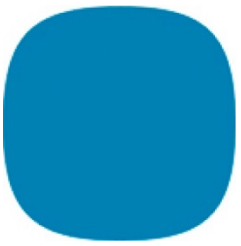

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A Critical Review of the Literature

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Parents' nonstandard work schedules and child wellbeing: A critical review of the literature

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Parents' nonstandard work schedules and child well-being: A critical review of the literature

ABSTRACT

This paper provides a comprehensive review of empirical evidence linking parental nonstandard work schedules to four main child developmental outcomes: internalizing and externalizing problems, cognitive development, and body mass index. We evaluated the studies based on theory and methodological rigor (longitudinal data, representative samples, consideration of selection and information bias, confounders, moderators, and mediators). Of 23 studies published between 1980 and 2012 that met the selection criteria, 21 reported significant associations between nonstandard work schedules and an adverse child developmental outcome. The associations were partially mediated through parental depressive symptoms, low quality parenting, reduced child-parent interaction and closeness, and a less supportive home environment. These associations were more pronounced in disadvantaged families and when parents worked such schedules full time. We discuss the nuance, strengths, and limitations of the existing studies, and propose recommendations for future research.

Keywords: Child mental health, Child obesity, Cognitive development, Nonstandard work schedules, Parental employment, Shift work

INTRODUCTION

Around the world, many societies are transitioning from industrial and post-industrial economies to service economies, which Presser (2003, pp. 64-65) calls the "24/7 economy." Accompanying this economy is a demand for services around the clock, which has driven a rise in work schedules in evenings, nights, and weekends (so called "nonstandard schedules"). Research to date has documented a high prevalence of nonstandard (NS) work schedules in developed economies (ABS, 2009; McMenamin, 2007; Presser, 2003; Presser, Gornick, & Parashar, 2008; Williams, 2008), particularly among parents (ABS, 2009; Presser, 2003). This labor market trend has raised concerns about its potential impact on children's well-being.

The influence of NS work schedules on children's health and development is an important issue for social, economic and workplace policy. Future economic prosperity and social cohesion are contingent on all children having optimal physical and mental health and the capacity to participate fully in the workplace and society. If there were convincing evidence that children's health and development is adversely influenced by parents' work schedules, it would strengthen the case for improving work conditions and for family friendly workplace reform. Such evidence would also make a strong argument for appropriate income support and child care provision for families with children.

The purpose of this paper is to provide a critical review and assessment of the evidence for the influence of parents' NS work schedules on their children's well-being. We confine the review to research on developed countries, discuss policy implications of the evidence, and offer directions for future research in this field.

Definition and Prevalence of NS Work Schedules

The definition of NS work schedules varies across studies and countries, but essentially refers to schedules in which the majority of work hours fall outside a typical daytime Monday to Friday work week. In general, NS schedules include evenings, nights, rotating shifts (i.e., alternating between day, evening, or night shifts, but on a fixed schedule), split shifts, irregular hours, and regular weekend work.

Based on United States (US) data from the Work Schedules and Work at Home Survey a supplement to the Current Population Survey in 2004, about 18% of all employed wage and salary workers (19% of men and 16% of women) reported a work shift for their primary job that fell outside of a usual daytime schedule (between 6am and 6pm) (McMenamin, 2007). The prevalence of NS work schedules is much higher among African Americans (23%), part-time workers (29%), and workers employed in the service sector (36%) (McMenamin, 2007). NS work schedules are also prevalent in other developed economies but, due to different definitions, their prevalence may not be directly compared across countries. In 2005, about 28% of Canadian workers worked a NS schedule, the vast majority of whom were full-time shift workers (Williams, 2008). Between 2001 and 2004, about 43% of Australian workers regularly worked some form of NS schedule, including weekends (Dockery, Li, & Kendall, 2009). Within Europe, the prevalence of weekday shift work varied widely across countries during 2005, from 15% in Luxembourg to 30% in the United Kingdom. The prevalence of usual weekend shift work ranged from 10% in Sweden to 34% in Italy (Presser et al., 2008).

Parents with young children tend to be more likely to work NS schedules due to child care needs or costs, or because parents wish to maximize their time with children while undertaking the employment by 'shift' or 'tag-team' parenting (Barnett & Gareis, 2007; Garey, 1999; Han, 2004; Hattery, 2001; Presser, 2003; Wight, Raley, & Bianchi, 2008). In 2004, approximately 30% of working American parents (both men and women) with children

under 18 usually worked on weekends rather than typical weekdays (McMenamin, 2007). Based on the 2004 US Current Population Survey (US Department of Commerce, Bureau of the Census, US Department of Labor, & Bureau of Labor Statistics, 2011) about 40% of mothers working NS schedules reported child care as the main reason for working NS schedules during the week (authors' own calculation). Australian Census data reveal that in 2007, in almost 60% of couples with children, either one or both parents typically worked some hours between 7pm and 7am (ABS, 2009).

CONCEPTUAL FRAMEWORK

In this section we discuss theoretical perspectives that help explain the potential effect of parental work schedules on children's well-being. We consider these theories to address the following three critical questions: 1) Why NS work schedules might influence children's development; 2) the plausible mechanisms (mediators) of this relationship; and 3) whether this relationship is moderated by characteristics of the child and family. Figure 1 illustrates the broad conceptual framework we developed from the relevant theoretical and empirical literature to guide this review. Throughout the discussions about the influence of NS work schedules on children, standard (weekday, daytime) schedules are used as the comparison group.

See Figure 1 (Appendix)

Ecological Theory

Bronfenbrenner's ecological theory (1979) conceptualizes child development as occurring within nested settings. The microsystems (e.g., family, school, childcare center) are the immediate settings in which a child is active, and are influenced by the mesosystems, namely the interrelationships between microsystems. Children and their immediate settings

sit, in turn, within the exosystem that arguably includes the parental workplace, and they all are situated within the context of the wider society and culture, the "macrosystem." Renamed a bioecological theory (Bronfenbrenner, 2005), it has since been extended to highlight the importance of genetic and other physiological characteristics and the continuous reciprocal interaction that takes place between the person and environment over time.

Conceptual Resource Framework

Following Bronfenbrenner, Brooks-Gunn and her colleagues (Brooks-Gunn, Brown, Duncan, & Moore, 1995) have operationalized the bioecological model in terms of familial and extra-familial resources and have developed a conceptual resource framework that integrates multidisciplinary perspectives (e.g., economists, sociologists, social demographers, developmental and clinical psychologists, and pediatricians). In broad terms, four categories of familial resources are thought to be critical for parenting and early socialization. These include income, time, human capital (e.g., parental education, together with special skills, training, and other characteristics), and psychological capital (e.g., the mental health of the parents, the quality of their relationships, the psychological importance to them of factors such as education and work, and beliefs about the parental role in childrearing). Extra-familial resources include child care settings, schools, peer groups, community, and wider social contexts (Kendall & Li, 2005). If the family engages with these community resources appropriately, they constitute social capital, another important resource for children's development. Brooks-Gunn and co-authors also focused on the issue of decision-making and the choices parents face about allocating limited resources (Brooks-Gunn et al., 1995). They later acknowledged that the conceptual framework did not account for the development of the human capital of the child, the continuous reciprocal interaction of which Bronfenbrenner spoke that explains why children are often resilient within the context of a poor or

dysfunctional family (Brooks-Gunn, 1995). Optimal child health and development is, therefore, a function of the quantity, quality and mix of familial and extra familial resources, the decisions parents make regarding the allocation of their resources, and the characteristics of the children themselves.

Based on bioecological theory and the conceptual resource framework, we have devised the following model to guide our review (Figure 1), showing the key concepts, their indicators, and linking paths. Structural factors that have contributed to the emergence of the 24/7 economy (Path A) are technological and demographic change, globalization, and labor market deregulation (Dockery et al., 2009; Presser, 1999, 2003; Strazdins, Korda, Lim, Broom, & D'Souza, 2004). Based on bioecological theory, we view the workplace as an important part of the exosystem within which children grow and develop. Hence, parents' NS work schedules, as a distal factor, are likely to influence children's development (Path B). From the point of view of the conceptual resource framework, parents' NS work schedules may influence their children's development through their impact on familial resources, such as income, parental time available for children, parental physical and psychological well-being, and the quality of the marital relationship (Paths C and D). According to the framework, parents who choose to work NS schedules may decide to trade-off income and time with their children for the potentially negative consequences that working NS schedules may bring. Whereas working NS schedules, particularly night and evening shifts, may enable more parent-child time during the day, such schedules can lead to fatigue and stress and hence reduce parents' physical and psychological capacity for providing quality parenting (Heymann, 2000). Similarly, if parents choose to work NS schedules to increase their income, it may mediate a positive effect of NS schedules on child outcomes; however, physical and psychological tolls associated with working such schedules may offset this effect. NS work schedules also likely influence child development through family processes,

such as parenting, parental-child relationship and home environment. The impact of NS work schedules on children may vary by the developmental age and gender of the child, the gender of parents, and family characteristics (Path E). These moderators may also modify the indirect effect of NS work schedules on child development via the mediators (Paths F and G). Below we discuss the mediators and moderators in more detail in light of relevant theoretical and empirical literature.

Mediators (pathways linking parental NS work schedules to child development)

Previous studies have documented associations between working NS schedules and the physical and mental health of workers, including working parents, although results are by no means consistent. NS schedules, especially regular night shifts and rotating shifts, disturb the body's circadian rhythms, alter physiological functions, and potentially lead to chronic health conditions, anxiety, neurotic disorders and depression, and chronic sleep deprivation and fatigue (Barnett, 2006; Kantermann, Juda, Vetter, & Roenneberg, 2010; Totterdell, 2005; Vogel, Braungardt, Meyer, & Schneider, 2012). Working evening or night shifts (but not rotating shifts) has been associated with greater depressive symptoms among mothers and fathers (Perry-Jenkins, Goldberg, Pierce, & Sayer, 2007).

Mental and physical health is an important resource for parents because they influence child health and development through their impact on family processes. Fatigue due to sleep deprivation and mental stress associated with working NS schedules can reduce the quality of time spent with children in developmentally important activities, and it can also lower the quality of parenting and the home environment. The stress associated with NS work schedules may adversely affect family dynamics and increase work-family conflict (Barnett, Gareis, & Brennan, 2008; Davis, Goodman, Pirretti, & Almeida, 2008; Liu, Wang, Keesler,

& Schneider, 2011) and marital instability, especially in association with night shifts (Davis et al., 2008; Kalil, Ziol-Guest, & Epstein, 2010; Presser, 2003).

Some studies have reported that parents who work NS schedules spend more time with their children and are more likely to be present when children return home from school (Wight et al., 2008), but other studies have found that working NS schedules is generally associated with less time spent with children (Connelly & Kimmel, 2011; Rapoport & Le Bourdais, 2008). Further, parents working NS schedules generally spend less time with children in developmentally important activities, such as helping with homework and attending parent-teacher meetings or school plays, than those working standard hours (Wight et al., 2008). Previous research has also shown that, compared to standard work hours, working NS schedules was associated with insensitive and harsh parenting practices (Grzywacz, Daniel, Tucker, Walls, & Leerkes, 2011) and a decrease in the quality of the home environment, especially in low-income families (Heymann & Earle, 2001).

Moderators

Most developmental perspectives (including bioecological theory and the conceptual resource framework) emphasize that the nature and strength of influences on children's outcomes will depend on the children's age, developmental status, and needs. Attachment, psychoanalytic, and family theorists have emphasized the importance of the parent-child relationship in developing children's trust and a sense of identity, and have drawn attention to the importance of age-related transitions in developmental capabilities (Sroufe &Waters, 1977; Thompson, 2006). Infants and toddlers require a large investment of time and effort from a primary caregiver to meet their physical needs and form a secure attachment. As toddlers, they require constant supervision and activities focused on language development, including reading time with their parents. Parents are invaluable in helping young children to

understand and express language, develop a variety of skills, and solve cognitive tasks (Bradley, 2002). Further, parents aid in the development of emotional capacities, such as regulating emotions, dealing positively with frustration, and delaying gratification (Eisenberg & Valiente, 2002). Thus, the early years constitute an important developmental stage for examining the impact of NS work schedules on children's development due to schedule-related parental stress and fatigue.

During middle childhood and adolescence, parental NS schedules may exert an influence on different developmental domains and through different mechanisms, such as parent-child closeness and supervision. These later years mark a time of important changes related to school entry and transitions, as well as developmental advances that establish children's sense of identity and their relationships with parents and peers (Eccles, 1999). Adolescence is an important developmental stage in which young people begin engaging in risky behaviors. Thus, parental supervision and monitoring may be just as important during these late developmental stages as in early childhood.

Given the different developmental needs of boys and girls (Shonkoff & Phillips, 2000), the association between parental work schedules and child well-being may vary by child gender. Boys have higher levels of activity than girls but they are less able to regulate attention and control impulses (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). They also manifest higher levels of direct aggression, associated with externalizing behavior, poorer peer relations, and lower pro-social behavior than girls (Card, Sawalini, Stucky, & Little, 2008). Thus, boys may be more affected by parental stress associated with NS work schedules than girls. Boys also appear to have more adverse cognitive outcomes than girls if their mothers were employed for more than 30 hours per week while they were infants (Brooks-Gunn, Han, & Waldfogel, 2002). Similarly, heightened sensitivity to increased maternal work hours has been observed in adolescent boys, relative to girls, in low-income

families (Gennetian, Lopoo, & London, 2008). Studies of dual-earner families with school-aged children also suggest a stronger association between parental work demands and poor monitoring for boys than girls (Bumpus, Crouter, & McHale, 1999; Greenberger, O'Neil, & Nagel, 1994).

Parental gender adds another dimension to the complex relationship between NS work schedules and child outcomes due to gendered pathways between parenting and child outcomes (Lamb, 2010; Laursen & Collins, 2009; Raley & Bianchi, 2006). Because parents tend to engage in more activities with same-gender children (e.g., fathers and sons), it is likely that fathers' absence due to NS work schedules has a larger detrimental effect on boys than girls. Fathers' long work hours (55 hours or more per week) have been associated with higher levels of externalizing behaviors in boys than girls (Johnson, Li, Kendall, Strazdins, & Jacoby, 2013).

The association between NS work schedules and child outcomes may also differ by the gender of parent due to differential sharing of child care and household work responsibilities. Despite increases in the proportion of women entering the labor force, women remain largely responsible for family life (Maume, 2011; Maume & Sebastian, 2012). Women working NS schedules report higher levels of sleep deprivation and work-to-family conflict than their male counterparts (Maume & Sebastian, 2012; Tuttle & Garr, 2012), and work-to-home conflict has a negative effect on marital quality in women but not in men (Maume & Sebastian, 2012). This suggests that maternal NS work schedules may exert a larger effect on the family and children than paternal shift schedules.

NS work schedules present parents with both advantages and challenges in balancing work and family demands. Whether or not a parent chooses (or can choose) to work NS schedules is likely to moderate the effect of NS schedules on both family processes and child outcomes. We know that some parents 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 associated with working non-day shifts might be offset by parents' satisfaction with their ability to spend time with and take care of their children (Garey, 1999). In the latter case, stress, parental depression, and marital instability induced by working NS schedules, as well as the physiological tolls (e.g., fatigue and interrupted sleep patterns) of such schedules, could adversely affect the child's well-being (Heymann, 2000).

Family structure and income constitute another potential moderator of the NS work effects on child outcomes. It is well established that socioeconomic disadvantage, such as living in a single-parent, low parental education and low-income family, is associated with poor child health and developmental outcomes (Hertzman, 1999; Keating & Hertzman, 1999). These factors may exacerbate any negative effect of NS work schedules on child development. Families with more social and economic resources may be better able to cope with challenges presented by NS work schedules and may even benefit from working such schedules, especially when parents chose to work these schedules. In 376 dual-earner middle-class families, Davis, Crouter, and McHale (2006) found higher levels of adolescent-reported intimacy with mothers when their mothers worked NS hours, compared to when they worked standard hours, perhaps because these shifts meant that they could spend more quality time with their children.

Family characteristics other than income and family structure may also modify the impact of NS work schedules on family processes and thus on child development. Such characteristics are diverse and are often better captured in qualitative research. Small-scale qualitative studies of nurses suggest that their families adapt to NS work schedules quite well and in some respects they even benefit from shift work. For example, in a study by Barnett and Gareis (2007), 8-14 year old children of mothers working an evening shift as nurses rated

their fathers as having greater awareness of their activities and better parenting skills, and they themselves were more likely to disclose information to their fathers. Thompson's study of night working nurses and their families in the UK also reveals that mother's absence due to work allowed the father to take on more child care and other domestic responsibilities (Thompson, 2009). Thus maternal NS schedules may draw fathers into closer care relationships with children and generate less gender stereotyped family interactions (McHale, Crouter, & Whiteman, 2003). However, to fulfil the gendered expectations to be "good" wives and mothers, the women in the Thompson study attempted to mitigate any potential negative impact of working night shifts on their families, at the expense of their own well-being, in the form of significant reductions in their own sleep duration, worse mood, and reduced alertness (Thompson, 2009).

This paper represents the first comprehensive and critical assessment of existing research evidence linking parents' NS work schedules to child development. The paper makes three key contributions to the field: development of a new conceptual model to guide the review; a synthesis and critical assessment (based on theory and on multiple methodological criteria) of the diverse research findings on the topic; and theory- and evidence-based recommendations for future research.

METHODS

This review focused on studies that directly examined the link between parents' NS work schedules and child mental, physical, and cognitive development. The search included peer-reviewed journal articles and books on this topic and was restricted to the literature from English-language sources in developed countries from 1980 to December 2012. We identified the majority of the studies through an electronic search in ProQuest, Web of Knowledge, Science Direct, PsycINFO, and OVID Medline.

We searched for broad key words and their combinations in the title of the article (nonstandard work, nonstandard hours, work schedules, shift work, night work, evening work, and weekend work), together with terms identifying outcomes anywhere in the full text of the article (mental health, behavior, overweight, obesity, body mass index (BMI), cognition, sleep, well-being, and child or adolescent). The initial search produced 364 records (See Figure 2). Using the reference lists of these articles and the web pages of some authors and professional associations to extend the search, we identified an additional three studies. After removing duplicate records, 241 records remained that were potentially relevant. An assessment of the titles and abstracts of these records against the selection criteria (examining a direct link between parental NS schedules and child developmental outcomes) resulted in 24 articles that we read in full. We excluded just one article after assessing the full text of the 24 studies because it did not examine a direct link between work schedules and child outcomes (Barnett & Gareis, 2007), leaving 23 studies in the final review. Many of the excluded articles focused on adult health and well-being outcomes, including sleep disturbance (n = 94), or family outcomes such as time spent with children, parenting quality, parent-child closeness, marital stability, and the home environment (n = 32) in respect to NS work schedules; and some of the other excluded studies focused only on the prevalence and determinants of NS work schedules. While not reviewed, we discussed the studies that examined the relationship between NS work schedules and family processes in both the introduction and discussion to facilitate our understanding of the pathways through which NS work schedules may influence child development.

See Figure 2 (Appendix)

We did not use a fixed definition of NS schedules as a selection criterion as there is no one single definition in the literature and by doing so we would have omitted a significant

number of relevant studies. The studies based on US national datasets typically define NS schedules as hours worked outside 6am - 6pm on the main job, with evening shifts sometimes defined as 2pm - 9pm and night shifts as 9pm - 8am (e.g., Han, 2008; Han & Miller, 2009; Han, Miller, & Waldfogel, 2010). Studies based on the Canadian National Longitudinal Study of Children and Youth (NLSCY) and the Household, Income and Labour Dynamics in Australia Survey (HILDA) defined self-reported worked schedules on the main job, including regular evening shifts, regular night shifts, irregular hours, and split or rotating shifts or weekends, as NS schedules (Dockery et al., 2009; Strazdins, et al., 2004; Strazdins, Clements, Korda, Broom, & D'Souza, 2006). Due to substantial diversity in the way both NS work schedules and child outcome variables were measured (e.g., mental health, behavioral difficulties), we undertook a comprehensive review of the extant published literature rather than conducting a meta-analysis.

Evaluation Criteria

We employed five methodological criteria to present the findings of the studies reviewed (see Appendix): (1) sample representativeness, (2) study design (longitudinal vs. cross-sectional, (3) adequate control for a minimum set of socio-demographic characteristics as confounders and covariates, (4) use of analytical methods to address selection bias, and (5) examination of mediating and moderating factors. Study quality ratings, which ranged from 0 to 5, indicated the number of criteria met by the study as determined by the authors. The most important issue we considered in rating the studies was the extent to which studies have adjusted for potential selection bias. That is, we whether the observed associations between NS work schedules and child outcomes could be attributed to other unobserved or omitted factors associated with the likelihood of working NS schedules *and* having poor (or positive) child outcomes. Comprehensively dealing with selection bias entails adjusting for major

known confounders and covariates using longitudinal data and employing such analytical techniques as Ordinary Least Square (OLS) Regression, fixed effects modeling, or propensity score matching. We consider a minimum set of key socio-demographic confounders and covariates to be family structure, parental education and age, the number of parental work hours, child gender and age, and the number of children in the household. Ethnicity was also considered as key covariate to adjust for as appropriate. Some studies were based on a predominantly homogeneous population, making this adjustment unnecessary (Strazdins et al., 2004). In other studies using fixed effects models, all time-invariant covariates, such as ethnicity or race, would have to be omitted.

See Table 1 (Appendix)

There are other sources of information bias, including self-reported outcome measures, missing cases and loss to follow-up in longitudinal data collection. Because these issues are inherent in non-experimental studies, such as those covered in this review, we did not use these factors as a criterion to rate the studies. We have, however, paid particular attention to research methodology that may also appropriately and adequately address missing information and/or attrition issues. We have also addressed these common methodological issues in the discussion section of this review.

RESULTS

Overview of the Results

The 23 studies that met the inclusion criteria (see Appendix) included 22 peer-reviewed journal articles and one book, all based on non-experimental data. Seventeen studies were based on a US sample, two studies used an Australian sample (Champion et al. 2012; Dockery et al., 2009), two analyzed data from a Canadian sample (Strazdins et al.,

2004, 2006), and there was one study each from the UK (Barton, Aldridge, & Smith, 1998) and Croatia (Radosevic-Vidacek & Koscec, 2004). Eleven studies were cross-sectional and 12 were longitudinal. Several studies were based on the National Longitudinal Study of Youth–Child Supplement (NLSY-CS), a data set that may overrepresent children who were born to young mothers with lower education and income (Chase-Lansdale, Mott, Brooks-Gunn, & Phillips, 1991). Three studies were based on data from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD), which may underrepresent children from disadvantaged families. The age of the children across these studies ranged from birth to 20 years. Twelve studies examined both parents' NS work schedules, ten focused only on mothers' NS work schedules, and one study examined only fathers' work schedules (Barton et al., 1998). Mental health and behavioral problems were the most common type of child outcome examined (15 studies). Four studies focused on cognitive development (Han, 2005; Han & Fox, 2011; Heymann, 2000; Odom, Vernon-Feagans, & Crouters, 2013), three studies examined children's body weight as the outcome (Champion et al., 2012; Miller & Han, 2008; Morrissey, Dunifon, & Kalil, 2011), and one focused on children's sleep patterns (Radosevic-Vidacek & Koscec, 2004). Two of the 15 studies that examined mental health and behavioral problems also analyzed school engagement and after-school activities as additional outcomes (Han, 2006; Hsueh & Yoshikawa, 2007).

The 23 studies provided a range of unstandardized and standardized effect sizes (ES). Wherever possible, a standardized ES was calculated from the published data to facilitate comparisons (see Appendix). Of those that used multiple linear regression techniques, six studies reported standardized beta coefficients (β), which can be interpreted as ES. In the nine studies the authors provided unstandardized beta coefficients (b) and we calculated ES using b and standard deviations (SD) of the outcome variable (b/SD). Four studies using logistic

regression provided an odds ratio (OR). In two studies where the authors used structural equation models (Han & Miller, 2009; Han et al., 2010), standardized beta coefficients (β) were reported that were equivalent to ES. In two studies (Barton et al., 1998; Radosevic-Vidacek & Koscec, 2004), analyzes of variance (*F* test) statistics were reported.

On the whole, the effect sizes of parental NS schedules on children's behavioral and cognitive outcomes were small by conventional standards, mostly < .20 (Cohen, 1988). The significant effect sizes, however, were larger for preschool-age or younger children (ES = .20 – .35). In studies stratified by indicators of socioeconomic status, effect sizes were larger in low-SES (Strazdins et al., 2004, 2006), low-income (Han, 2008; Han et al., 2010), and single parent families (Dockery et al., 2009; Han & Waldfogel, 2007). Four studies analyzed only low-income or low-wealth samples: two studies examined preschool-age children (Joshi & Bogen, 2007; Odom et al., 2012), with small effect sizes for cognitive ability (< .20) and medium effect sizes (unmediated ES = .36 – .55) for behavioral outcomes; and two analyzed school-age children (Dunifon, Kalil, & Bajracharya, 2005; Hsueh & Yoshikawa, 2007), with a small effect size (mostly ES < .10). In studies that included both parents, the ES was comparable for maternal and paternal work schedules, although the relative strength of association varied by child age, SES and type of NS schedule. The ES for BMI was also mostly small, < .20 (Miller & Han, 2008; Morrissey et al., 2011). Miller and Han (2008) found a considerable effect size for the number of years mothers worked a NS shift on child BMI among families in the second income quartile (ES = 0.27).

Child Mental Health and Behavioral Problems

In this section, we summarize the findings with reference to the conceptual framework presented in Figure 1. Although child age is included as a moderator in our conceptual framework (Figure 1), because few studies had directly tested child age as a

moderator and because the majority of the studies analyzed the data separately by child age group, we begin the discussion of the results separately for preschool and school-age children and adolescents.

Preschool Children

Evidence from both cross-sectional (Gassman-Pines, 2011; Joshi & Bogen, 2007; Strazdins et al., 2004, 2006) and longitudinal studies (Daniel, Grzywacz, Leerkes, Tucker, & Han, 2009; Rosenbaum & Morrett, 2009) was consistent and suggests that young children with at least one parent who worked NS schedules had more emotional and behavioral problems than those whose parents worked standard schedules. The magnitude of the association was similar for both mothers' and fathers' NS schedules (Strazdins et al., 2004, 2006).

Evidence suggests that exposure to parental NS work schedules in the child's first few years of life is particularly detrimental. Mothers' or fathers' NS schedules in their child's infancy were associated with more behavioral problems at ages 2 and 3, as compared to parents with standard schedules (Daniel et al., 2009; Rosenbaum & Morrett, 2009). Two studies found that evening or night shifts had the strongest and most consistent associations with child behavioral problems, such as excessive fussiness and distractibility, as well as internalizing and externalizing behaviors (Gassman-Pines, 2011; Rosenbaum & Morrett, 2009).

School-Age Children and Adolescents

The findings from two longitudinal studies that used representative samples and addressed selection bias reported a significant association between the child's cumulative exposure to parental NS work schedules and mental health and behavioral problems. Han (2008) found that behavioral problems among 4- to 10-year-old children increased with the number of years that mothers had worked a NS schedule. Similarly, Han and Miller (2009) reported that the number of years mothers worked night shifts and fathers worked evening shifts was

significantly associated with higher risks of depression in children aged 13 or 14. Han et al. (2010) found that the number of years mothers had worked a night shift was also linked to adolescent smoking, drinking, drug use, delinquency, and sexual activity. Based on a sample of low-income families (primarily single mothers), Hsueh and Yoshikawa (2007) found that 5- to 16-year-old children whose primary caregiver worked variable NS schedules had more teacher-reported externalizing behaviors but fewer parent-reported internalizing behaviors than children whose caregivers did not work such hours.

In contrast, Dunifon et al. (2005) reported no association between parental NS schedules and behavioral problems in 372 children aged 5-15 whose mothers were receiving cash assistance in an urban Michigan county.

Mediating Factors

Studies that have examined pathways linking NS schedules with child behavioral problems reported that mediating factors include parental depressive symptoms (Daniel et al., 2009; Rosenbaum & Morrett, 2009; Strazdins et al., 2006), poor parenting and parental supervision (Han et al., 2010; Strazdins et al., 2006), reduced parent-child closeness and less time spent with children (Han & Miller, 2009; Han et al., 2010; Rosenbaum & Morrett, 2009), and a less supportive home environment (Han & Miller, 2009; Han et al., 2010; Han & Waldfogel, 2007). Of note, Han et al. (2010) found that irregular shifts were associated with greater parental knowledge of child's whereabouts, which, in turn, reduced risks for adolescent risky behavior. The authors speculated that families with parents who worked irregular shifts were of higher SES in this particular NLSY sample, and therefore may have chosen these schedules to meet their child care or family needs.

Moderating Factors

Whereas the majority of the studies adjusted for child gender in their analyses, few specifically examined child gender as a moderating factor. Whereas Han et al. (2010) found

that adolescent boys were more likely than girls to engage in risky behavior due to cumulative exposure to mothers' night shifts, two studies based on small local samples found that girls were more negatively affected by parents' NS work schedules (Barton et al., 1998; Joshi & Bogen, 2007). With regard to family structure, there is consistent evidence from three studies based on large samples that children of single-mothers tended to have more problems associated with NS work schedules than those living in two-parent families (Dockery et al., 2009; Han, 2008; Han & Waldfogel, 2007). Similarly, there is a consistently stronger association in low-SES families than in middle- or high-SES families (Han, 2008; Strazdins et al., 2004, 2006). Han (2008) found a stronger relationship between the number of years a mother had worked NS schedules and poorer behavioral outcomes in 4- to 10-year-old children who either lived in single-mother or low-income families, whose mothers worked in cashier or service occupations, or whose mothers worked non-day shifts full-time.

Child Cognitive Development

Four studies have assessed cognitive outcomes in respect to parental NS work schedules. In a US sample, Han (2005) found that children of mothers who worked NS schedules in their first year of life had poorer cognitive outcomes two to three years later, although the results varied by dimensions of cognitive performance, timing and length of exposure to these schedules. Children had lower scores on the Mental Development Index (MDI) at 24 and 36 months, and significantly lower verbal comprehension and expressive language skills at 36 months, if their mother had worked a NS schedule in the first year of life but not in the second or third year. Using data from the NLSY-CS, Heymann (2000) found a higher proportion of school-aged children with poorer outcomes in mathematics, vocabulary and reading if parents worked evenings or nights. Based on the same dataset but using growth-curve modeling, Han and Fox (2011) found that the number of years a mother worked

a night shift was associated with lower reading scores, and the number of years she worked evening or night shifts was associated with lower progress in math skills between ages 6 and 14 . Having a father who worked more years at an evening shift was also associated with reduced mathematic scores. The authors' mediation analysis suggested that eating meals together, parent knowledge of children's whereabouts, and some after-school activities were plausible explanations for these associations (Han & Fox, 2011). In a US sample of 250 African American children (aged 24 to 36 months) born to mothers residing in low-income and rural counties in North Carolina and Pennsylvania, Odom and co-authors found that mothers' NS work schedules at 24 months were associated with lower expressive language ability at both 24 and 36 months (Odom et al., 2013). These associations were mediated through negative maternal interactions with their children and negative work-family spillover.

Childhood BMI

Analyzing data from the NLSY-CS, Miller and Han (2008) found that the BMI of 13- to 14-year-old American children increased significantly if mothers worked either a few (< 4) or many (10 or more) years of NS schedules. This relationship was stronger among the "near poor" (i.e., families in the second quartile of family income, a level of income where families could not qualify for a number of public assistance programs yet tend to have substandard living), compared to families in other income quartiles. In a largely representative sample of 434 children born to Caucasian women in Adelaide, South Australia, Champion et al. (2012) reported that fathers' NS work schedules (shift schedules, evenings, nights, and weekends) were associated with increased odds of child overweight and obesity. In contrast to other studies on the topic, mothers' NS work schedules were not significantly associated with the outcome variables examined. However, when both parents worked NS schedules the

investigators found an increased risk for child overweight and obesity. Due to the study's cross-sectional design and the fact that all types of NS work schedules were combined into one category, the findings reported by Champion et al regarding mothers' NS work schedules need to be interpreted with caution.

Using longitudinal data from the NICHD SECCYD and within-child fixed-effect models, Morrissey et al. (2011) found no significant association between maternal NS work schedules and child BMI among 990 American school children aged 8 to 12. However, the NICHD SECCYD sample is not nationally representative, with 80% of the children living in two-parent families and more than 75% in higher-income families.

Other Outcomes

Two of the 15 studies that examined child behavioral problems (already reviewed above) also examined children's school engagement (Han, 2006; Hsueh & Yoshikawa, 2007) and involvement in extracurricular activities (Han, 2006) as additional outcomes. One study focused on child sleep patterns (Radosevic-Vidacek & Koscec, 2004). These studies found that children tend to have lower levels of school engagement, attend fewer extracurricular activities, and sleep less when their parents work NS hours. The studies provided no information, however, about the mechanisms that might underpin this association. Whereas parents working NS hours (e.g., evenings or nighttime) are available during daytime when outside school activities take place (3pm-6pm), they may not have sufficient energy to take their children to such activities or may lack time to do so due to the competing demands of housework, such as preparing meals before they go to work in the evening. It is possible that disrupted family processes or child mental health and behavioral problems associated with NS work schedules may affect the child's sleep and school engagement.

DISCUSSION

Guided by our conceptual framework, we examined studies that investigated the associations between parents' NS work schedules and four child developmental outcomes (internalizing and externalizing problems, cognitive development, and body mass index) and three other related outcomes (sleep pattern, school engagement, and extracurricular activities). Of 23 studies reviewed, 21 studies reported a statistically significant negative association between NS work schedules and at least one child developmental outcome. Thus, the majority of the studies support our general hypothesis that parental NS work schedules, as a distal factor or part of the "exosystem" in which children grow and develop, have negative consequences for the developing child with regards to mental health and behavioral problems, cognitive development, overweight and obesity, and other related outcomes.

Two studies that did not find a significant association between NS work schedules and child outcomes were Dunifon (2005) and Morrisey (2011) and their respective colleagues, although both studies were based on longitudinal data and used child fixed effects models to address potential selection bias. Dunifon et al. (2005) examined behavioral problems in a small sample of children from low-income families ($N = 372$, ages 2 -15) and found no effect of NS work schedules on child behavioral problems. In contrast, Han (2008) analyzed a large longitudinal national data set that over-represented less advantaged families (US NLSY-CS, $N \approx 7{,}000$, ages 4 - 10), and reported a significant association between the number of years mothers worked NS schedules and behavioral problems in children, particularly in low-SES families. A child fixed effects model was also used in this study. Morrisey et al. (2011) did not find a significant relationship between NS schedules and child BMI in a sample of US children (NICHD SECCYD $N = 990$, ages 8-12) in which low-income families were underrepresented. In contrast, Miller and Han (2008) also analyzed longitudinal data and used child fixed effects models to address selection bias, but they

reported a significant association between NS schedules and child BMI in a large sample of teenage children (ages 13-14). These differing results may be in part attributed to the size and the characteristics of the population under investigation, and different constellations of factors adjusted in the studies.

Findings regarding child gender differences in the effect of NS work schedules on child behavioral outcomes differed by study quality. Highly rated studies (meeting all five criteria) reported that adolescent boys were more likely than girls to engage in risky behavior due to their cumulative exposure to mothers' night shifts (Han et al., 2010), but two cross-sectional studies based on small local samples (meeting only two of the five criteria) found that girls were more negatively affected by their parents' NS work schedules (Barton et al., 1998; Joshi & Bogen, 2007).

The most consistent associations were reported among preschool-age children for both cognitive and mental health/behavioral problems, and among adolescents for risky behaviors. These findings suggest that parental NS work schedules matter for both early and later developmental stages but in different developmental domains. Consistent with our broad conceptual framework, there is evidence that the negative associations between NS work schedules and child behavioral problems are partly mediated through family resources, such as parental psychological capital (e.g., depressive symptoms) (Daniel et al., 2009; Rosenbaum & Morrett, 2009; Strazdins et al., 2006), family processes such as low quality parenting (Han et al., 2010; Strazdins et al., 2006), reduced child-parent interaction and closeness (Han & Miller, 2009; Han, et al., 2010; Rosenbaum & Morrett, 2009), and a less supportive home environment (Han & Miller, 2009; Han et al, 2010; Han & Waldfogel, 2007). We should be cautious, nevertheless, about concluding that maternal depressive symptoms constitute a mediating factor, as in almost all studies of behavioral problems that focused on young children (age 0-10) child mental health/behavioral problems were

measured with mother-reported ratings (e.g., CBCL, BPI), which are likely to be influenced by the mothers' mental health.

As expected, some of the studies reviewed have shown that associations between NS work schedules and child developmental outcomes differ by family SES. For example, based on studies that addressed selection bias and controlling for key confounders and covariates, there is clear evidence that associations between parents' NS work schedules and child outcomes are more pronounced in low SES families (e.g., low-income, single-parenthood, and low occupational status). This evidence is demonstrated in studies that found significant interactions between SES and NS work schedules (Dockery et al., 2009; Han, 2008; Han & Waldfogel, 2007; Strazdins et al., 2004, 2006) when mental health and behavioral problems were examined. These findings suggest that families with more economic resources and human capital may better be able to meet the challenges of NS work schedules than less advantaged families. The association between NS work schedules and child outcomes is also magnified when parents work NS schedules on a full-time basis, compared to working these schedules on a part-time basis. These findings suggest that evening and night shifts are particularly detrimental to child developmental outcomes (Daniel et al., 2009; Han & Fox, 2011; Han & Miller, 2009; Rosenbaum & Morrett, 2009). Further, cumulative exposure to NS work schedules has a negative impact on child developmental outcomes (Han, 2008; Han & Fox, 2011; Han & Miller, 2009; Miller & Han, 2008), thus underscoring the importance of using longitudinal data in future inquiry.

Strengths and Limitations of Reviewed Studies

The robustness of the evidence provided by the studies reviewed depends on their methodological rigor. The majority were based on large and/or representative samples, controlled for key confounders, and examined moderating and mediating factors, thus

providing in-depth information about the link between NS work schedules and child developmental outcomes. There were, however, a number of limitations.

Cross-Sectional Data

Due to the nature of the topic, experimental data were not a possibility and thus a causal relationship between parental NS schedules and children's well-being is difficult to establish. Whereas it is encouraging that 12 out of 23 studies used a longitudinal design, ten studies were based on cross-sectional data, thus precluding inferences about NS work schedules as a causal factor for child well-being, and raising a concern about reverse or reciprocal causality. For example, it is possible that parents arrange their work schedules as a way of managing children with more behavioral problems. In addition, the measurement of work schedules at one point in time does not provide information about how long children have been exposed to these work patterns and the changes that may have occurred over time. Use of longitudinal data would reveal whether or not, or to what extent, the any disadvantages associated with NS schedules found at one time point persists over time. Longitudinal studies reviewed to date have begun to consider both the onset and duration of children's exposure to parents' NS work schedules (Han & fox, 2011; Han & Miller, 2009; Han et al., 2010). We call for many more studies in the future to take a longitudinal approach.

Less Information about Father's Work Schedules

We were pleased to see that 13 out of the 23 studies examined fathers' work schedules. However, the remaining ten studies did not do so, primarily due to lack of data. The association between NS work schedules and child outcomes may differ by the gender of the parent due to gender differences in sharing child care and household work responsibilities and also gender differences in occupations. With an increasing emphasis on paternal involvement in children's development, the field will benefit from giving equal attention to the work schedules of both mothers and fathers, and, in particular, joint work schedules in

dual-earner families. One cross-sectional study examined joint NS schedules worked by both parents in 434 nine-year-old children and found that these schedules were associated with child overweight and obesity, but with a weak statistical significance. The small sample size and the cross-sectional design limited the generalization of this study. Given that fathers tend to provide more child care than normal when mothers work NS schedules (Barnett & Gareis, 2007; Thompson, 2009), it is important to understand how both mothers' and fathers' work schedules may independently or jointly shape children's development. Indeed, the evidence from the studies that examined both mothers' and fathers' NS work schedules suggests that both parents' NS schedules matter (Champion et al., 2012; Han & Fox, 2011; Han & Miller, 2009; Rosenbaum & Morrett, 2009; Strazdins et al., 2004, 2006). Whereas maternal work schedules (particularly night shifts) appear to be more strongly linked to child well-being, the type of NS schedule each parent works has differential but significant associations with child outcomes. Maternal night shifts and paternal evening shifts had the most consistent negative associations with child and adolescent mental health issues (Han & Fox, 2011; Han & Miller, 2009; Han et al., 2010). Unfortunately, most of the existing large datasets do not have as detailed information about fathers as on mothers. We call for future data collection efforts to overcome this common limitation.

Lack of Data on Child Care and Choice of NS Work Schedules

Most studies lacked information about the availability and quality of child care available to parents working NS schedules. The studies examined also lack precision as to measurements of the timing of child care arrangements that can be matched to the timing of parental work schedules. The impact of parental NS schedules on children may depend on the availability, affordability and quality of care arrangements. For example, formal care for children is rarely available outside standard business hours and weekdays. Children whose mothers work NS schedules are more likely to be cared for by fathers in two-parent families or by other

relatives or non-relatives in a single-mother family (Han, 2004). When both formal and informal supports are absent, parents working NS schedules may have great difficulties in juggling work and family demands. This is a particularly important issue for single-parent families and a plausible explanation for the findings from this review that the adverse association between NS schedules and child outcomes is stronger in single-parent families. The quality of child care also matters. Previous research has shown that high quality child care has a long-term positive impact on children's development (Kohen, Hertzman, & Willms, 2002). With the passage of the US federal welfare reform law, many low-income and single mothers have no choice but to place their young children at low quality childcare facilities, which may impair their children's development (Chaudry, 2004). Socially disadvantaged families may be more likely to use poor quality child care when working NS schedules. Hence child care quality is a plausible mechanism linking NS schedules to poor child well-being and warrants future inquiry.

Closely tied to child care is the issue of whether parents choose to work NS schedules or have job flexibility in order to meet family and child care needs. These issues were not considered in the majority of studies reviewed. NS work schedules may present advantages to both-parent families where parents are able to choose work schedules to meet their child care needs and to enable fathers' greater participation in parenting (Barnett & Gareis, 2007; Thompson, 2009). Indeed, some parents choose to work NS schedules as a way of spending more time with their children (Hattery, 2001). Working mothers with flexible schedules tend to spend more time in direct child care but less time in shared leisure activities (Rapoport & Bourdais, 2008). However, it is unclear if the choice of flexible NS schedules benefits children's mental health and cognitive development. Parents who choose to work flexible NS schedules may still be prone to stress and fatigue associated with NS schedules. Tuttle and Garr (2012) have shown that women working shift work have greater work-to-family conflict

than men, even when women have more control over their work schedule. It is important for future research to take this issue into consideration. Recent welfare reform in the US has seen a great number of low income single mothers move into poor quality jobs that require inflexible NS schedules (Jones-DeWeever, Peterson, & Song, 2003; Presser, 1999; Presser & Cox, 1997).

Reliance on Parent-Reported Measures of Child Behavioral Outcomes

There is considerable research on the concordance between parent- and child/adolescent-reported measures of behavioral problems. However, there is no evidence that child-reported measures are more accurate than those reported by their parents. The accuracy of reported child behavioral problems is influenced by the saliency of behavioral problems to parents and children, and the willingness of both to report these problems (Karver, 2006). The accuracy of self-reports may also differ by the relevance of the problems to a specific setting (home versus school) and the parent's gender. The literature recommends employing multiple informants when collecting information on child and adolescent behavioral problems (Karver, 2006; Salbach-Andrae, Lenz, & Lehmkuhl, 2009; Seiffge-Krenke & Kollmar, 1998).

Child-reported measures of behavioral problems should be collected in studies that involve older children who are able to answer the questionnaire. Out of all 15 studies of mental health and behavioral problems, 11 involved school-aged children and adolescents, but only five of these used child-reported measures of behavioral outcomes, and the other six studies analyzed samples combining young and older children (ages 2-16). While mother-reported measures may be considered practical for young children (ages 0-5) in these studies, such measures can be complemented or enriched by a secondary carer (e.g., child care centre or kindergarten or preschool teachers, fathers, grandparents or nannies). Further, mothers may be biased either downward or upward in their assessment of their children's behavior, particularly when maternal mental health is a concern (Sawyer, Streiner, & Baghurst, 1998).

Hsueh and Yoshikawa (2007) have shown that parental NS schedules were associated with teacher-reported child behavioral problems but not with mother-reported child behaviors.

Other Sources of Information Bias

Self-reported measures, missing cases and loss to follow-up are also potential sources of information bias. None of the four studies that examined child cognitive outcomes, and none of the three that examined adolescent body weight, used self-reported outcome measures. Instead objective measures were used, including cognitive and language test scores and body weight and height. However, in all 15 studies of child behavioral problems, parent-, teacher- or child-reported outcome measures were used. Self-reporting is unavoidable in both clinical and non-clinical studies that examine mental health and behavioral problems. For example, well-established instruments, such as the Kessler Psychological Distress Scales (Kessler et al., 2002), the Beck Depression Inventory (Beck, Steer, & Carbin, 1988), the Child Behavior Checklist (Achenbach, 1991), and the Behavior Problems Index (Zill, 1990) are all based on data collected from self-reports. As discussed above, one way of minimizing potential bias is to collect information from multiple informants (child/adolescent, mother, father, teacher, and secondary cares). Missing cases and loss to follow-up are also a source of potential informational bias and are common problems with survey and cohort data. The vast majority of the studies covered in this review utilized such data. To the extent that low SES groups are often over-represented in missing cases and in loss to follow-up (Li, Kendall, Henderson, Downie, Landsborough, & Oddy, 2008), the negative effects of NS work schedules on child outcomes are likely to be underestimated.

FUTURE DIRECTIONS

Parental work is an important social determinant of child health and wellbeing, especially in the era of changing economic dynamics and an increasingly globalised economy. In

particular, occupations that require employees to work NS schedules, such as in the service sector, are expected to account for proportionally high job growth in the future (US Bureau of Labor Statistics, 2012). The findings from the studies reviewed have shown that NS work schedules exert a larger negative impact on children from low SES backgrounds than on children from families with more resources. This has important implications for understanding well-established social gradients in child health and development (Keating & Hertzman, 1999). Poor working conditions, including parental NS schedules, are a plausible mechanism mediating these social gradients and disparities in child developmental outcomes. Therefore, the impact of parental NS work schedules on children's developmental outcomes warrants more fine-grained research. This line of enquiry also needs greater guidance by a theoretical framework that recognises broader societal and community influences and considers the characteristics of parents and the child at different developmental stages. Below we discuss a number of issues for future investigators to consider.

Links between NS Schedules and a Broader Range of Developmental Outcomes

Most studies to date have focused on behavioral and mental health outcomes, only four have examined children's cognitive development, and only three have investigated obesity. Much more research is needed to enhance our knowledge about the relationship between NS work schedules and child cognitive outcomes, particularly academic achievement in school-age children. Further research is also needed not only to examine the link between NS work schedules and child BMI but also to investigate whether and how proximal factors, such as nutrition and physical activity, may also be influenced by NS work schedules. Based on the conceptual resource framework, we would expect parental NS work schedules to influence these developmental outcomes through the pathways of time available for the use of family and psychological capital (i.e., parental mental health and the quality of

the relationships between the parents themselves and with their children). It is also plausible that these various developmental outcomes are interrelated contemporaneously or longitudinally. With the use of more rigorous research design and advanced modelling, it will be possible to examine various developmental outcomes of children who are exposed to parental NS work schedules over time. This would help researchers determine if behavioral and cognitive development in early childhood leads to mental health problems and risk-taking behavior in teenagers, relative to children whose parents work standard daytime schedules. The field will also benefit from more research addressing the important issue of whether or not the association between parental NS work schedules and early child development will persist or dissipate over time.

Better Specification of NS Work Schedules

Some of the studies reviewed have shown that night shifts were associated with poor cognitive and behavioral outcomes among young children, and with higher levels of depression and more risky behaviors among adolescents. On the other hand, two studies reported that irregular or variable shifts were associated with reduced adolescent risk-taking behaviors (e.g., smoking, drinking, and using drugs) via improved parental knowledge of their child's whereabouts (Han et al., 2010; Han & Waldfogel, 2007). We note, however, that the data (NLSY-CS) used in these studies suggested that parents who reported having irregular shifts tended to choose such schedules and/or have some control over the time when they worked. Rotating and irregular shifts would have less predictable effects on parental time at home, which might make it harder for families to plan and attend events together. These shifts, nevertheless, can be beneficial to children if the shifts are employee-initiated rather than required by employers (Henly, Shaefer, & Waxman, 2006). Such findings highlight the importance of distinguishing between the evening, night, rotating, irregular or

weekend work of mothers and fathers and of taking into account whether parents choose these shifts.

Often researchers have collapsed different types of NS schedules into one single category due to inadequate sample sizes in each group. As noted by other scholars in the field, such an analytic strategy limits our understanding about which schedules influence child development and family processes (Barnett, 2006; Presser, 2003). Further, no studies have considered the location of NS work schedules (at home vs. outside home) and its potential benefit or detriment to child wellbeing. Parents working NS schedules at home may be able to adjust hours to suit their family needs. Rapoport and Bourdais (2008) have shown that working at home in general is associated with more time devoted to household chores for mothers and more time for social activities and family meals for fathers. Future research should investigate whether the effects of NS schedules worked at home are different from those worked elsewhere. Better specification of NS schedules also requires a focus on the family as the unit of analysis, considering joint work scheduling patterns in dual-earner families. The degree to which the work schedules of parents in dual-earner families overlap also has important implications for parental relationships, the division of household labour, and parental participation in children's activities (Barnett, 2006; Staines & Pleck, 1983), all of which may influence child outcomes.

Attention to a Wider Range of Moderating and Mediating Factors

Fourteen of the 23 studies reviewed examined a range of moderating or mediating factors that were likely to play a role in the association between NS work schedules and child development. There was, however, a general lack of information on the child's temperament, parental marital satisfaction, levels of actual and perceived social support, and parents' job quality. These factors have been shown to influence child development (Brooks-Gunn, Han,

& Waldfogel, 2010; Han & Waldfogel, 2007; Strazdins, Shipley, Clements, Obrien, & Broom, 2010). Strazdins and colleagues (2010) reveal that when parents hold poor-quality jobs their children show more emotional and behavioral difficulties, independent of income, parent education, family structure, and work hours. Similarly, job characteristics and job quality associated with certain types of NS schedules may be an important confounder or moderator. For example, the effects of NS work schedules may be exacerbated by stressful work conditions, such as long hours, lack of support from coworkers and supervisors, and pressures for meeting deadlines. It is critical that future research adequately examines the role these factors may play in mediating or moderating the relationship between NS schedules and various domains of child development.

Further, whereas most of the reviewed studies adjusted for family structure and income as confounders, relatively few examined how the relationship between NS schedules and child outcomes may differ by these contextual factors. It is important to examine factors that may modify the effect of working NS schedules on child development, such as those based on SES (Repetti, 2005) and other characteristics of the family and the child. Families are complex and diverse with different capacities for responding to the challenges of combining work and family. Families with more resources (e.g., both-parent and high income families) are either less affected (Han, 2008; Han & Waldfogel, 2007; Strazdins et al., 2004, 2006) or unaffected by NS work schedules (Dockery et al., 2009; Morrissey et al., 2011). Some small scale studies linking NS work schedules with family processes (Barnett & Gareis, 2007; Davis et al., 2006) suggest that family with more resources can benefit from mothers' NS work schedules in terms of fathers' participation in parenting. It is thus important for future research and interventions to identify and target subgroups of children from less advantaged families, particularly those who have low levels of multiple developmental resources (e.g., parental SES, time, psychological and physical health).

More Sophisticated Analytical Approaches

Causality and selection bias have always been a concern in social science research. Increasingly, studies use longitudinal datasets to handle temporal issues in linking parental work schedules with children's well-being. Longitudinal data, however, do not always enable researchers to conclusively answer the fundamental question of causality. In the absence of experimental data, some existing studies have used more sophisticated statistical approaches to address this issue. For example, Han (2008) used a child fixed effects model to tackle the issue of unobserved heterogeneity. Other studies have used propensity score matching (Han et al., 2010) to address selection bias and causality. These statistical tools allow researchers to compare outcomes for children of parents who worked NS and the children of parents who did not work such schedules, but had a similar predicted propensity to do so. In this way, these two groups are comparable so we can minimize the possibility that observed associations between NS work schedules and child outcomes are attributable to selection bias (see discussion in Hill, 2008). As more longitudinal data and sophisticated statistical techniques become available, future studies need to tackle the issue of causality.

Implications for Practice and Policy

We envision a number of ways in which the government and society as a whole can intervene to prevent or buffer the negative effects of NS work schedules on children and families through policy initiatives, where such impact exists. None of the reviewed studies examined indicators of broader influence outside the home, such as the neighborhood, community resources (e.g., the accessibility and cost of child care facilities, school, before- and after-school care for school age children, and public transportation), and work place policy initiatives. These factors can potentially mitigate the negative association between NS

work schedules and child development. For example, greater support at the workplace for fathers to increase their levels of involvement in child care, and greater quality of father involvement in household work generally, will come a long way to help families cope with their daily stress due to NS work schedules. This will, in turn, enhance family and child well-being. School also has an important role to play, such as in the provision of healthy breakfast and lunch at school cafeterias, and greater social and emotional support and intellectual stimulation targeting children whose parents work NS schedule and may have a reduced capacity to adequately provide their children with these healthy developmental inputs. Further, the availability of before- and after-school care and child care for young children during NS work hours can reduce the stress on parents who work NS schedules. As also noted by Barnett (2006), the availability of medical appointments on weekends and public transportation outside normal business hours can assist parents working NS schedules to cope with demands from work and family. In the absence of such community resources, parents with NS work schedules may resort to unreliable options (Barnett, 2006). Finally, given evidence that children living in low-income families are more vulnerable, ensuring adequate pay and/or supplements paid for NS schedules is another intervention option for industrial relations and regulatory efforts.

The trend towards the 24/7 economy is unlikely to reverse in the future, and the evidence to date suggests that some aspects of children's development is shaped by the timing of their parents work. We are fully aware of the complexity of the ways in which parental market work affects children's health and development. In spite of the best efforts made by scholars to capture such complexity, existing research may still barely do justice to the influences (positive and negative) at play, and the challenges and difficulties confronting working parents and their children. Possibly, mixed methods may enable researchers to better understand the everyday experiences of today's families and how these experiences interact

with parental labor market involvement to influence children's development. In many respects the field is yet to mature, and the next real task is for research and policy to do justice to the complex relationship between parental NS work schedules and children's health and development.

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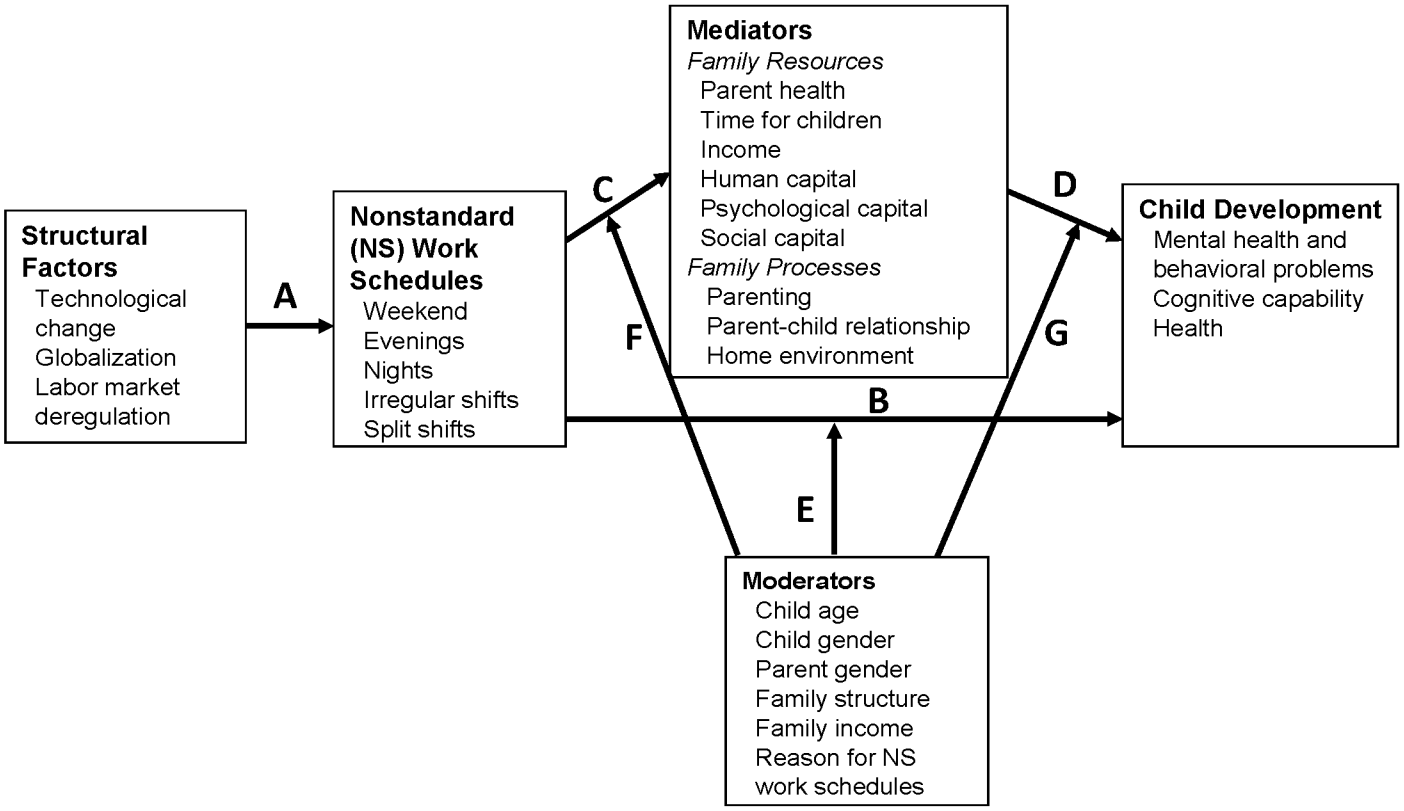
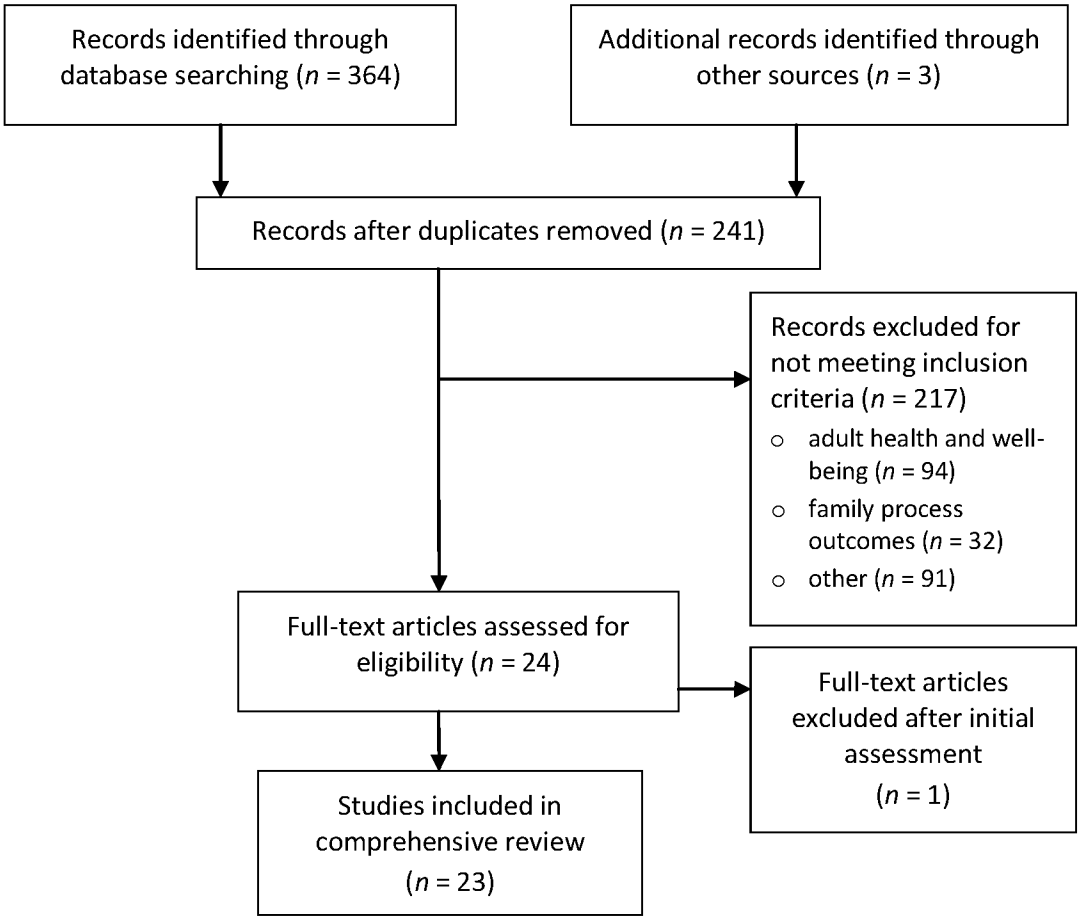
Appendix

FIGURE 1. Theoretical Background: Adapted from Bioecological Theory (Bronfenbrenner, 2005) and Conceptual Resource Framework (Brooks-Gunn et al.,1995)



Appendix

FIGURE 2. Summary of the Literature Search Process



Appendix

Table 1. Summary of Reviewed Studies (N = 22)

Study	Sample and Design	Age	Definition of Nonstandard (NS) Work	Child Outcome Measures	Confounders and Covariates (C)[a] / Moderators (Mo)/ Mediators (Me)/ Analysis Techniques (AT)	Results/Effect Size[b]	Quality Rating[c]
Mental health							
Han et al., 2010	US: NLSY-CS Five cohorts of children born 1982-1991 (N = 4,200)^ Longitudinal	Birth to age 13/14 years	Mother and father: # of years parent worked evening (2pm–midnight), night (9pm–8am), or irregular shift (other NS types) from birth to age 11/12. Variables also created by developmental stage (<5, 5–10, 11–12)	Risky behaviors at age 13–14: Ever smoked Ever drunk alcohol Ever used illicit drugs Number of delinquent behaviors Ever had sex *Child reported*	C = MIN, family income, welfare, maternal occupation, birthweight, smoking & alcohol consumption during pregnancy Me = *Child reported*: time together, maternal & paternal closeness, parental knowledge, HOME score Mo = Child gender, income-to-needs ratio, maternal occupation, family structure. AT = SEM/PSM	*Full sample (all ages)* - Indirect effect of mothers' # of years of night shift (via time spent with children) on smoking (ß = -.096**), drinking (ß = –.081**) and drug use (ß = –.095**) - Indirect effect of mothers' # of years of night shift (via home environment) on drinking (ß = –.114***), delinquency (ß = –.082***), and sex (ß = –.145***) - Indirect effect of mothers' # of years and fathers' # of years irregular shift (via parental knowledge) on smoking (ß = –.088***), drinking (ß = –.114***), and delinquency (ß = –.077***) - Direct effect of father # of years irregular shifts on drinking (ß = .080**) Strength & nature of effects varied by developmental stage at which NS work occurred Subgroup analysis showed effects of mothers' night shift stronger among boys, low-income families, when non-professional and when a sole parent for majority of time	5

Daniel et al., 2009	US: NICHD-SECC (*N* = 1,364 children born in 1991 and mothers are FT by 6 months)^ Longitudinal	6–36 month	Mother: Began NS work (evening, night or variable) in 1st year, or began after 1st year vs. only standard	Behavioral problems (CBCL) at 24 & 36 months: Internalizing T-score Externalizing T-score *Mother reported*	C = MIN, poverty level, weeks of maternity leave, job flexibility, location Mo = Child temperament Me = Maternal depression and sensitivity. AT = OLS	Effect of mothers' NS schedule (without mediators/ with mediators) on Internalizing if - Began NS in 1st yr (24 months): ES = 0.02/ –0.04 - Began NS after 1st yr (24 months): ES = –0.13/ –0.12 - Began NS in 1st yr (36 months): ES = 0.24**/ 0.20* - Began NS after 1st yr (36 months): ES = 0.18/ 0.16 Externalizing if - Began NS in 1st yr (24 months): ES = 0.31**/ 0.24* - Began NS after 1st yr (24 months): ES = 0.03/ 0.08 - Began NS in 1st yr (36 months): ES = 0.21*/ 0.19* - Began NS after 1st yr (36 months): ES = 0.15/ 0.13 *Interactions significant at p < .10 indicating NS schedules had greater effects on internalizing (24 & 36 months) and externalizing (24 months)if mother began NS work in the 1st year of the child's life & child had difficult temperament*	4
Han, 2008	US: NLSY-CS children born 1982-1991 of mothers who had ever worked *(N* = 12,207)^ Longitudinal	4–10 years	Mother & father: NS (6pm– 6am) vs. standard shift (# of years)	Behavioral problems (BPI): Total score *Mother reported*	C = MIN Mo = Years lived with couple or sole parent, average family income, mother's occupation – # of years, average work hours AT = Child FEM	*All families:* Effect of mothers' # of years NS shift on BPI: ES = 0.03* - Years NS & always single mother family: ES = 0.09** - Years NS & bottom 3rd of income distribution: ES = 0.07** - Years NS & years cashier/service occupation: ES = 0.01* - Years NS & average hour s are FT (>35hrs): ES = 0.10*** *Two-parent families:* - Mothers'/fathers' # of years NS shift: ES = 0.03 / ES = 0.01	4

						- Years mother NS & average hours are FT: ES = 0.10*** - Years father NS & average hours are FT: ES = 0.10***	
Rosenbaum & Morett, 2009	US: ECLSBC (*N* = 1,650) Children born in 2001 & in DE families at baseline (9 months)^ Longitudinal	9–24 month	Couple: At least one parent works NS shift; 6-category variable – day (6am–6pm)/ evening (2pm–midnight)/night (9pm–8am)/rotating/split/ other	Behavioral problems (ITSC) at 24 months *Mother reported.*	C = MIN, preterm, birthweight, childcare type, job benefits, more than 1 job, child ITSC at birth Mo = Parent gender Me = Father-child interaction, marital quality, shared dinners, self-rated health, depression AT = OLS	Effect of parental NS shift (without/with mediators) on behavioral problems at 24 months: - Either/ both parents work NS shift: ES = 0.19***/ ES = 0.14* - Father day, mother evening/night: ES = 0.35***/ ES = 0.34*** - Father day, mother irregular: ES = 0.23**/ ES = 0.18* - Father evening/night, mother day: ES = 0.32**/ ES = 0.15 - Father irregular, mother day: ES = –0.15/ ES = –0.22* - Both evening/night/irregular: ES = 0.06/ ES = –0.21	4
Dockery et al., 2009	Australia: HILDA waves 1–4, 2001–2004 (unbalanced panel: *N* = 3,429 observations, 1,691 youth, 1,197 houses)^ Cross-sectional	15–20 years	Either mother or father works NS hours in couple families; one parent in lone parent families (all types including weekend) vs. standard	SF36 mental component score (*M* = 50, *SD* = 10). *Child reported*	C = MIN, family prosperity, long-term disability. Mo = Family structure, work hours Me = Time with children, parental mental health. AT = OLS	Effect of either parent working NS hours (without/with mediators) on SF36 mental health score: - All families: ES = –0.08*/ ES = –0.08* - Lone parent: ES = –0.19*/ ES = –0.19* - Two-parent: ES = –0.06/ ES = –0.07	3
Dunifon et al., 2005	US: WES, LI women (*N* = 372) from	2–15 years	Mother mostly NS i.e., evening or mixed day/evening (at	Behavioral problems (BPI) at wave 4 (aged 5–15):	C = MIN, average hourly wage, irregular hours, lengthy commute, marital	*Total sample (results from OLS)* Effect of mothers' NS shift on behavioral problems: - NS shift at W1 & internalizing: ES = –0.07	3

	cash assistance rolls, 1997–2002 (4 waves, women employed in at least one wave Longitudinal		1 wave only, or at 2 or more waves) vs. mostly standard shift	Internalizing Externalizing Positive behavior *Mother reported*	status; mother's self-rated health, mental health, learning disability, stress, domestic violence Mo = Child age/ gender, no of other adults in house AT = OLS / FEM	- NS shift at W1 & externalizing: ES = –0.07 - NS shift at W1 & positive behavior: ES = –0.06 - NS shift at W2+ & internalizing: ES = 0.12 - NS shift at W2+ & externalizing: ES = 0.04 - NS shift at W2+ & positive: ES = –0.08 No significant interactions	
Han & Miller, 2009	US: NSLY-CS Five cohorts of children born 1982–1991 (*N* = 4,200)^ Longitudinal	Birth to age 13/14 years	Mother & father: Standard (6am–6pm), evening (2pm–midnight), night (9pm–8am), irregular. Measured as # of years from birth to age 11/12	Adolescent Depression Scale at age 13–14 *Child reported*	C = MIN, welfare reliance, family income, marital status, birthweight, smoking or drinking in pregnancy, occupation Me = Time with parents, parent-adolescent relationship, monitoring, HOME score, frequency of meals, TV. AT = SEM	- Indirect effect of maternal # of years night shift and paternal # of years evening shift (via home environment) on depression (ß = –.036***) - Indirect effect of paternal # of years evening shift (via paternal closeness) on depression (ß = –.096***) - Indirect effect of maternal # of years irregular shift & paternal # of years irregular shifts (via mothers' knowledge of whereabouts on depression (ß = –.070***)	3
Han & Waldfogel, 2007	US: NLSY-CS, 8 waves 1988–2002 (*N* = 12,207)^ Cross-sectional	10–14 years	Mother & father: 6 category: Standard (8am–6pm), Evening (2pm–12), night (9pm–8am), rotating, irregular	Risk-taking behavior: Substance abuse Disobedience Criminal behavior School-related trouble *Child reported*	C = MIN, marital status, birthweight, mother's cognitive ability, income Mo = Family type. Me = Parental monitoring, child-parent closeness.	*Two-parent families* Effect of mothers' evening shift (unmediated/mediated) on: - Criminal behavior: *OR* = 1.48 (0.26)*/ *OR* = 1.38 (0.26) *Single-mother families* Effect of mothers' rotating shift (unmediated/mediated) on: - Disobedience: *OR* = 1.77 (0.41)* / *OR* = 1.63 (0.38)*	3

					AT = LOGR	- Criminal behavior: *OR* = 1.57 (0.29)* / *OR* = 1.49 (0.28)* - School trouble: *OR* = 1.74 (0.33)** / *OR* = 1.59 (0.31)*	
Hsueh & Yoshikawa, 2007	US: LI from Milwaukee, Wisconsin New Hope Project 1994–1995 (*N* = 486 parents, 529 children with valid data) Longitudinal	5–16 years	PCG (mother): 4-category variable – Fixed NS shift (at least 50% hours outside 8am-4pm, incl. weekend); variable NS; variable standard vs. fixed standard at 2-year followup	Behavioral problems (BPI) at 2-year (age 5–12) & 5-year (age 6–16) Internalizing Externalizing School engagement School performance. *Teacher and parent reported.*	C = MIN, parental gender, access to car, income, receipt of AFDC Me = Parental stress, perceived time pressure, regularity of family mealtime. AT = OLS Adjusted for 2–year outcomes at 5–year followup	Effect of mothers' NS shift (without mediators) on: *Parent-reported* - Internalizing (2-year): β = –.10/ β = –.13* (fixed /variable NS shift) - Internalizing (5-year): β = .09/ β = –.05 - Externalizing (2-year): β = .01/ β = .02 - Externalizing (5-year): β = –.03/ β = .02 *Teacher-reported* - Internalizing (2-year): β = –.07/ β = .02 - Internalizing (5-year): β = –.02/ β = –.00 - Externalizing (2-year): β = –.05/ β = .15* - Externalizing (5-year): β = –.05/ β = .01	3
Strazdins et al., 2006	Canada: NLSCY 1996–1997 (*N* = 4,306 DE families, 6,156 children) ^ Cross-sectional	2–11 years	Mother or father or both NS (any incl. weekends) vs. both standard	Social & emotional wellbeing derived from CBCL (*M* = 0, *SD* = 1). *PCG reported*	C = MIN, child care use Mo = Child age (2–4/5–11), SES (derived composite) Me = Family functioning, parental depressive symptoms, hostile or ineffective parenting AT = Linear mixed model with household random	Effect of parental NS shift (without/with mediators) on social and emotional wellbeing: - Father NS (all children): β = .16**/ β = .11** - Mother NS (all children): β = .14**/ β = .08* - Both NS (all children): β = .14**/ β = .07* - Father NS (1st SES quartile, all children): β = .16/ β = .07 - Mother NS (1st SES quartile, all children): β = .18/ β = .09 - Both NS (1st SES quartile, all children): β = .19*/ β = .07 - Father NS (pre-school children): β = .25**/ β = .18** - Mother NS (pre-school children): β = .20**/ β = .12*	3

					effect	- Both NS (pre-school children): β = .22**/ β = .14**	
Gassman-Pines, 2011	US: Children of LI working mothers from preschool at four Head Start Centres (*N* = 61 mothers, 724 person-days) Cross-sectional	Pre school age	Mother: Based on daily diaries - night (6pm-6am) or weekend vs. daytime (8am-6pm), (# of hours of each)	Child behavior Externalizing Internalizing Positive behavior Mother-child interactions – 5 subscales Maternal mood *Mother reported*	C =MIN, teenage parent, living with grandparent; other daily level covariates e.g., whether child was sick that day, care by father. Mo = weekend AT = MLM	Effect of each increasing hour of mothers' night work on: - Externalizing: ES = 0.04 - Internalizing: ES = 0.04 - Positive behaviors: ES = –0.06* *Interaction significant at p < .05 indicated that the effect of # of hours worked at night on the weekend reduces positive behavior more so than # of hours worked at night on a weekday*	2
Han, 2006	US: NSAF, children of working mothers (*N* = 20,823 in 1997; *N* = 21,730 in 1999) ^ Cross-sectional	6–17 years	Mother: NS (6am–6pm) vs. standard	Behavioral problems (BPI) Extra-curricular activities School engagement *MKA (mostly mother) reported*	C = MIN, childcare type Mo = Child age (6–11/12–17), marital status and work hours, family poverty and welfare status, parenting stress and mental health. AT = OLS	Effect of mothers' NS schedule on behavioral problems at: - 6–11 yrs (1997/1999): ES = –0.06/ 0.01 - 12–17 yrs (1997/1999): ES = –0.03/ 0.05	2
Joshi & Bogen, 2007	US: 1999, 206 LI children from Welfare, Children & Families: A Three City	2–4 years	Mother: "regular" NS (all types including weekend) vs. standard	Behavioral problems, CBCL (*M* = 0, *SD* = 1): Internalizing Externalizing Positive behavior *Mother reported*	C = MIN, city, welfare, income, health insurance, depressive symptoms & social support, birthweight or preterm Mo = Child gender,	Effect of mothers' NS schedule (without/with mediating factors) on: - Internalizing: β = 0.47*/ β = 0.32 - Externalizing: β = 0.55**/ β = 0.37* - Positive behavior: ES = –0.36**/ ES = –0.27*	2

	Study Cross-sectional				presence of biological father, & other adults. Me = Parenting stress. AT = OLS	*Interactions significant at p <.10 indicate the effect of mothers' NS schedules on internalizing was less if other adults were in the household; and effect on externalizing was less if child was a boy*	
Strazdins et al., 2004	Canada: NLSCY 1996-97 (*N* = 4,433 DE families, 6361 children) ^ Cross-sectional	2–11 years	Mother/father/both NS (any incl. weekends) vs. both standard – usually worked in past 12 months	At least one emotional or behavioral difficulty (14%) *PCG reported*	C = MIN, child care use Mo = Child age (2-4/ 5-11), SES (derived composite measure from education, income and occupation) AT = LOGR	Effect of NS schedule on child emotional or behavioral difficulty: - Father NS (all ages): *OR* = 1.29 (1.04−1.60)* - Mother NS (all ages): *OR* = 1.43 (1.13−1.81)** - Both NS (all ages): *OR* = 1.40 (1.12−1.73)** - Father NS (1st SES quartile, all ages): *OR* = 1.35 (0.83−2.19) - Mother NS (1st SES quartile, all ages): *OR* = 1.67 (1.02−2.75)* - Both NS (1st SES quartile, all ages): *OR* = 1.62 (1.03−2.54)* - Father NS (pre-school children): *OR* = 1.89 (1.30−2.74)*** - Mother NS (pre-school children): *OR* = 1.65 (1.09−2.48)* - Both NS (pre-school children): *OR* = 1.81 (1.24−2.66)**	2
Barton et al., 1998	UK: (*N* = 190 children of employed fathers – manual/semi-skilled workers) Cross-sectional	8–11 years	Father: Shift or day	(SPPC) subscales CDI total score and subscales *Child reported*	C = Age Mo = Child gender AT = MANOVA	Effect of father working a regular shift on: - Perceived academic competence (girls only): *F* (1,80) = 4.40*; and discrepancy between perceived and ideal levels of competence (girls only) *F* (1,76) = 4.99 * Girls had more symptoms than boys when fathers worked shifts of depression (total score): *F*(1,76) = 4.93*; negative mood: *F* 1,87)= 4.42*; interpersonal problems: *F* (1, 87) = 8.33**; and anhedonia: *F* (1, 87) = 4.30*	0
Cognitive Ability (see also Han, 2006 and Hsueh & Yoshikawa, 2007 for outcomes related to school engagement, school performance and involvement in extracurricular activity)							
Odom et al.,	US: *N* = 231	2-3 yrs	Mother:	Child expressive	C = Child age, income/	Effect of mother working a NS schedule without (with) mediators	1

2013	children of employed African American mothers born in 2002 in low-wealth rural households from The Family Life Project Longitudinal		NS (fixed evening, fixed night, rotating shift or irregular) vs standard (most hours 8am-5pm) at 24 months	language outcomes: NDW @ 24 months PLS @ 36 months	needs ratio, work hours, maternal education, formal child care Me = maternal positive engagement, negative work-family spillover AT = OLS	on: -NDW at 24 months: β = -.16*/ β = -.12 -PLS at 36 months: β = -.12*/ β = -.06	
Han & Fox, 2011	US: NLSY-CS (*N* = 7,105). Six cohorts of children born 1982-1993 who have been followed for 13-14 year period) ^ Longitudinal	Birth up to 13-14 years	Mother & father: Standard (6am–6pm); Fixed evening (2pm-9pm); Fixed night (9pm-6am); Variable (other schedule). # of years worked evening, night or variable shifts	PIAT Reading and Math (level and trajectory) from ages 5 to 14).	C = MIN, marital status, family income, welfare, occupation Me = *Child reported*: time together, maternal & paternal closeness, parent missing events, parental knowledge, HOME score, shared meals, after-school activities AT = Multilevel GCM	Mothers Effect of # of years night shift (without/with mediators) on: - Reading level: ES = - 0.02*/ - 0.02* - Reading trajectory: ES = 0.01 - Math level: ES = 0.02/0.01 - Math trajectory: ES = -0.05** Effect of # of years evening shift (without/with mediators) on: - Reading level: ES = -0.01/-0.01 - Reading trajectory: ES = 0.00 - Math level: ES = 0.03**/ 0.02 - Math trajectory: ES = -0.04** Effect of # of years variable shift (without/with mediators) on: - Reading level: ES = 0.02**/0.02**	4

						- Reading trajectory: ES = -0.02* - Math level: ES = 0.02**/0.01 - Math trajectory: ES = -0.02 Fathers Effect of # of years night shift (without/with mediators) on: - Reading level: ES = - 0.04**/0.01 - Math level: ES = 0.03*/0.03* Effect of # of years evening shift (without/with mediators) on: - Reading level: ES = -0.02/-0.02 - Math level: ES = -0.02/-0.03* (Note that there was not association between fathers work schedule and trajectories)	
Han, 2005	US: NICHD - SECC (*N* = 900 children whose mothers had worked in the first 3 years) Children born in 1991^ Longitudinal	0–3 years	Mother: NS (combined evening 3pm-midnight/ night (11pm–7am)/ variable hours) vs. standard. Measured seven combinations of onset and duration	BMDI at 15 & 24 months BSR at 36 months Reynell Verbal comprehension & Expressive language at 36 months *Mother reported.*	C =MIN, maternal cognitive ability, family income, poverty, depression at one month Me = Amount of maternal employment, maternal depression, home environment, mother's sensitivity, childcare type and quality AT = OLS	Effect of mother beginning NS schedule in the child's 1st year and continuing to 3rd year (without/with mediators) on: - Bayley MDI (15 months): ES = –0.20*/ ES = –0.13 - Bayley MDI (24 months): ES = –0.21**/ ES = –0.12 - Bracken school readiness (36 months): ES = –0.02/ ES = 0.03 - Reynell verbal (36 months): ES = –0.30***/ ES = –0.21* - Reynell expressive (36 months): ES = –0.20*/ ES = –0.15 (See paper for results for other schedule onset and duration)	3

Heymann, 2000 (pp 55-56)	US: NLSY-CS 1990–1996 (*N* = 4,689 working parents)^ Cross-sectional	School aged	Parents: Evening (6–9pm) Night shift	Mathematical ability (PIAT); Vocabulary Reading; Repeating a year at school; School suspension	C = Child gender, parental education, marital status, work hours, family income AT = OLS	Effect of parent's NS work schedules on: - Low maths achievement - bottom quartile on PIAT (# of hours worked by parent in evening): *OR* = 1.17, p < 0.05 - School suspension (night shift): *OR* = 2.72, p < .01 Other OLS results N/A	1
Body Mass Index (BMI)							
Champion et al., 2012	Australia: Generation 1 Study (*N* = 434 children of mothers living in Adelaide 2008-2010) ^ Cross-sectional	9 years	Mother and father (partner living in the home): Standard (9am – 6pm); NS ('always' or 'often' working shifts, after 6pm or overnight or weekend); Not employed. Joint parental work schedules	Overweight or obese based on age and gender standardised BMI (International Obesity Taskforce)	C = MIN, time child spends in front of a TV, computer or game system AT = LOGR	Effect of mother's NS work schedule on: - Overweight/obese: *OR* = 1.26, p > .05 Effect of father's NS work schedule on: - Overweight/obese: *OR* = 1.97, p < .05 Effect of both parents working a NS work schedule on: - Overweight/obese: *OR* = 2.26, p > .05 (compared with standard work schedule)	2
Morrissey et al., 2011	US: NICHD SECC (*N* = 990 children in 3rd, 5th and 6th grades - complete data	8–12 years	Mother: NS (7pm–8am) vs. standard at each grade/ number of data points with NS schedules from 3	Age and gender standardised BMI	C = MIN, birthweight, child grade, income Me = TV time, physical activity, HOME environment, parental supervision &engagement,	Effect (without mediators) of mothers' NS schedule on BMI (in child FEM – authors preferred model): ES = 0.20 Effect (without mediators) of # of periods mother worked NS schedule on BMI (in child FEM): ES = 0.02	4

	for at least 2 grades). Born in 1991^ Longitudinal		months to 2nd grade – max 19)		mother depression Mo = gender, grade, maternal education AT = REM / Child FEM	No significant moderated effects	
Miller & Han, 2008	US: NLSY-CS Five cohorts of children born 1982–1991 (*N* = 2,353 children of mothers who ever worked)^ Longitudinal	13–14 years	# of years mother worked NS (evening 2pm-midnight/night 9pm-8am/split/ other) vs. standard (6am-6pm)	Continuous BMI Risk of overweight (cutoff > 85th percentile of BMI) *Child reported*	C = MIN, birthweight, mother's cognitive ability, income at baseline, years in poverty, frequency of TV, shared dinners; mother's BMI Mo = Family income, whether child had ever lived with a single mother. AT = OLS/LOGR	Effect of # of years mother worked NS shift on: BMI continuous if - full sample: ES = 0.10* - ever / never a single parent: ES = 0.11/ ES = 0.08 - income quartiles 1 to 4: ES = 0.22; 0.27*; 0.04; 0.07 BMI >85th percentile if - full sample: *OR* = 1.34(1.07−1.68)* - ever / never a single parent: *OR* = 1.25(0.91−1.71)/ *OR* = 1.43(1.03−1.99)* - income quartiles 1 to 4: *OR* = 1.66 (0.97−2.85); 1.97(1.20−3.26)**; 1.05(0.68−1.60); 1.18(0.77−1.83)	3
Sleep Patterns							
Radosevic-Vidacek & Koscec, 2004	Croatia: (*N* = 2,363 students in DE families 2001-02)^ Cross-sectional	11-18 years	Couple: Both day, one nonstandard, both nonstandard *Child reported*	Sleep patterns: *Child reported* Usual bedtime Usual waketime *Calculated* Sleep duration Bedtime delay and sleep extension	C = child gender, type of school (elementary/high) AT = MANOVA MO = child gender	Effect of having one shiftworking parent on: - usual waketime of high school students when attending school in the morning (earlier): *F* (2,1,360)= 4.97** Effect of having both shiftworking parents on: - sleep duration of high school students attending school in the morning (shorter): *F* (2,1,360)= 5.24** - bedtime on the weekend (later): *F* (2,1,360) = 7.85** - See paper for more results on bedtime delay and sleep	1

		extension on weekends.

+p< 0.10 *$p < .05$, **$p < .01$, ***$p < .001$

Note. *b* = unstandardized coefficient; *ß* = standardized coefficient; BMDI = AFDC = Aid to Families with Dependent Children; Bayley Mental Development Index; BMI = Body Mass Index; BPI = Behavioral Problems Index; BSR = Bracken School Readiness; CBCL = Child Behavior Checklist; CDI = Children's Depression Inventory; DE = dual earner; ECLSBC = Early Childhood Longitudinal Survey Birth Cohort; *ES* = Effect Size calculated by authors as b/SD_y; FEM = Fixed Effects Model; FT = full-time; GCM = Growth Curve Modelling; HILDA = Household, Income and Labour Dynamics in Australia; HOME = Home Observation Measurement of the Environment; ITSC = Infant Toddler Symptom Checklist; LI = low income; LOGR = Logistic Regression; MANOVA = Multivariate Analysis of Variance; M = mean; MKA = Most Knowledgeable Adult; MLM = Multilevel Modelling; N/A = not available; NDW = Number of different words; NICHD-SECC = National Institute of Child Health and Human Development Study of Early Child Care; NLSCY = National Longitudinal Study of Children and Youth; NLSY–CS = National Longitudinal Study of Youth – Child Supplement; NSAF = National Survey of American Families; *OR* = Odds Ratio; OLS = Ordinary Least Squares regression; PCG = Primary Caregiver; PIAT = Peabody Individual Achievement Test; PLS = Preschool Language Scale; PSM = Propensity Score Matching; *SD* = standard deviation; REM = Random Effects Model; SEM = Structural Equation Modelling; SES = socioeconomic status; SF36 = Short Form 36; SPPC = Self-perception profile for children; UK = United Kingdom; US = United States; WES = Women's Employment Study; W1 = one wave; W2+ = two or more waves; ^Study is representative of a population or subpopulation.

[a]MIN = minimum set of sociodemographic confounders and covariates included in the analysis i.e., child gender, child age (or developmental stage), number of children in household (or presence of siblings/birth order), family structure (couple/lone, presence of a non-biological parent, marital status), parental age (at least of mother), parental work hours (at least of mother, and at least FT/PT status), parental education, race/ethnicity (of parent or child).

[b]Where possible all results for the study have been provided regardless of statistical significance. When there are too many results to report in the table, only those significant at $p < .05$ have been presented (e.g., for SEM models).

[c]Study quality rating is from 0-5 indicating the number of criterion met by the study as determined by the authors: (1) sample is representative of population or subpopulation, (2) study design is longitudinal, (3) a minimum set of sociodemographic confounders have been considered, (4) analytical methods have been used to address selection bias, and, (5) the study has considered at least one moderator and one mediator.