presents the separate analyses for each of the six different contextual factors for children's total BPI scores. Results indicate that children had more behavioral problems (as shown by the positive coefficients) when their mother had worked non-day shifts for more years *and* (a) they had lived in a single-mother family for a long period of time, (b) their family's average income was at the bottom third of the sample's income distribution (below US\$28,985 in 2000 constant dollars), (c) their mother had worked in a cashier or service occupation for more years, (d) their mothers worked for 35 or more hours per week, (e) their father had also worked non-day shifts for more years, or (f) both their mother and father worked non-day shifts for 35 hours or more per week.

Discussion and Conclusion

This article explores the association between maternal shift work and child behavioral outcomes using a large, longitudinal dataset, the NLSY-CS, which follows children from birth to age 10. To reduce potential selection bias, child fixed-effects models were utilized.

The results indicate that children whose mothers worked non-day shifts had more behavioral problems. In particular, elevated levels of behavior problems were found when mothers worked non-day shifts *and* they worked in a cashier or service occupation, worked more than 35 hours per week, were single mothers, or had a low family income. Indeed, the results suggest that children whose mothers worked non-day shifts and who had almost always (more than two-thirds of the time) lived in single-mother families, in low-income families, in families where mothers worked in a cashier or service occupation, or in families where mothers worked full-time on average had a predicted BPI score of 8.82 as compared to a score of 5.19 for other children. Thus, family type, family income, mother's occupation, and mother's work hours combined with shift work to make about a 4-point difference in the predicted BPI scores for these children, representing a 70% increase in child behavioral problems.

The results in Table 2 further show that children in two-parent families whose mothers and fathers had both worked non-day shifts on a full-time basis had the most behavioral problems, with a predicted BPI score of 9.64. Conversely, children whose fathers worked non-day shifts and whose mothers worked day shifts on a part-time basis had the fewest behavior problems, with a predicted BPI score of 6.12.

These results suggest that family type, family income, mother's occupation, mother's work hours, and the patterns of parental shift work and work hours all made substantial differences in the links between parental shift work and children's behavioral problems. We can only speculate as to the reasons for these associations, but one possibility may have to do with the involuntary nature of non-day shift work for many low-income, single mothers. Specifically, the associations may be partly due to the financial hardships experienced by single-mother or low-income families together with the physical and emotional stress experienced by mothers working non-day shifts. Indeed, in results not shown (available upon request), children of mothers who had worked non-day shifts for more years *and* whose family incomes were increasing over time actually had significantly fewer behavior

problems. The present results may also point to the importance of supervision or monitoring (McLanahan, 1997) given that mothers working non-day shifts would not be able to supervise their children during the evenings, nights, or early mornings. In particular, the finding that children in two-parent families had the most behavioral problems if both their mothers and fathers worked non-day shifts on a full-time basis may speak to the importance of supervision in preventing child behavioral problems.

The evidence provided in this paper has implications for future research. First, we need to better understand the consequences that parental shift work has for children when that employment is undertaken “involuntarily,” whether it is because of a spouse's unemployment or other factors that might push parents to work non-day shifts that they might not have otherwise chosen. Second, the stronger association between parental shift work and behavioral problems for some groups of children should prompt further research on what factors pose special risks for them (such as difficult working conditions, parental role strain, or the quality of the time mothers and fathers spend with their children). At the same time, the heterogeneity of working parents highlights the need for finer-grained analyses of the ways that economic factors (e.g., family income) and social factors (e.g., parental stress) intersect in shaping both their families as a whole and their children in particular.

Acknowledgments

The author would like to thank Jane Waldfogel and participants at the 2004 annual conference of the Population Association of American and 2004 annual conference of the Association for Public Policy Analysis and Management Conference for valuable discussions, and Rocky Citro for wonderful editorial assistance. The author gratefully acknowledges support from the Smith Richardson Foundation.

Appendix Table

Sample Characteristics by the Assessment Point and by Maternal Shift Work

	By ages 4		By ages 6		By ages 8		By ages 10
	Only worked at day shift	Ever worked at non-day shift	Only worked at day shift	Ever worked at non-day shift	Only worked at day shift	Ever worked at non-day shift	Only worked at day shift
Boy (%)	48.85	49.11	47.31	49.58	46.61	49.81	45.35
Having older siblings (%)	52.01	65.63***	50.50	64.38***	50.33	64.05***	49.64
Family income the year before birth	36151.77 (48260.90)	30614.42 (72432.77)	39335.91 (55286.36)	30288.37** (68033.60)	40341.19 (57534.01)	30249.83** (67149.75)	41220.67 (59774.91)
Mother's education at birth	12.76 (2.12)	12.32 (2.09)***	13.03 (2.11)	12.29 (2.08)***	13.13 (2.11)	12.28 (2.07)***	13.17 (2.15)
Mother's AFQT	42.99 (26.68)	36.42 (27.00)***	45.57 (26.10)	36.42 (27.00)***	45.86 (26.07)	36.59 (27.00)***	46.07 (26.21)
Mother's age at birth	24.70 (3.67)	24.81 (3.37)	25.35 (3.62)	24.58 (3.41)***	25.53 (3.50)	24.55 (3.44)***	25.57 (3.47)
Mother married at birth (%)	77.08	66.74***	80.04	67.10***	80.53	67.32***	80.43
Average family income by assessment point	41283.95 (51887.02)	33173.01 (45386.99)***	46771.61 (57604.71)	33115.58 (46852.12)***	49764.11 (58898.63)	34944.09 (45259.12)***	47360.04 (49249.89)
Years living in single-mother family	0.85 (1.42)	1.21 (1.60)***	1.18 (2.04)	1.92 (2.38)***	1.65 (2.71)	2.61 (3.13)***	1.89 (3.00)

	By ages 4		By ages 6		By ages 8		By ages 10	
	Only worked at day shift	Ever worked at non-day shift	Only worked at day shift	Ever worked at non-day shift	Only worked at day shift	Ever worked at non-day shift	Only worked at day shift	Ever worked at non-day shift
by assessment point								
Years living in welfare-reliant family by assessment point	0.53 (1.09)	1.20 (1.53)***	0.45 (1.15)	1.79 (2.27)***	0.53 (1.40)	2.35 (2.98)***	0.63 (1.71)	2.00 (2.54)***
Years of working at professional or managerial occupation	0.88 (1.39)	0.52 (1.02)***	1.55 (2.06)	0.64 (1.33)***	2.30 (2.74)	0.94 (1.73)***	2.96 (3.44)	1.00 (1.58)***
Years of working at sales occupation	0.13 (0.50)	0.18 (0.53)	0.18 (0.64)	0.20 (0.61)	0.24 (0.88)	0.28 (0.78)	0.34 (1.13)	0.40 (1.29)
Years of working at cashiers or service occupation	0.59 (1.11)	0.96 (1.21)***	0.78 (1.55)	1.09 (1.55)***	1.05 (2.07)	1.42 (1.93)**	1.23 (2.54)	1.70 (2.54)***
Job dissatisfaction	-0.02 (0.55)	0.02 (0.62)	-0.23 (2.64)	0.06 (2.08)*	-0.44 (3.42)	0.07 (2.69)**	-0.42 (4.37)	0.00 (2.08)
Years working non-day shifts by assessment point -- Mother	Na	2.08 (0.90)	na	3.00 (1.37)	na	3.38 (1.58)	na	3.00 (1.37)
Average working hours per week by assessment point -- Mother	32.66 (12.34)	18.71 (15.88)***	36.44 (8.63)	20.76 (15.16)***	37.61 (7.46)	22.66 (14.58)***	38.00 (7.33)	20.76 (15.16)***
Years working non-day shifts by assessment point -- Father	1.87 (1.41)	2.87 (1.40)***	2.47 (1.99)	3.09 (1.98)***	2.62 (2.20)	3.38 (2.14)***	2.78 (2.31)	3.09 (1.98)***
Average working hours per week by assessment point -- Father	43.58 (8.03)	43.95 (9.81)	43.18 (7.94)	43.57 (10.34)	42.57 (7.48)	43.05 (10.74)	42.80 (6.33)	43.57 (10.34)
<i>Behavioral outcomes</i>								
BPI at age 4	3.38 (4.43)	3.87 (5.05)	na	na	na	na	na	na
BPI at age 6	4.83 (5.35)	5.85 (6.26)**	5.66 (5.51)	5.50 (6.14)	na	na	na	na
BPI at age 8	6.11 (5.83)	8.11 (6.74)***	6.78 (5.76)	7.69 (6.74)*	6.87 (5.73)	7.65 (6.72)	na	na
BPI at age 10	8.24 (5.84)	9.00 (6.44)*	7.74 (5.53)	9.06 (6.40)**	7.63 (5.46)	9.06 (6.43)***	7.58 (5.48)	9.06 (6.43)***
N (%)	518 (32.91%)	1056 (67.09%)	378 (21.81%)	1355 (78.19%)	324 (20.05%)	1292 (79.95%)	267 (17.72%)	1292 (79.95%)

Note. Sample includes only mothers ever worked since birth until ages 10. Full sample size is 6,430 and child fixed group sample size is 1,985. Significant tests were performed (denoted by asterisks) with chi-square used for categorical variables and t-test used for continuous variable to compare mothers who had ever worked at nonstandard schedules with those who had only worked at standard schedules by the assessment year. na=not applicable.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Biography

Wen-Jui Han is Associate Professor at Columbia University School of Social Work. She has extensive research experience in the area of child care, maternal employment, and child well-being, including examining maternal employment and child cognitive and socioemotional well-being, the extent to which parental work schedules on child care arrangements and on child well-being, and the developmental experiences of young children in immigrant families. Her work has been published in academic journals including *Child Development*, *Demography*, *Developmental Psychology*, and *Journal of Marriage and Family*.

References

- Barnett RC, Baruch GK. Determinants of fathers' participation in family work. *Journal of Marriage & the Family*. 1987; 49(1):29–40.
- Bogen, K.; Joshi, P. Bad work or good work: The relationship of part-time and non-standard work schedules to parenting and child behavior in working poor families; Paper presented at NICHD conference on “Working Poor Families: Coping as Parents and Workers; 2002.
- Bohle P, Tilley AJ. Early experience of shiftwork: Influences on attitudes. *Journal of Occupational & Organizational Psychology*. 1998; 71(1):61–79.
- Booth A, Johnson DR, White L, Edwards J. Women, outside employment, and marital instability. *American Journal of Sociology*. 1984; 90(3):567–583.
- Bronfenbrenner, U., editor. *Making human beings human: Bioecological perspectives on human development*. Sage Publications, Inc; Thousand Oaks, CA: 2005.
- Bureau of Labor Statistics. Workers on flexible and shift schedules in May 2004. Department of Labor; Washington, DC: 2005. from <http://www.bls.gov/news.release/pdf/flex.pdf>
- Chase-Lansdale PL, Mott FL, Brooks-Gunn J, Phillips D. Children of the NLSY: A unique research opportunity. *Developmental Psychology*. 1991; 27(6):918–931.
- Conger RD, Conger KJ, Elder GH Jr, Lorenz FO, Simons RL, Whitbeck LB. A family process model of economic hardship and adjustment of early adolescent boys. *Child Development*. 1992; 63(3): 526–541. [PubMed: 1600820]
- Costa G. The impact of shift and night work on health. *Applied Ergonomics*. 1996; 27:9–16. [PubMed: 15676307]
- Costa G. Factors influencing health of workers and tolerance to shift work. *Theoretical Issues in Ergonomics Science*. 2003; 4(3-4):263–288.
- Coverman S, Sheley JF. Change in men's housework and child-care time, 1965–1975. *Journal of Marriage & the Family*. 1986; 48(2):413–422.
- Davis RF, Sanik MM. Fathers' participation in infant care. *Journal of Consumer Studies & Home Economics*. 1991; 15(1):45–55.
- Deutsch, F. *Having it all: How equally shared parenting works*. Harvard University Press; Cambridge, MA: 1999.
- Dosa NP, Auinger P, Olson B, Weitzman M. Parents' workshift and attention and behavior problems in school aged children. Paper presented at the Pediatric Academic Societies' Annual Meeting, Baltimore, MD, May 4-7, 2002. 2002
- Duncan, G. *Consequences of growing up poor*. Brooks-Gunn, J., editor. Russell Sage Foundation; New York: 1997.
- Dunifon R, Kalil A, Bajrachaya A. Maternal working conditions and child well-being in welfare-leaving families. *Developmental Psychology*. 2005; 41(6):851–859. [PubMed: 16351332]
- Elder GH, Conger RD, Foster EM, Ardel M. Families under economic pressure. *Journal of Family Issues*. 1992; 13(1):5–37.
- Ernisch, J.; Francesconi, M. The effect of parents' employment on children's educational attainment. Institute for the Study of Labour, Bonn; Germany: 2000. IZA Discussion Paper No. 215

- Garey, AI. Weaving Work and Motherhood. Temple University Press; Philadelphia: 1999. Chapter 5: Motherhood on the night shift; p. 108-139.
- Gold DR, Rogaca S, Bock N, Tosteson TD, Baum TM, Speizer FE, et al. Rotating shift work, sleep, and accidents related to sleepiness in hospital nurses. *American Journal of Public Health*. 1992; 82(7):1011–1014. [PubMed: 1609900]
- Gordon NP, Cleary PD, Parker CE, Czelsner CA. The prevalence and health impact of shiftwork. *American Journal of Public Health*. 1986; 76(10):1225–1228. [PubMed: 3752325]
- Greene, WH. *Econometric analysis*. 3rd ed.. Prentice Hall; London: 1997.
- Gregg, P.; Washbrook, E.; the ALSPAC Study Team. The effects of early maternal employment on child development in the UK. Project of Understanding the Impact of Poverty on Children of the 90's; Bristol, UK: 2003. CMPO Working Paper Series No. 03/070
- Han W-J, Waldfogel J, Brooks-Gunn J. The effects of early maternal employment on later cognitive and behavioral outcomes. *Journal of Marriage and the Family*. 2001; 63(2):336–354.
- Han W-J. Maternal nonstandard work schedules and child cognitive outcomes. *Child Development*. 2005; 76(1):137–154. [PubMed: 15693763]
- Hertz R, Charlton J. Making family under a shiftwork schedule: Air Force Security guards and their wives. *Social Problems*. 1989; 36(5):491–507.
- Heymann, J. *The widening gap: Why America's working families are in jeopardy and what can be done about it*. Basic Books; New York: 2000.
- Hsiao, C. *Analysis of panel data*. Cambridge University Press; New York: 1986.
- Jackson AP, Brooks-Gunn J, Huang C-C, Glassman M. Single mothers in low-wage jobs: Financial strain, parenting, and preschooler's outcomes. *Child Development*. 2000; 71(5):1409–1423. [PubMed: 11108104]
- Kitterød RH, Pettersen SV. Making up for mothers' employed working hours? Housework and childcare among Norwegian fathers. *Work, Employment, and Society*. 2006; 20(3):473–492.
- La Valle, I.; Arthur, S.; Millward, C.; Scott, J.; Clayden, M. *Happy families? Atypical work and its influence on family life*. The Policy Press; Bristol, UK: 2002.
- McCulloch A, Joshi HE. Neighbourhood and family influences on the cognitive ability of children in the British National Child Development Study. *Social Science & Medicine*. 2001; 53(5):579–591. [PubMed: 11478538]
- McCulloch A, Wiggins RD, Joshi HE, Sachdev D. Internalizing and externalizing children's behaviour problems in Britain and the US: Relationships to family resources. *Children & Society*. 2000; 14(5):368–383.
- McLanahan, SS. Parent absence or poverty: Which matters more?. In: Duncan, GJ.; Brooks-Gunn, J., editors. *Consequences of growing up poor*. Russell Sage Foundation; New York: 1997. p. 35-48.
- McLoyd VC. The impact of economic hardship on black families and children: Psychological distress, parenting, and socioemotional development. *Child Development*. 1990; 61(2):311–346. [PubMed: 2188806]
- McLoyd VC, Jayaratne TE, Ceballo R, Borquez J. Unemployment and work interruption among African American single mothers: Effects on parenting and adolescent socioemotional functioning. *Child Development*. 1994; 65(2):562–589. [PubMed: 8013240]
- Menaghan EG, Parcel TL. Social sources of change in children's home environments: The effects of parental occupational experiences and family conditions. *Journal of Marriage & the Family*. 1995; 57(1):69–84.
- Nock SL, Kingston PW. Time with children: The impact of couples' work-time commitments. *Social Forces*. 1988; 67(1):59–85.
- Perry-Jenkins M, Repetti RL, Crouter AC. Work and family in the 1990s. *Journal of Marriage & the Family*. 2000; 62(4):981–998.
- Peterson JL, Zill N. Marital disruption, parent-child relationships, and behavioral problems in children. *Journal of Marriage and the Family*. 1986; 48(2):295–307.
- Pleck JH, Staines GL. Work schedules and family life in two-earner couples. *Journal of Family Issues*. 1985; 6(1):61–82.

- Presser HB. Nonstandard work schedules and marital instability. *Journal of Marriage & the Family*. 2000; 62(1):93–110.
- Presser, HB. *Working in a 24/7 economy: Challenges for American families*. Russell Sage Foundation; New York: 2003.
- Presser HB, Cox AG. The work schedules of low-educated American women and the welfare reform. *Monthly Labor Review*. April.1997 :25–34.
- Ross Phillips, K. Parent work and child well-being in low-income families. Urban Institute; Washington, DC: 2002. *Assessing the New Federalism Occasional Paper Number 56*
- Strazdins L, Clements MS, Korda RJ, Broom DH, D'Souza RM. Unsociable work?: Non-standard work schedules, family relationships, and children's well-being. *Journal of Marriage and Family*. 2006; 68(2):394–410.
- Strazdins L, Korda RJ, Lim LY, Broom DH, D'Souza RM. Around-the-clock: Parent work schedules and children's well-being in a 24-h economy. *Social Science and Medicine*. 2004; 59(7):1517–1527. [PubMed: 15246179]
- Tapp WN, Holloway FA. Phase shifting and circadian rhythms produces retrograde amnesia. *Science*. 1981; 211(4486):1056–1058. [PubMed: 7193351]
- Tepas, DI.; Price, JM. What is stress and what is fatigue?. In: Hancock, PA.; Desmond, PA., editors. *Stress, Workload, and Fatigue*. Lawrence Erlbaum Associates; Mahwah, NJ: 2001.
- Waldfoegel J, Han W-J, Brooks-Gunn J. The effects of early maternal employment on child cognitive development. *Demography*. 2002; 39(2):369–392. [PubMed: 12048957]
- Wedderburn, A., editor. *European Foundation for the Improvement of Living and Working Conditions*. Office for Official Publications of the European Communities; Luxembourg: 2000. Vol 1. Shiftwork and health. Special issue of *Bulletin of European studies on Time (BEST)*.
- White L, Keith B. The effect of shift work on the quality and stability of marital relations. *Journal of Marriage & the Family*. 1990; 52(2):453–462.

Table 1

Estimates of Associations between Maternal Shift Work and Children's Behavioral Problems

Time-variant variables by assessment point	Behavioral Problems
Years working non-day shifts	0.21 (0.10) *
Years living in single-mother family	0.16 (0.08) *
Years living in welfare-reliant family	0.37 (0.09) ***
Average family income (in USD, figure in thousands)	0.003 (0.005)
Mother's average working hours per week	0.02 (0.02)
Years working in a professional or managerial occupation	-0.24 (0.09) **
Years working in a sales occupation	-1.13 (0.19) ***
Years working in a cashier or service occupation	-0.03 (0.09)
Job dissatisfaction	-0.03 (0.04)
Assessment age at 4	-4.33 (0.33) ***
Assessment age at 6	-3.08 (0.24) ***
Assessment age at 8	-1.60 (0.18) ***
Constant	6.86 (0.75) ***
R-square Within	.1964

Note. Full sample size is 6,430 and child fixed group sample size is 1,985. Time-invariant variables including child's age, child is boy, having older siblings, the log of family income the year before birth, mother married at birth, mother's AFQT, mother's education at birth, mother's age at birth, and maternal self-esteem were dropped out. Numbers represent unstandardized coefficients with standard errors in parentheses.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Estimates of Associations between Maternal Shift Work and Children's Behavioral Problems by Various Characteristics

	Behavioral Problems
<i>By family type (n=1985)</i>	
Years working non-day shifts (1)	0.02 (0.13)
Living in single-mother family for one-third of the time (2)	-0.20 (0.52)
Living in single-mother family for two-thirds of the time (3)	0.59 (0.71)
Almost always living in single-mother family (4)	0.47 (0.80)
Interaction of (1) & (2)	0.29 (0.16)
Interaction of (1) & (3)	0.32 (0.18)
Interaction of (1) & (4)	0.58 (0.19)**
<i>By family income (n=1985)</i>	
Years working non-day shifts (1)	0.05 (0.13)
Average family income in bottom third of sample distribution (2)	0.22 (0.63)
Average family income in middle third of sample distribution (3)	0.46 (0.46)
Interaction of (1) & (2)	0.43 (0.17)**
Interaction of (1) & (3)	0.16 (0.13)
<i>By mother's occupation (n=1985)</i>	
Years working non-day shifts (1)	0.06 (0.14)
Years working in a professional or managerial occupation (2)	-0.34 (0.12)**
Years working in a sales occupation (3)	-0.88 (0.32)**
Years working in a cashier or service occupation (4)	-0.25 (0.14)
Interaction of (1) & (2)	0.03 (0.03)
Interaction of (1) & (3)	-0.06 (0.06)
Interaction of (1) & (4)	0.06 (0.03)*
<i>By mother's work hours per week (n=1985)</i>	
Years working non-day shifts (1)	-0.18 (0.16)
Average working hours per week ≥ 35 (2)	-0.13 (0.09)
Interaction of (1) & (2)	0.60 (0.14)***
<i>By mother's and father's shift work (n=1685)</i>	
Years mother worked non-day shifts (1)	-0.20 (0.16)
Years father worked non-day shifts (2)	-0.07 (0.16)
Interaction of (1) & (2)	0.08 (0.03)**
<i>By mother's and father's shift work and average work hours per week (n=1685)</i>	
Years mother worked non-day shifts (1)	-0.30 (0.16)
Mother's average working hours per week ≥ 35 (2)	-0.10 (0.10)
Interaction of (1) & (2)	0.61 (0.15)***
Years father worked non-day shifts (3)	-0.56 (0.23)*
Fathers' average working hours per week ≥ 35 (4)	-0.39 (0.13)**

	Behavioral Problems
Interaction of (3) & (4)	0.60 (0.16) ***

Note. Time-invariant variables (i.e., child is boy, having older siblings, the log of family income the year before birth, mother married at birth, mother's AFQT, mother's education at birth, mother's age at birth, and maternal self-esteem) were dropped out in child fixed-effect models. BPI: Behavioral Problem Index. Numbers represent unstandardized coefficients with standard errors in parentheses.

*
 $p < .05$.

**
 $p < .01$.

 $p < .001$.