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Parental Work Schedules and Adolescent Risky Behaviors

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Abstract

Using a large contemporary data set, the National Longitudinal Survey of Youth-Child Supplement (NLSY-CS), this paper examines the effects of parental work schedules on adolescent risky behaviors at age 13 or 14 and the mechanisms that might explain them. Structural equation modeling suggests mothers who worked more often at night spent significantly less time with children and had lower quality home environments, and these mediators were significantly linked to adolescent risky behaviors. Similar effects were not found for evening work schedules, while other types of maternal and paternal nonstandard work schedules were linked to higher parental knowledge of children's whereabouts, which led to lower levels of adolescent risky behaviors. Subgroup analyses revealed that males, those in families with low incomes, and those whose mothers never worked at professional jobs may particularly be affected by mothers working at nights, due to spending less time together, having a lower degree of maternal closeness, and experiencing lower quality home environments. In addition, the effects of maternal night shifts were particularly pronounced if children were in the preschool or middle-childhood years when their mothers worked those schedules. Implications and avenues for future research are discussed.

Keywords

delinquency; nonstandard work schedules; risky behavior; sexual behavior; shift work; substance use

Adolescence involves a number of developmental transitions. Some youth find these difficult and are thus more likely to engage in risky behavior. A great deal of research has investigated the factors contributing to such adverse outcomes (see reviews in Boyer, 2006; Eccles & Gootman, 2002; Steinberg & Morris, 2001). In this paper, we examine how one such potential contributing factor, parents' working nonstandard schedules, affects cigarette smoking, alcohol use, drug use, delinquency, and sexual activity in early adolescence, and whether parent-adolescent relationships, parental knowledge of children's whereabouts, or the quality of the home environment play a mediating role. As noted in more detail below, we define "nonstandard work schedules" as work shifts that occurs outside of typical daytime hours (6 am and 6 pm), and often interchangeably use the terms "shift work" and "nonstandard hours" to describe such shifts throughout the paper. To frame our investigation, we begin by discussing pertinent theoretical perspectives and empirical research, and then turn to our hypotheses and a discussion of our outcomes of interest.

While we focus on parents' shift work, we acknowledge that adolescent risky behaviors are also heavily influenced by family contexts (e.g., parental educational attainment and family socioeconomic status). Moreover, parents who work nonstandard hours are not a random sample. Past research has shown that individuals who are Black, less educated, low skilled,

or in non-professional occupations are more likely than others to work nonstandard hours (Presser, 2003). It is thus possible that any links between parental work schedules and adolescent risky behaviors may be due at least in part to these family or occupational contexts rather than parental work schedules, and we therefore use several methods to address the potential for such selection bias in our analyses.

THE ROLE OF PARENTS IN ADOLESCENT RISKY BEHAVIORS

Parent-Child Interactions and Adolescent Outcomes

Several theoretical perspectives emphasize how important parent-child relationships are to adolescent development (see e.g. the ecological perspective, Bronfenbrenner & Crouter, 1982; Bronfenbrenner & Morris, 1998; and the social development literature, Boyer, 2006). The closeness a child feels toward his/her parents signals a good quality parent-child relationship and may also result in greater parental knowledge of children's whereabouts due to children's willingness to volunteer information about their daily lives to parents (Stattin & Kerr, in press). In addition, a supportive and warm home environment (e.g., parental expectations about chores, frequency of family activities) may provide a secure space for adolescents to grow.

Many studies have shown that strong connections between the parent and child and high levels of parent involvement are instrumental as protective factors against a variety of risks (e.g. Boyer, 2006; Crouter & Head, 2002; Guilamo-Ramos, Jaccard, & Dittus, in press). For example, children aged 12–14 who ate dinner with a parent 5 or more days per week were found to be less likely to smoke, use alcohol or marijuana, or have had sex (Council of Economic Advisors, 2000). Conversely, early initiation of sexual behavior has been related to time spent alone without a parent in the home (Buhi & Goodson, 2007) and to limited parent-adolescent communication (Guilamo-Ramos et al., 2007; McBride, Paikoff, & Holmbeck, 2003). Parent-child communication has also been found to protect adolescents from becoming habitual smokers (Distefan, Gilpin, Choi, & Pierce, 1998). Parental knowledge of child's whereabouts has been associated with decreased problem behaviors and delinquency (e.g., Rai et al., 2003; Soenens, Vansteenkiste, Luyckx, & Goossens, 2006) and has also been found to moderate the genetic and environmental correlates of adolescent smoking (Dick et al., 2007). Finally, parental support has been associated with decreased alcohol consumption (Urberg, Goldstein, & Toro, 2005).

Nonstandard Parental Work Schedules and Adolescent Well-Being

These findings highlight the importance of parent-child relationships (e.g., parent-child closeness), parental knowledge of children's whereabouts, and the home environment to adolescent outcomes. By extension, theory and prior research also suggest that factors that affect these family dynamics may be important to adolescent outcomes. Parental shift work represents one such factor, as it may have significant implications for the time, energy, and resources that parents can draw upon to raise their children (Heymann, 2000a).

The main theoretical direction for our study derives from the literature on work-family spillover effects (Repetti, 2005), and more generally the literature on work-family balance (e.g. Menaghan, 2005; Perry-Jenkins, Repetti, & Crouter, 2000). Scholarship in this area has suggested that parents' experiences at the workplace may spill over to the home by influencing their personal well-being, which in turn impacts relationships with their children (Bumpus et al., 1999, 2006; Crouter, Bumpus, Maguire, & McHale, 1999; Repetti & Wood 1997). In particular, the stressful job conditions associated with working a nonstandard schedule may in turn lead to less positive family dynamics, including reduced time spent with children (Greenberger, O'Neil, & Nagel, 1994), lower parental knowledge of children's whereabouts (Bumpus et al., 1999, 2006), and lower quality home environments (Menaghan

& Parcel, 1995). Moreover, even if they are able to find the time to spend with their children, parents working evening or night hours may not have the energy to foster a positive parent-child relationship (Presser, 2003).

Empirical research has demonstrated the effect of work stress spillover on the family and home environment and its further impact on adolescent psychosocial functioning. Galambos and colleagues (1995) found feelings of parental work overload to be associated with parental stress and in turn poorer parent-child relationships and adolescent problem behavior, but also found that this spillover may operate differently for mothers and fathers. Crouter and colleagues (1999) found that the association between both parents' work pressure and adolescent well-being was mediated by parental role overload and parent-adolescent conflict. However, mothers' feelings of overload were linked to both their spouses' work pressure and their own, whereas fathers' feelings of overload were only associated with their own work pressure.

While literature on stress spillover speaks to the effects of *contemporary* parental work schedules, there is also reason to believe that past work schedules may also influence adolescent outcomes. The literature on poverty and child development (Brooks-Gunn, Duncan, & Aber, 1997), for instance, shows that both the timing and the length of poverty matter. Similarly, the literature on adolescent development and stress (Brooks-Gunn, 1991; Simmons, Burgeson, Carlton-Ford, & Blyth, 1987) suggests that an increased number of stressful events experienced over certain periods of one's life may increase the risk of developing problems in adolescence (Turner & Lloyd, 2004). This line of scholarship suggests that the timing and cumulative nature of experiences are important to take into account.

On the whole, the research above suggests that working nonstandard hours may cause parents to feel stressed and too emotionally and physically drained to have consistently warm and supportive interactions with their adolescents, which might in turn compromise parent-child communication and parental knowledge of children's whereabouts (Crouter, Bumpus, Head, & McHale, 2001; Stattin & Kerr, in press) and the quality of the home environment (Menaghan & Parcel, 1995), leading to increased adolescent risk-taking behaviors.

Most previous research on parental shift work and child outcomes has focused on younger children and has found parental work schedules to be important to child cognitive and behavioral development. For instance, Han (2008) found that maternal shift work contributed to more behavioral problems for children aged 4 to 10, particularly for mothers who were single, receiving welfare, earning a low income, or working in a cashier or services occupation. Stradzins and colleagues (2006, 2004) found a strong association between parents' shift work and property offenses for children age 4 to 11, which seemed to be partially accounted for by heightened parental depression and ineffective parenting behaviors. Heymann (2000a & b) found that children whose parents worked nights were more likely to be suspended from school. In addition, one recent study on pre-school age children in families on welfare found higher problem behaviors and lower positive behaviors for 2- to 4-year-old children of mothers working non-day shifts versus those with day shifts (Joshi & Bogen, 2007). However, two studies examining children age 5 to 15 in families with low incomes or on welfare found no significant effects (Dunifon, Kalil, & Bajrachaya, 2005; Ross Phillips, 2002).

Only two studies to date have concentrated solely on adolescent outcomes. Both found a mixed relationship between parental work schedules and adolescent-parent relationships. In a study of the effects of current parental work schedules on early adolescents using the

NLSY-CS data, Han and Waldfogel (2007) found that, in two-parent families, parental shift work was associated with improved parental knowledge but poorer adolescent-parent closeness, and hence effects on adolescent outcomes were neutral. However, children of single mothers working rotating shifts were more likely to be engaged in delinquent behavior than their peers. Mixed evidence also comes from a recent but smaller study that compared adolescents whose parents worked non-day versus day shifts (Davis, Crouter, & McHale, 2006). Although adolescents reported closer relationships with mothers who worked non-day shifts, fathers who worked non-day shifts were less knowledgeable about their children's daily activities.

Two reasons may account for the varied findings of previous studies. First, the effects of shift work will likely vary by the specific work schedule. Distinguishing between different types of shifts is important because each is likely to affect family processes and adolescent outcomes in different ways. Also, the effects of one parent's work schedule will depend on whether another parent is home, awake, and energized to take care of the child. Thus, the effects of shift work are likely to vary depending on both the type of shift and the patterns of both parents' work schedules (for two-parent families). Second, the mixed findings of prior research may reflect differential effects of parental shift work at different developmental stages. As discussed above, studies have tended to find more adverse effects when parents worked nonstandard hours in the preschool or school-age years, but more mixed effects when the work occurred in adolescence.

Risky Behaviors

A strength of the NLSY-CS is that it directly surveyed adolescents regarding behaviors that might be risky for their health and well-being. This study focuses on five: cigarette smoking; alcohol use; drug use; delinquency; and sexual behavior. We selected these outcomes for three main reasons. First, and most importantly, each behavior poses a relatively substantial threat not only to immediate adolescent well-being, but also can mark the initiation of long-term risky behavior. For instance, adult smokers typically begin smoking in adolescence (The National Center on Addiction and Substance Abuse at Columbia University [CASA], 2006).

Second, although a minority of young people engages in any of these behaviors, the prevalence for each is high enough to warrant concern. Among eighth-grade students in 2007, 22.1% had smoked a cigarette, 38.9% had ever consumed alcohol, 17.9% had ever been drunk, and 27.7% had ever used any illicit drugs (Johnston, O'Malley, Bachman, & Schulenberg, 2008). In 2002 (most recent data available), offending rates among 13 and 14 year olds were 39.2 and 63.2 per 1,000 youth respectively (Stahl, et al., 2005). Over one-third of 9th graders in 2005 had had sex, nearly 9% before the age of 13 (CDC, 2006).

Third, each of our outcomes has been identified in previous research as related to parent-child relationships, parental knowledge of children's whereabouts, or the home environment and thus could possibly be affected by parental shift work. For instance, smoking among adolescents has been linked to low levels of parental support or involvement (Tyas & Pederson, 1998; Simons-Morton, Haynie, Crump, Eitel, & Ssaylor, 2001). Adolescents who perceived less monitoring by their parents were more likely to have a history of alcohol use and to have had greater alcohol consumption in the past 30 days (DiClemente, et al., 2001). Among many potential factors, a seminal review (Hawkins, et al., 1992) identified poor parenting practices, poor parent-child relationships, and lack of closeness to parents as risk factors for adolescent substance use. Prior studies have also found links between parental knowledge of children's whereabouts and decreased alcohol and drug use (Steinberg, Fletcher, & Darling, 1994) and delinquency (de Kemp, Scholte, Overbeek, Rutger, & Engels, 2007). Finally, a recent review (Buhi & Goodson, 2007) found time alone at home

and adolescents' perceptions of parental attitudes to be consistently predictive of adolescent sexual behavior.

CONTRIBUTION OF THIS STUDY

No study has yet examined the pathways by which parental work schedules are linked to adolescent risky behaviors. This study fills this gap by exploring the mechanisms by which parental work schedules might affect adolescent risky behaviors, paying particular attention to adolescent-parent relationships, parental knowledge of children's whereabouts, and the home environment. The theoretical perspectives and empirical results discussed above suggest that parental shift work may affect adolescent risky behaviors, but that the effects will likely depend on a number of different factors. To this end, we allow for three possible types of effects. Parental nonstandard work may have (1) negative effects on adolescent outcomes if it reduces parental knowledge of children's whereabouts, or the quality of adolescent-parent relationships or the home environment; (2) positive effects if it allows for greater parental knowledge of children's whereabouts, or improved relationships or home environments; or (3) neutral effects if it creates both negative and positive effects on the mediating factors.

Our analyses take advantage of a large sample from the National Longitudinal Survey of Youth–Child Supplement (NLSY-CS). Special attention is paid to the child's developmental stage at the time the shift work occurred, based on findings of prior research. Special attention is also paid to boys, children in low-income families, and children of parents in non-professional occupations because these subgroups tend to be at higher risk for the outcomes considered (Brooks-Gunn, et al., 1997) and may also be particularly vulnerable to the relationships under study. For instance, studies of parental employment have tended to find that boys are more strongly affected than girls (Bogenschneider & Steinberg, 1994; Hoffman & Youngblade, 1999), while prior studies of shift work have found the strongest effects in low-income families (Han, 2008). Variation between families with one or two parents is also examined, given the likely role that a second parent plays in moderating the effect of the other parent's work schedule.

As with all non-experimental analyses, caution must be taken in providing a causal interpretation to the findings. Compared to most previous research, however, particularly comprehensive controls for non-random selection into different work schedules are included and some effort is made to investigate omitted variable bias. In addition, two post hoc supplementary analyses (discussed below) were adopted to address the causality issue.

DATA AND METHODS

Data

This study uses data from the National Longitudinal Survey of Youth – Child Supplement (NLSY-CS). The NLSY followed a nationally representative sample of 12,686 young men and women who were 14 to 21 years old when the survey was initiated in 1979, collecting data annually until 1994 and every other year thereafter. Beginning in 1986, a separate biennial Child Supplement (the NLSY-CS) was administered to collect data on the children of the women in the NLSY. In 1988, the Child Supplement was expanded to survey children ages 10–14 on a variety of measures regarding their behavior and feelings, which we use to examine a series of adolescent outcomes including cigarette smoking, alcohol use, drug use, delinquency, and sexual activity. In addition, children aged 10–14 also report how close they are to their mother and father, how often each parent misses important events, and how well they share ideas with their parents. The NLSY-CS remains the only national survey that includes longitudinal information on both parental work schedules and adolescent outcomes.

The sample for the present study consists of all the children in the NLSY-CS who have been followed for a 13 to 14 year period and have valid data on any of the outcome variables at ages 13 or 14. We imputed missing data for predictor variables using maximum likelihood estimation methods (Little & Rubin, 1987), employing the expectation-maximization (EM) algorithm included in the *MPlus* software package. We implemented this by including all of the children and then kept the imputed data only for predictor variables and children were dropped from the analyses if they were missing information on outcome variables (analyses not including imputed values for outcome measures typically lead to better statistical estimates, see von Hippel, 2007). The children who were dropped were more likely to be from a racial/ethnic minority group, as well as having mothers who were younger at the child's birth and had lower educational attainment. If these family contexts are associated with larger effects of parental shift work on adolescent outcomes, the associations between parental work schedules and adolescent risky behaviors could be under-estimated in this analysis.

In general, demographic variables had missing data in 5% or fewer cases. Variables identified as endogenous mediators (see below) had missing data in about 20% of the cases. Because of the way the NLSY-CS is structured (e.g., no adolescent self-report questions until 1988 and biennially afterwards) and in order to utilize the longitudinal information on children since birth, the sample consists of five cohorts of children: those born in 1982/83, 1984/85, 1986/87, 1988/89, and 1990/91, who were followed from birth to age 13 or 14 in 1996, 1998, 2000, 2002, and 2004, respectively. Approximately 4,200 children are available for analysis. Of these, 54% are non-Hispanic White, 26% are non-Hispanic Black, and 19% are Hispanic. About half are males.

Outcome Measures at Age 13 or 14

Substance use—The NLSY-CS asked children whether they had ever smoked a cigarette, drunk alcohol, or used marijuana or other drugs (e.g., LSD, cocaine, uppers, or downers). For each of these outcomes, we created a dichotomous measure coded as 1 if the child answered yes to the question and 0 otherwise. In this sample, about 26%, 27%, and 12% of the children had ever smoked a cigarette, drunk alcohol, and used marijuana or other drugs by age 13 or 14, respectively (sample means for these and all variables shown in Appendix Table 1).

Delinquent behavior—This variable measures the number of delinquent behaviors the adolescent had engaged in during the year preceding the survey (Elliot, Huizinga, & Ageton, 1985). Delinquent behaviors included: staying out later than their parents allowed, lying to their parents about something important, staying out one night without permission, hurting someone badly enough to need a doctor, taking something without paying for it, damaging school property on purpose, ever getting drunk, doing something wrong at school that required their parents to come, or skipping a day of school. Overall, 57% of children reported having committed any delinquent behavior at age 13 or 14. The average number committed was 1.04 ($SD = 1.42$). Among adolescents who had committed any, the average number was 2.01 ($SD = 1.39$).

Sexual behavior—The NLSY-CS asked children aged 13 or older whether they had ever had sex and the age of their first sexual intercourse. A dummy variable was created, coded 1 if the child answered yes to “ever had sexual intercourse” and 0 otherwise. About 14% of children reported that they had ever had sexual intercourse by the age of 13 or 14.

Endogenous Mediators

From 1988 onwards, the NLSY-CS collected self-administered information from children aged 10 and older on various dimensions of their daily life, along with information gathered from their mothers (but not from fathers). Below we describe how we use this information to operationalize variables identified in the literature as potential mediators of the effects of parental shift work on adolescent outcomes, including adolescent-parent relationships (proxied by time spent together, maternal closeness, and paternal closeness), parental knowledge of children's whereabouts (proxied by whether the mother and father know who the child was with when not at home), and the home environment (measured by the Home Observation and the Measurement of the Environment - Short Form HOME-SF and frequency of eating meals together). Because the outcome measures were collected at age 13 or 14, to specify a proper pathway and to address at least partially the potential for reverse causality, all of the exogenous predictors including parental work schedules were taken from the first 11 or 12 years of a child's life and all of the endogenous mediators were taken at ages 11 or 12. However, we acknowledge that, because several of the outcome variables are defined as ever having engaged in a particular behavior by age 13 or 14, a small percentage of sample may have engaged in the behavior by age 11 or 12 (at a time that might be contemporaneous with the mediators). Specifically, about 9%, 9%, 2%, and 2% of the sample had ever been involved in smoking, drinking, using drugs, or having sex, respectively, by age 11 or 12.

Time spent together—This construct was measured using eight questions that asked the adolescents to report whether they went to church, movies, dinners, shopping, or outings with their parents in the month preceding the survey, or had done things, worked on schoolwork together, or played a game or sport together with their parents in the week preceding the survey. A variable was created to record the number of different activities the child had done with their parents (values range from 0 to 8) (Cronbach Alpha of 0.60). Adolescents reported that they had done an average of about 4 things together with their parents during the preceding period.

Maternal closeness—Three variables were used to proxy the child's closeness with the mother as a single latent factor (Cronbach Alpha of 0.70). First was the child's report of how close he/she felt toward the mother, coded as: not very close (1), fairly close (2), quite close (3), and extremely close (4). About 64% of the adolescents reported they felt extremely close to their mothers. Second was the child's report of how well he/she shared ideas and talked about important things with the mother, coded as: not very well (1), fairly well (2), quite well (3), and extremely well (4). About 40% of the adolescents reported they shared ideas and talked about important things extremely well with the mother. Finally, the child was asked how often his/her mother missed important events with possible responses of: a lot (1), sometimes (2), and almost never (3). About 13% of the adolescents reported that the mother missed important events a lot.

Paternal closeness—Children reported data for three variables that were used to create a latent factor of paternal closeness (Cronbach Alpha of 0.70). Similar to maternal closeness, this included measures of children's reports of how close they felt toward their fathers, how well they shared ideas and talked about important things with their fathers, and how often their fathers missed important events. About 42% of the adolescents reported that they felt extremely close to their fathers, 26% that they shared ideas and talked about important things extremely well, and 28% that their fathers missed important events a lot.

Parental knowledge of children's whereabouts—The NLSY-CS asks adolescents how often the mother knows who the child is with when not at home; responses included all

the time (4), most of the time (3), some of the time (2), and rarely (1). About 60% of children in two-parent families reported that their mother knew most or all of the time who they were with when not at home; the figure was 38% for mothers in single-parent families. A parallel question is asked about the father's knowledge of children's whereabouts when not at home. About 48% of children in two-parent families reported that their father knew who they were with most or all of the time. We combined these two sources of information to create a standardized variable summarizing both parents' knowledge of their children's whereabouts.

Home environment—Two variables were used to create this measure (Cronbach Alpha of 0.64). The first was the standardized score on the short form of the Home Observation and the Measurement of the Environment scale (HOME-SF), a frequently used measure of the home environment which has been found to have excellent reliability and validity (Menaghan & Parcel, 1991). This variable includes information such as the number of books the child has, the availability of newspapers to the family, how often children were taken to museums or theater, if mom conversed with the child without scolding, if mom's voice conveyed positive feeling about child, whether the interior of the home was clean and well-lit, and whether the exterior of the home was safe. The second variable, only asked of two-parent families, was the frequency of eating meals together with both parents during a week as reported by mothers, which ranged from never (coded 0) to more than once a day (coded 5). About 50% of mothers reported that their children ate dinner with both parents five or more times a week.

Exogenous Predictors

Parental work status/schedules—The main independent variable of interest is parental work schedules, for which the NLSY collects very detailed data. Following the definitions used by the NLSY, a mother's work schedule was coded as "standard" if work begins at 6 a.m. or later and ends by 6 p.m. The schedule was coded as "evenings" if the job begins at 2 p.m. or later and ends by midnight and "nights" if the job begins at 9 p.m. or later and ends by 8 a.m.. We coded the schedule as "other type of nonstandard schedule" if the respondent had another type of schedule outside of standard hours; this category included schedules characteristic of both manual and professional schedules, such as those that were changed periodically by the employer or rotated as well as those that changed at employees' discretion. Women who were not working at any type of job at the time of the interview were identified as "out of the labor market."

Given the complex and potentially cumulative relationships between parental work schedules, parent-adolescent relationships, parental knowledge of children's whereabouts, the home environment, and adolescent outcomes, a simple measure of parental work schedules may not be sufficient to disentangle them. A measure of contemporary work schedules would fail to distinguish those children whose parents had worked nonstandard hours in the past. At the same time, a variable that indicates simply whether a parent had worked nonstandard shifts by the time the child was 11 or 12 may not capture the experience of children whose parent(s) worked nonstandard shifts for a long time, or the differential effects of different types of shift work.

Therefore, we created two types of work schedule variables to more fully capture the extent of children's experience with parents working nonstandard hours. The first represented the number of years a mother had worked nonstandard schedules since the child's birth until age 11 or 12. At each interview year, women were coded as having a nonstandard schedule if they were working at hours other than "regular day shifts" (coded as 1 and 0 otherwise). Thus, this variable is the sum of the years a woman had been working a nonstandard

schedule with a minimum of 0 and a maximum of 12 years by the assessment point when the child was 11 or 12 years old. To better assess the varied effects of different types of shift work, we created a second set of variables to represent the number of years a mother had worked at (1) evenings, (2) nights, or (3) other nonstandard schedules by the time her child was 11 or 12 years old. For two-parent families, data on fathers' work schedules were also available every year since 1981 and every other year after 1994, and two sets of variables for them were created in a similar fashion.

To assess potential variations in the effects of shift work by child's developmental stage, we also created a set of parental work schedule variables reflecting the timing of parental shift work by the child's developmental stage. These variables measure the number of years of specific types of nonstandard work before age 5 (preschool years), between ages 5 and 10 (middle childhood), and between ages 11 and 12 (early adolescence). Nonstandard work is very prevalent in this sample. More than two-thirds of working mothers had ever worked nonstandard hours by the time their children were 4 years old, and more than 80% had done so by the time their children were age 11 or 12, with an average duration of about 4 years by that time. Over 80% of spouses in the labor market had ever worked nonstandard shifts. The mean number of years spouses worked nonstandard hours by the time the child was age 11 or 12 was also 4 years.

Other parental and family characteristics—To reduce potential omitted variable or selection bias, an extensive set of child, parental, and family characteristics that have been shown in prior research to be associated with family process and adolescent development were controlled for in the models. Unless otherwise noted, each of the following characteristics were measured at the time of the interview or child assessment at age 11 or 12: whether the child is a boy, child's race/ethnicity, whether the child has any siblings, whether the child had a low birth weight, mother's age, educational level, and marital status at the child's birth, family's income the year before the birth, frequency of mother smoking during pregnancy (ranging from 0 for never to 3 for 2 or more packs a day), frequency of mother drinking alcohol during pregnancy (ranging from 0 for never to 7 for every day), number of years the child has lived in a single-mother family, and number of years the child's family has received welfare.

We also include controls for parental occupation and work hours. Controlling for occupation is important because employees who work nonstandard hours are more likely to be in sales or cashier and service jobs than those in standard schedules. Also, using these variables will control for the fact that women in professional or managerial jobs tend to report working nonstandard shifts voluntarily, while those in other types of jobs tend to report working nonstandard shifts involuntarily (Han, 2008; Garey, 1999). Mother's occupation at her current or most recent job was collected at each interview year. Following Presser (2003), we created variables to control for the number of years respondents worked at three types of occupations: cashier and service jobs, sales position, and professional or managerial jobs. To understand whether the links between parental work schedules and adolescent risky behaviors may be moderated by parental occupation, we conducted some analyses separating the sample by whether mothers had worked at a professional job compared to those who had not.

Controlling for work hours is important because empirical studies have found that work hours vary by parental work schedule. In particular, mothers working part time are more likely to work at nonstandard hours than mothers working full time (Presser, 2003), and partners appear to arrange their work hours around each other's shifts (Han, 2008; Han & Waldfogel, 2007). Therefore, variables were created to control for the average weekly hours that mothers (and fathers) had worked by the time their children were 11 or 12. The

cumulative average number of hours mothers worked per week was 28. The corresponding figure for fathers was 43.

Of course, even with these extensive controls, the possibility remains that parents or families differ in other ways that cannot be controlled for in the data and that might bias the results. Hence we use two additional methods to test the robustness of our results as detailed in the Methods section below.

Appendix Table 1 presents the means and standard deviations of all of the analyzed variables in addition to the correlations between each analyzed variable. As indicated in the table, the raw data suggest that mothers working more years at night hours tend to have lower family income, are less likely to be married, are younger and less-educated, and spend more years as single mothers. Similar correlations with marital status, age, and education were observed for fathers. In contrast, mothers and fathers working more years at other nonstandard schedules tend to be more advantaged than their counterparts, perhaps reflecting the fact that at least some of them in this category were professional who had hours that varied by their choice.

The data from Appendix Table 1 also indicate that different types of nonstandard shifts are differentially correlated with the mediators. For example, the number of years mothers worked evening hours was positively correlated with mothers knowing where the child was, but negatively correlated with the frequency of having meals together. At the same time, the number of years mothers worked night hours was negatively correlated with scores on the HOME-SF and the frequency of having meals together, and positively correlated with both the mother and father missing important events. Of course, a large sample size may result in statistical significance for correlations of small magnitude, and we are cautious not to overemphasize these relations.

Methods

The primary analytic method used here is structural equation modeling (SEM). We conducted SEM using *MPlus* software in three steps. We first tested confirmatory factor analyses (CFA) to evaluate the measurement model underlying our hypothesized latent variable structure. Second, we evaluated the fit of our hypothesized model (shown in Figure 1). Third, we conducted several supplementary analyses to examine the association between parental work schedules and adolescent outcomes for subgroups defined by child's gender, family income (divided into 4 income-to-needs ratio groups), or maternal occupation (ever vs. never worked as professional). We also conducted supplementary analyses to examine whether the associations varied by the child's developmental stage during which the shift work occurred (preschool years, middle childhood, and early adolescence) or whether they differed between two-parent and single-parent families. By default, *MPlus* uses linear regression models for continuous outcome variables (i.e., delinquency) and logistic regression models for binary categorical outcomes (i.e., smoking, drinking, using drugs, and having sex).

We experimented with using sampling weights to adjust our estimates and found that the results are similar to those reported here. As detailed in Winship & Radbill(1994), sampling weights are not necessary when the variables used to select samples were also controlled for in a regression model. Gelman (2007) provides another important perspective on the use of sampling weights in regression analysis, and indicates that in general sampling weights are not always necessary with non-randomly selected samples. In our case, the children of mothers in the NLSY79 were not randomly selected, rather they were born to a randomly selected nationally representative sample of women who were 14 to 21 years of age by December 1979. Thus, our sample of children essentially was selected based on which

women were more likely to give birth at each point in time. According to the various years of Current Population Report, "Fertility of American Women," characteristics such as education, age, race/ethnicity, marital status, and labor force participation are the important factors in the fertility behavior of American women. Our analysis has included these factors.

It is important to note that the large sample size afforded by the NLSY-CS renders some traditional fit indices of SEM undiagnostic, and this is particularly true for the chi-square. It is thus important in identifying a well-fitted model to consult several fit indices that are less reliant on sample size (Fan, Thompson, & Wang, 1999). In our analyses, we evaluate model fit using the Comparative Fit Index (CFI) and the root mean square error of approximation (RMSEA), for which Hu and Bentler (1999) recommend cutoff values of .95 and .06 respectively.

An important challenge in this study, in common with other studies using observational data, is causal inference (see discussion in Rutter, 2007). Our SEM results are extremely useful in establishing how parental nonstandard work schedules are linked to adolescent outcomes, and the role played by possible mediators, but such estimates could potentially be biased if there are important factors not observed in our data that influence parents' choice of nonstandard work schedules and also affect adolescent outcomes.

How to address this potential omitted variable and selection bias is not straightforward in the absence of experimental data. We apply two methods to address bias and to test the robustness of our SEM results. First, we re-estimate our models by sequentially adding blocks of covariates while paying attention to changes in parameter estimates for our main shift work variables. If the estimates change substantially as we add more controls, this would be an indication that there is a good deal of heterogeneity between the treatment and control groups and might raise concerns about other heterogeneity remaining even after the addition of many controls, while small changes indicate that unobserved heterogeneity is of little concern (see, for example, Altonji, Elder, & Taber, 2005; Ruhm, 2008). Second, we estimate a set of propensity score matching models. These models address the problem of selection bias by comparing outcomes for children of parents who worked particular types of nonstandard schedules (the treatment groups) and the members of the control group who did not work such schedules but had a similar predicted propensity to do so; in this way, they are more likely to compare like to like, and reduce the possibility that estimates are affected by selection bias (see discussion in Hill, 2008). We implement these models using the method provided in Imai and van Dyk (2004) for estimates where the treatment variables are continuous. Specifically, the continuous levels (or dosage levels) of the shift work variables (the treatment of interest) are regressed on a set of child and family covariates as described above using ordinal logistic regression using R software. Following Imai and van Dyk, we divide the data into four equal-size sample subsets by sorting their propensity function; that is, the first subset includes the bottom 25 percentile of the samples with the lowest propensity scores, the second subset includes the next 25 percentile of the samples with the propensity scores placing them in the second quartile of the distribution, and so forth. We then fit a structural equation model for each of the four subsets to estimate the coefficients with a total of four sets of coefficients. Finally, we compute the overall average estimates by placing the weight of $\frac{1}{4}$ for the coefficients obtained in each of the four subsets and the overall variance by taking the total variances of each of the four subclasses multiplied by $\frac{1}{16}$. To the extent that the results from the propensity score models are similar to those from the unmatched models, this will give us more confidence that these estimates are not affected by selection bias.

A further caveat is that our use of observational data complicates our ability to identify mediated effects. Although it is common in social sciences research to attribute a causal

relationship to mediators in an SEM framework, there are specific criteria that must be met to do so with observational data. As Sobel (2008) notes, the ability to identify model parameters as mediated effects effectively hinges on the assumption that assignment to a mediator condition (e.g. having high maternal closeness) is ignorable, that is, independent of a potential outcome of interest (e.g. adolescent smoking). Most commonly, ignorability is achieved through the use of random assignment (as with a planned randomized study design or natural experiment) or via the use of instrumental variables methods.

In the absence of random assignment and lacking suitable instruments for assignment to the various mediators, our ability to identify our mediators as causal is premised on the assumption that we can achieve ignorability through the use of extensive covariate controls (Sobel, 2008). If, however, we have neglected to control for the full range of variables related to both our mediators and the outcome variables, this assumption is not tenable.

RESULTS

Confirmatory factor analyses

The first step in our structural equation modeling was to establish the viability of our hypothesized latent variables using CFA. Two latent variables – maternal closeness and paternal closeness -- were constructed. As shown in Table 1, these two latent variables achieved acceptable model fit indices (and were significantly intercorrelated). Our other three mediators – time spent together, parental knowledge of children’s whereabouts, and the home environment -- were constructed using STATA’s “alpha” and “generate” functions and then imported it into the SEM analysis. We constructed these in this manner, rather than with CRA, because two variables are typically preferred when constructing a latent variable in CFA models, and these three mediators do not meet this condition.

Testing our structural model

Given that the parental work schedule variables are the focus of this paper, we specifically tested both the direct and indirect (or mediational) pathways of these variables to adolescent risky behavior outcomes. In addition, after evaluating model fit for some of the outcomes, we added a few pathways from some demographic controls directly to the adolescent outcomes in addition to the indirect pathways through the endogenous mediators. Based on evidence provided by the literature, these direct pathways were: 1) being male on delinquent behavior; 2) being Black, being Hispanic, and mother’s age at birth on smoking; and 3) mother’s age at birth and number of years working in the service sector on drinking. These additions for direct pathways were able to bring the CFI and RMSEA model fit indices to the acceptable levels (better than .95 and .06, respectively).

For simplicity, we focus our discussion on the results from the structural models, with particular attention to the parental work schedule variables. Nonetheless, the latent factors established above and the exogenous demographic variables are included in the models below.

As noted, we specified models using the number of years mothers and fathers worked at any nonstandard shift over the first 11–12 years of a child’s life as well as the number of years mothers and fathers worked at specific types of nonstandard schedules (i.e., evenings, nights, or other nonstandard schedules). Because theory and previous studies suggest that different types of nonstandard work may have differential effects, we present results using the second set of measures.

The model proposed in Figure 1 achieved good fit indices (CFI = .957, RMSEA = .022, χ^2 ($df=60$) = 183.857). For brevity sake, we focus our discussion on parental work schedules

that were significantly associated with both mediators and adolescent risky behaviors. This means that we show in the Figures and discuss only those parental work schedules that had significant effects, but it is important to note that each model included the full set of mother and father work schedule variables (results in Appendix Table 2). Similarly, we discuss only those mediators that were significantly associated with both parental work schedules and adolescent risky behaviors, although all of the mediators were included in all models and were consistently significantly associated with adolescent risky behaviors (results in Appendix Table 3).

Figure 2 presents the SEM standardized coefficients linking the number of years mothers and fathers worked specific types of work schedules to each of the five mediators and then to the outcomes. Results for mothers working night shifts and other nonstandard schedules and for fathers working evening shifts and other nonstandard schedules are shown because these had significant links to at least one mediator or significant direct effects on at least one outcome. Lines shown in bold indicate a significant path which is moreover part of a significant mediated pathway. Lines not in bold either indicate a direct significant association or an indirect association that was found only part of but not the overall pathway to be significant in the model. In addition, we use the notation M and F to indicate where a path from a mediator to an outcome is relevant only in conjunction with the mother's or father's work schedule, respectively.

The results in Figure 2 indicate that the number of years mothers worked night hours was significantly linked with spending less time with their children and a less supportive home environment, and that both were significant mediated pathways (shown in bold) to more adolescent drinking. The mediated pathway through spending less time together was also linked to more adolescent smoking and drug use, whereas the mediated pathway through a less supportive home environment was linked to more adolescent delinquent and sexual behaviors. In contrast, the number of years that mothers and fathers worked at other nonstandard schedules was associated with improved parental knowledge of children's whereabouts, and this was a significant mediated pathway to reduced adolescent smoking, drinking, and delinquency. However, the number of years that fathers worked at other nonstandard schedules also had a significant direct path to increased adolescent drinking. Finally, fathers' years working evening hours had several significant links with mediators but no significant mediated pathways to the outcomes.

Results by Developmental Stage

As discussed earlier, there is a hint in prior research that parental shift work may lead to more adverse adolescent outcomes if it happened during children's preschool or middle-childhood years, rather than in adolescence. We therefore estimated a model where we allowed the effects of parental shift work to vary by the stage at which it occurred. For clarity, we present the results by developmental stage: Figure 3a for shift work occurring during the child's preschool years (before age 5); 3b for middle-childhood (between age 5 and 10); and 3c for early adolescent years (between age 11 and 12). But it is important to note that the full set of parental work schedule variables by developmental stage was included in the same model.

Results suggest that the effects of parental shift work on adolescent outcomes do vary by the stage at which that work occurred. With regards to the effects of parental work schedules during the preschool years (Figure 3a), we found a significant mediated path linking years of maternal night shift to reduced time spent together, which in turn predicted increased adolescent smoking. In addition, both the number of years mothers and fathers worked night shifts were linked to adolescent sexual behaviors via significant direct paths, but maternal night work reduced adolescent sex whereas paternal night work increased it. The figure also

shows significant links between these types of work schedules and home environment and paternal closeness, as well as between paternal evening shifts and time spent together.

Regarding the middle-childhood years (Figure 3b), we found that the number of years mothers worked night shifts was linked to increased adolescent smoking via a significant mediated path through reduced time spent together (as was the case for the preschool years). In addition, years mothers worked night shifts were linked to increases in both drinking and smoking through reductions in the quality of the home environment. The number of years fathers worked night shifts, however, was linked to reduced adolescent sex, via a direct path. A few other significant effects were found for these two types of shift work, as well as for fathers' evening shift. Finally, years of working at other nonstandard schedules by fathers were linked to reduced adolescent smoking, drinking, and delinquency, via a significant mediated path through increased parental knowledge of children's whereabouts.

Results in Figure 3c focusing on the early adolescent years reveal a set of effects that may than work occurring earlier in childhood. The number of years that mothers worked evening hours was linked to increased adolescent smoking, drinking, delinquency, and having sex, via a significant mediated path through reduced quality of the home environment. The number of years that fathers worked night shifts was linked to increased adolescent delinquency via a significant mediated path through lower paternal closeness. Paternal night shift was also linked to reduced adolescent drinking, via a direct path. Finally, the years that mothers worked in other nonstandard shifts were again linked to increased parental knowledge of children's whereabouts.

Subgroup Analyses

Because previous literature has indicated that adolescents who are boys, from lower-income families, or from families with parents in non-professional occupations might be at elevated risk for the outcomes considered here and to assess whether they might be more sensitive to parental work schedules, we conducted several subgroup analyses. In general, results (not shown) indicate that the effects we found for parental work schedules in Figure 2 were primarily confined to males, children in families with income-to-needs ratio ≤ 1 , or children whose mothers never worked at professional jobs. These results are therefore consistent with the hypothesis that youth at higher risk are more sensitive to parental work schedules.

We also carried out some analyses to see whether the effects of maternal and paternal work schedules varied by family structure, dividing our sample into families where a spouse was present less than one-third of the time during the first 11 or 12 years of a child's life ($n=158$), one-third to two-thirds of the time ($n=596$), or more than two-thirds of the time ($n=3421$). Our expectation was that fathers' schedules would be more consequential in families where they were present more of the time, and that mothers' schedules would be particularly consequential in families where they were the sole parent much of the time. Results (not shown) for the most part confirmed this expectation. For instance, years of maternal night shift work, in families with a father present less than one-third of the time, were significantly directly linked to increased adolescent smoking and drinking, while for children in families with a father present one-third to two-thirds of the time, years of paternal evening shift work were significantly linked to reduced adolescent drinking and having sex, via a significant path through spending more time with their children, and years of paternal other nonstandard shifts had a significant direct effect on reducing adolescent sexual behavior. Results for children in families with a father present more than two-thirds of the time are mainly consistent with those for the full sample shown in Figure 2.

Alternative Specifications and Tests of Robustness

With observational data, it is always challenging to determine whether the “effects” being estimated represent causal estimates or are affected by the failure to fully control for unobserved differences between those in the treatment and control groups that are correlated both with their selection into the treatment group and with the outcomes being considered. In our case, there are many differences between the types of families where parents work different types of nonstandard schedules (the treatment groups) and families where parents work standard hours (the control group). Even with a rich set of controls for characteristics associated with the selection into different types of work schedules and adolescent outcomes, our estimates might still be biased by the failure to control for potentially important, but unobserved, variables.

Therefore, to account for possible omitted variable bias and unobserved heterogeneity and to test the robustness of our estimates of the effects of parental work schedules, we carried out two additional analyses. First, an extensive set of parental and family characteristics were sequentially added into the model (i.e., child’s characteristics such as gender and birth weight, parental characteristics such as education and marital status, and then family characteristics such as family income and years of living in single-mother families) to detect any substantial changes in the parameter estimates for the nonstandard work schedules while accounting for an increasing portion of the heterogeneity (see, for example, Ruhm, 2008). Results of this robustness check (not shown) showed that the estimated effects of parental work schedules did not change substantially as we added progressively richer sets of controls, suggesting that omitted variable bias was not likely to be a concern.

Second, we calculated average treatment effects using propensity score models, where the treatment groups were adolescents whose parents worked at evenings, nights, or other nonstandard schedules for at least one year versus the control groups whose parents did not work at all at the corresponding schedules, using methods developed by Imai & van Dyk (2004) for continuous treatment variables. Propensity score methods are useful because they compare adolescents in the treatment groups (those whose parents worked specific types of nonstandard schedules) and those from the control group (whose parents did not work nonstandard schedules) who had a similar propensity to work such schedules; thus, we can be more confident that we are comparing like to like and that our estimates are not affected by selection bias. The results (not shown) were very similar to our main results (using the unmatched sample). Maternal night shifts were found to lead to significantly less time spent together and poorer home environment and then again lead to increased adolescent risky behaviors. In addition, mothers and fathers working at other nonstandard schedules were found to have significantly higher parental knowledge about children’s whereabouts, which again led to decreased risky behaviors.

Taken together, these additional models largely confirmed our main results, improving our confidence that our results may reflect causal estimates, even though we lack experimental data.

DISCUSSION AND CONCLUSION

This paper provides new evidence on the pathways linking parental work schedules with adolescent risky behaviors, paying particular attention to mediators that theory and previous research suggest might have important links to both adolescent risky behaviors and parental work schedules. We were interested in knowing if parental work schedules have cumulative effects on adolescent behaviors. Our two strongest findings are that years of work at night by mothers were linked to unfavorable child-parent relations and that such factors translated into adolescent risky behaviors, but that years of working at other types of nonstandard

schedules by mothers and fathers were linked with higher parental knowledge of children's whereabouts which acted as a protective factor. Table 2 provides a summary of the key findings for these two types of nonstandard work schedules. Effects were particularly evident when parents worked such schedules during children's middle-childhood years, but were also evident during preschool years and early adolescence. Subgroup analyses indicated that these effects, although generally small in magnitude, were particularly pronounced for males, children in poor families, and children whose mother never worked as professionals, and that effects of fathers' work schedules were more pronounced in families where they were present for more years, while mothers' schedules tended to have stronger effects in families where they were sole parents for more years.

One potential explanation for the links between maternal night shift and adolescent risky behaviors might be that such families have other characteristics that lead to poorer adolescent outcomes. It is true that there are significant correlations in the raw data between mothers working night hours and being Black or Hispanic, having lower family income, being less likely to be married, younger, and less-educated, and spending more years in single-mother families. However, our models control for these and other child and family characteristics. In addition, our results for parental work schedules did not change when we estimated additional models (adding progressively richer sets of controls and estimating propensity score models). While we are careful not to overly emphasize a causal interpretation for our findings (given that we lack experimental data), we believe that the robustness of our results regarding night shift work by mothers is important evidence for future research to build on.

Our results for the full sample suggest that the links connecting maternal night shift to poorer adolescent outcomes work primarily through reductions in both time spent with the adolescent and the quality of the home environment. For some subgroups (boys, low-income children), the number of years mothers worked at night also resulted in reductions in maternal closeness, and for low-income children these reductions constitute a significant mediated path to increased delinquency.

Our analyses by children's developmental stage suggest that the number of years parents worked nonstandard hours at various stages of childhood matter for adolescent outcomes, but in different ways depending on the stage when that work occurred. These results make sense given that children face very different developmental tasks during these different stages. In particular, the middle-childhood years mark a time of important changes related to school transitions, developmental advances that establish children's sense of identity, and developing relationships with parents and peers (Eccles, 1999). These years serve as a foundation for later development, and experiences during these periods can have lasting effects. Furthermore, research has suggested that parents tend to have better knowledge about children's whereabouts and daily life when children are younger versus when they are older (Crouter & Head, 2002), reflecting the developmental path of child autonomy. The implication is that if working at nonstandard hours reduces parental knowledge of children's whereabouts and their daily life, then parental nonstandard work schedules during middle childhood years may have more influence on adolescent-parent relationships and thus in turn on adolescent well-being compared to the early adolescent years. However, we found that parental nonstandard work during early adolescence also matters, which would make sense given that this is a period when young people begin engaging in many of these risky behaviors. Future research is welcomed to examine the issue of differential effects by developmental stage in more depth.

The fact that the effects we find are generally more pronounced for males than females resonates well with the child and adolescent development literature (Crouter et al., 1990). In

particular, a growing body of research (see e.g. Moffitt, 2005) suggests that not only are males more likely to engage in delinquent behavior, but that these actions reflect an inherent genetic susceptibility that may be triggered by young males' environments.

Our finding of a link between mothers working night hours and adolescent delinquency, through reduced maternal closeness, in low-income families is consistent with literature on child well-being in low-income families (e.g., Duncan & Brooks-Gunn, 1997). In particular, closeness and delinquency may be affected more by shift work in low-income families because mothers may experience greater stress from working nonstandard hours combined with financial strain and hardship, which are in turn negatively associated with parental psychological functioning and parenting behavior (Conger et al., 1992; Elder, Conger, Foster, & Ardel, 1992; Gershoff, Aber, Raver, & Lennon, 2007; McLoyd, 1990).

Our findings for mothers who work non-professional jobs are also of interest. As discussed earlier, it is possible that unfavorable effects from mothers working nonstandard hours might be related to the nature of mothers' job characteristics (e.g., occupation, quality, and complexity, see review in Repetti, 2005). It has been theorized that the effects of maternal employment may depend on the way a parent interacts with his or her family (e.g., Menaghan, 2005; Menaghan & Parcel, 1995). Positive work experiences may help a parent be more relaxed and responsive at home, whereas negative or draining work experiences may do the opposite. Thus, characteristics of the parent's job or occupation may moderate the effects of parental work schedules on adolescent outcomes. Our subgroup analyses suggest that among mothers who never worked at professional jobs, the years that mothers worked night hours are linked with spending less time together, which in turn predicted more adolescent drinking. Further fine-grained analyses are warranted given these findings and given prior evidence on the roles mothers' job characteristics may play in moderating or mediating the effects of parental employment on children's well-being.

Collectively, our results highlight the potential risks faced by children of low-income or non-professional parents who may have little or no choice regarding the type of shift they work. This lack of choice is an important and under-studied component, particularly since declining real wages at the lower end of the income distribution have made full time employment by both parents a necessity for families. It is thus important to identify family friendly policies as well as workplace practices and policies that may buffer parents from the possible risks associated with working nonstandard hours. For example, the disadvantages associated with shift work may be reduced for people whose workplaces provide employees with employee assistance programs, the ability to choose their shift schedules, flexibility in arrival and departure times, the option of shift differentials, and/or higher wages. Having sufficient paid personal time off may also help people working at nonstandard hours have more rest and help them meet family demands (e.g., spending more time with family members, taking care of children during school off days due to either snow or teacher-training days, and so forth). It is important to note that the degree to which shift work may be less problematic depends on not only established organizational policies as described above but also critically on informal supervisory practices. This has been documented in qualitative studies; whether or not the employee has the scheduling flexibility necessary to meet his or her family demands depends to a large extent on the supervisor's discretion (Heymann, 2000a; Henly, Shaefer, & Waxman, 2006).

On a positive note, we found that adolescents have a lower incidence of risky behaviors if their parents worked at other types of nonstandard schedules which allowed parents (particularly mothers) to know more about their children's whereabouts. This result may not come as a surprise considering that parents working at other nonstandard schedules were more likely to be married, were older, had higher maternal education, and had higher family

income, reflecting the fact that some in this category had work hours that varied as a matter of choice (rather than as a result of their employer's decision). Studies have documented the benefits of having flexible schedules in terms of work-family balance (Hill et al. 2001). Thus, the link between maternal work at other nonstandard schedules and reduced incidence of risky behaviors may reflect the fact that the "other nonstandard schedules" work category captures parents who are working flexible work schedules of their own choosing. This category also includes some parents who are working rotating shifts. Han & Waldfogel (2007) found, when examining contemporary parental work schedules in the years when rotating shifts information was available in the NLSY, that in single-mother families, rotating shifts were associated with greater delinquent behavior. Unfortunately, the NLSY's survey design does not allow us to differentiate between flexible work and rotating shifts, nor to identify rotating shifts consistently across all of the assessment years, prohibiting further analysis along these lines. In future work, it would be useful to further tease out the effects of other nonstandard schedules versus flexible schedules.

An important contribution of this paper is that we have examined both mothers' and fathers' work schedules, unlike most previous studies, which mainly focused on maternal work schedules. We find some evidence that nonstandard work has differential effects depending on which parent undertakes it. For example, we found consistently negative effects of maternal night hours on adolescent outcomes, working through several mediators, whereas fathers' night hours had fewer effects, although they were directly linked to adolescent sex. This latter result is interesting in light of previous research suggesting that fathers play an important role in deterring the initiation of adolescent sexual activity (Dittus, Jaccard, & Gordon, 1997; Hepburn, 1981). More generally, research on parenting has suggested that fathers tend to spend less time with their children and tend to be less warm and more restrictive than mothers (Larson et al., 1996; Parke, 2002). Thus, even though shift work may bring stress and work overload to fathers, the fact that fathers spend less time with their children may temper the negative consequences associated with their work schedules, relative to those of mothers. This assumption is consistent with what we found here, in that the most consistently undesirable consequences were linked with mothers working night hours. In addition, research has found that fathers' stress is buffered by mothers and thus fathers' stress from work overload may not manifest when fathers interact with their children, while mothers' stress from work tends not to be buffered by fathers and thus stress experienced by mothers from work would likely influence mother-child interactions and relationships (Crouter et al., 1999; Jones & Fletcher, 1993; Schneider & Waite, 2005). At the same time, research on dual-earner families has suggested that fathers are more likely to participate in caregiving if their wives worked full-time (or their wives' availability was restricted due to work schedules) (Presser, 1994). If this is the case, then we would expect fathers to spend more time with their children while mothers were at work during nonstandard hours and thus fathers' own work stress or overload may be as likely as mothers' to influence the father-child relationship and in turn adolescent well-being. It would be informative if future research could examine in more detail the patterns of maternal and paternal work schedules to understand how mothers and fathers juggle family and work demands and how this may affect adolescents' well-being. Future research could also usefully further examine the distinction between the effects of employment in two-parent and single-parent families. To the extent that such research can effectively delineate the means by which interaction between parents affects family stress and thus risky behaviors by adolescents, interventions may be developed that are aimed at assisting families strike a more healthy balance between work and family.

Another contribution is that we provide evidence on the cumulative effects of parental nonstandard work on adolescent risky behaviors, in contrast to prior research that mainly focused on contemporary work. Our results suggest that cumulative experience matters. In

addition, although we are not able to make strict causal claims about our findings, we believe that the robustness of our results (particularly for mothers' night shift work) to alternative specifications and robustness checks bolsters the case for a causal interpretation to our findings. We welcome further research to more carefully explore these results.

Several limitations are worth noting and also provide implications for further research. First, as discussed earlier, we were unable to separate the various types of work schedules that fall under the category of "other types of nonstandard schedules." This category includes some schedules that employees are unlikely to choose voluntarily (schedules where employers change the work hours periodically, or require rotating shifts) but also includes work schedules that are changed by the *employee* at his or her request. In future work, it would be very helpful to be able to distinguish between these different types of work schedules.

Second, information on work schedules was not collected on a monthly basis and was not available for weekends. Thus, the measures used here might undercount the occurrence of nonstandard schedules because some parents might have worked weekends; additionally, some parents might have switched into and then back out of a nonstandard schedule between data collection points. To the extent that these undercounts occurred, the associations between nonstandard schedules and adolescent outcomes would be underestimated in this analysis. In addition, unmeasured hours of unpaid or unofficial work by parents may also result in an undercount of the occurrence of parental nonstandard work schedules. The manner by which this undercount would influence our mediators and outcomes of interest is unclear, but perhaps in the future this could be addressed in a dataset that gathered more detailed data on parents' employment and time use.

Third, although we were able to explore many possible mediating mechanisms, we were not able to examine every one that might be relevant. In particular, one of the mechanisms that has been discussed in the previous literature on adolescent risky behaviors is how adolescents spend their time after school. Although in preliminary analyses we examined whether or not children had adults at home after school as a possible mediator, this variable did not explain any of the significant effects of parental shift work on adolescent risky behaviors. This result may partly be due to the fact that about 80% of the children whose parents worked at nonstandard shifts reported having adults home after school. Such "homogeneity" may thus render this variable ineffective. Nonetheless, future research should examine in more detail whether or not parental work schedules are associated with the activities adolescents are involved in after school and how this relates to risky behaviors. More generally, our analysis of mediators, like most such analyses, suffers from the problem that most potential mediators are effectively post-treatment variables. As we discuss above, statisticians and analysts from related disciplines have pointed out the pitfalls associated with such analyses (see e.g. Sobel, 2008) but available methods to estimate mediation more robustly are few. This is an important challenge for future research.

As discussed above, a contribution of this paper is that we have examined both mothers' and fathers' work schedules, but our data on fathers are not as detailed as our data on mothers. This is a frequent limitation in datasets, but one that we hope will be addressed in future data gathering efforts.

In terms of directions for future research, these analyses provide evidence that parental nonstandard work matters for adolescent risky behaviors at age 13 or 14. A question for further research is whether and how parental nonstandard work influences any escalation in adolescent risky behaviors thereafter. Another important direction for future research is to further examine the distinctions among various types of work schedules and in particular the extent to which they are voluntarily selected. For many parents, particularly those in low-

paid, low-skilled positions, a nonstandard shift is a requirement of the job, rather than something chosen for work-family balance. A noteworthy finding is that parents working nonstandard schedules other than evenings or nights (possibly signifying greater control or flexibility as to their work schedules) tend to have higher parental knowledge of children's whereabouts, an important protective factor in adolescent risky behaviors.

In conclusion, studies such as this one, together with future studies, may increase awareness and understanding of the experiences families working nonstandard schedules have as they juggle family and work responsibilities and how the public as well as the government may respond to them. With so many families working nonstandard schedules, the way we respond to this challenge may have profound implications for adolescent's well-being.

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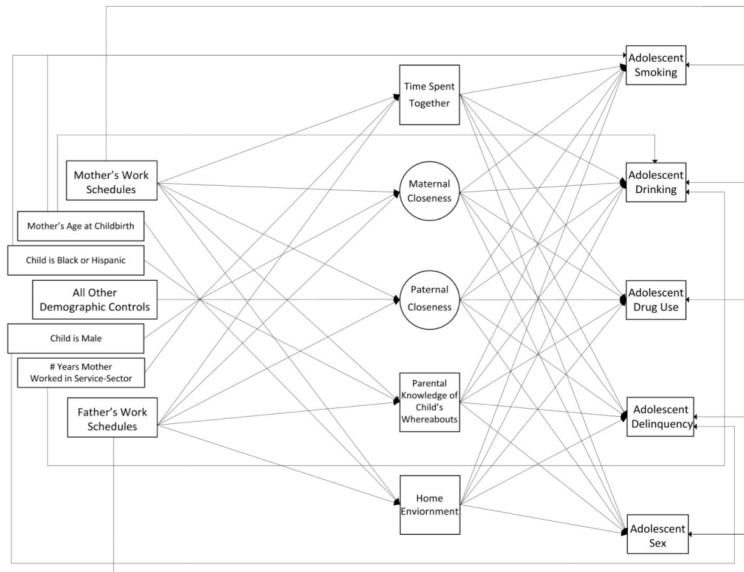


Figure 1. Hypothesized Pathways of Parental Work Schedules on Adolescent Risky Behaviors

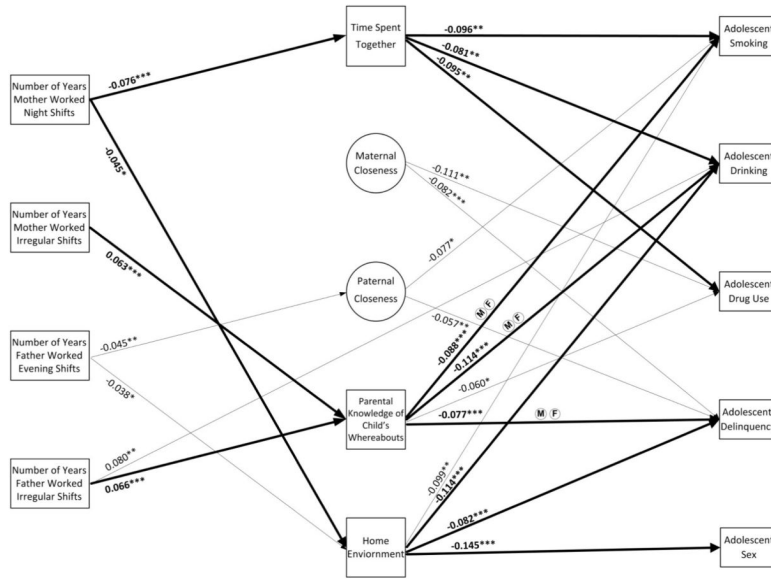


Figure 2. Pathways linking Parental Work Schedules to Adolescent Risky Behaviors, Full Sample

Note: N = 4175. CFI=.957; RMSEA=.022; $\chi^2(df=60)=183.857$. Numbers shown are standardized coefficients. A bolded line represents a mediated pathway that is significant at least the 5% level. Notations M and F indicate where a path from a mediator to an outcome is relevant only in conjunction with the mother's or father's work schedule, respectively. Model controls for child's gender, race/ethnicity, having siblings, born low birth weight, mother's age, marital status, and education at birth, family income the year before birth, number of years receiving welfare, number of years living in single-mother families, mother smoking during pregnancy, mother drinking alcohol during pregnancy, mothers' average weekly work hours, number of years mothers working at professional, sales, or service-sector jobs, and father's average weekly work hours. Standard errors were adjusted using bootstrapping to account for dependency across families. $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 3a:

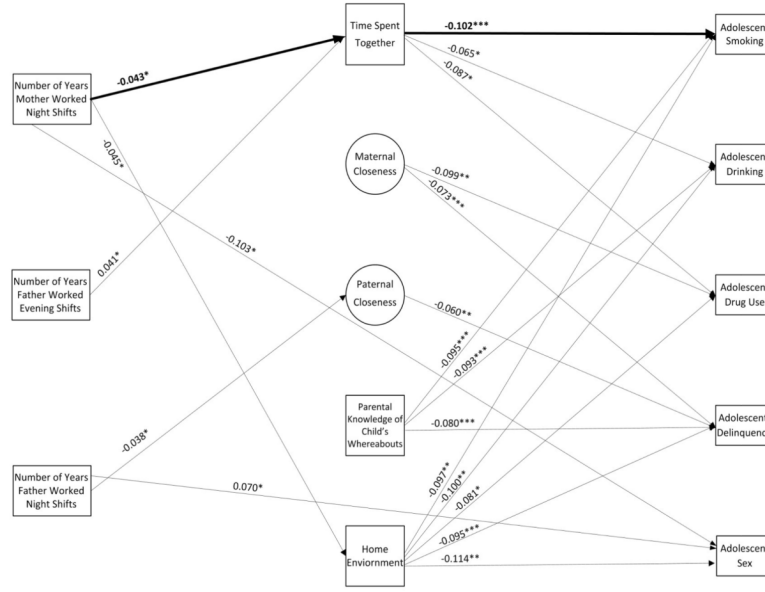


Figure 3b:

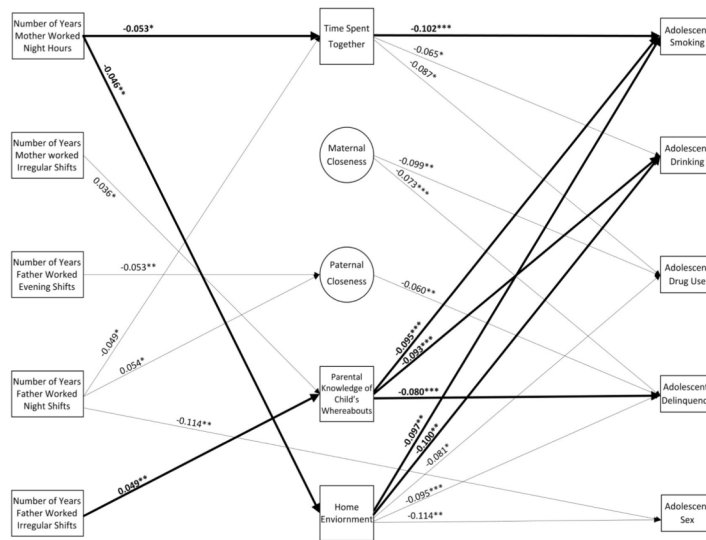


Figure 3c:

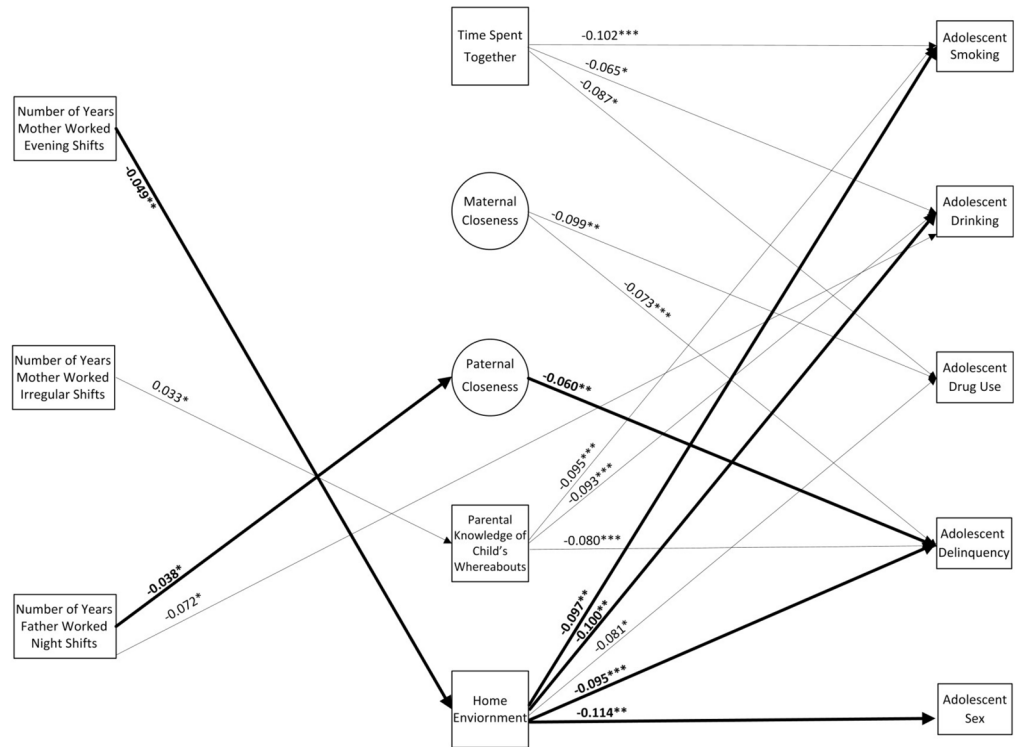
**Figure 3.**

Figure 3a: Pathways linking Parental Work Schedules to Adolescent Risky Behaviors, Developmental Stage Before Age 5

Note: $N = 4175$. CFI=.913; RMSEA=.033; $\chi^2(df=114)=642.804$. Numbers shown are standardized coefficients. A bolded line represents a mediated pathway that is significant at at least the 5% level. Model controls for child's gender, race/ethnicity, having siblings, born low birth weight, mother's age, marital status, and education at birth, family income the year before birth, number of years receiving welfare, number of years living in single-mother families, mother smoking during pregnancy, mother drinking alcohol during pregnancy, mothers' average weekly work hours, number of years mothers working at professional, sales, or service-sector jobs, and father's average weekly work hours. Standard errors were adjusted using bootstrapping to account for dependency across families. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 3b: Pathways linking Parental Work Schedules to Adolescent Risky Behaviors, Developmental Stage Between Ages 5 and 10

Note: $N = 4175$. CFI=.913; RMSEA=.033; $\chi^2(df=114)=642.804$. Numbers shown are standardized coefficients. A bolded line represents a mediated pathway that is significant at at least the 5% level. Model controls for child's gender, race/ethnicity, having siblings, born low birth weight, mother's age, marital status, and education at birth, family income the year before birth, number of years receiving welfare, number of years living in single-mother families, mother smoking during pregnancy, mother drinking alcohol during pregnancy, mothers' average weekly work hours, number of years mothers working at professional, sales, or service-sector jobs, and father's average weekly work hours. Standard errors were adjusted using bootstrapping to account for dependency across families. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 3c: Pathways linking Parental Work Schedules to Adolescent Risky Behaviors, Developmental Stage Between Ages 11 and 12

Note: $N = 4175$. CFI=.913; RMSEA=.033; $\chi^2(df=114)=642.804$. Numbers shown are standardized coefficients. A bolded line represents a mediated pathway that is significant at at least the 5% level. Model controls for child's gender, race/ethnicity, having siblings, born low birth weight, mother's age, marital status, and education at birth, family income the year before birth, number of years receiving welfare, number of years living in single-mother families, mother smoking during pregnancy, mother drinking alcohol during pregnancy, mothers' average weekly work hours, number of years mothers working at professional, sales, or service-sector jobs, and father's average weekly work hours. Standard errors were adjusted using bootstrapping to account for dependency across families. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 1

Summary of Confirmatory Factor Analysis Measurement Model

	Unstandardized coefficient	Standard errors	Standardized coefficient
Maternal Closeness			
Variable loadings on latent factor			
How close the child felt toward the mother	1.00 ^a	0.00	.56
How well the child shared ideas with the mother	1.14	0.06***	.61
Mom missed important events a lot	-0.16	0.02***	-.34
Paternal Closeness			
Variable loadings on latent factor			
How close the child felt toward the father	1.00 ^a	0.00	1.00
How well the child shared ideas with the father	0.87	0.03***	.87
Dad missed important events a lot	-0.47	0.02***	-.47
Covariance	0.27	0.01***	.33
<i>Model fit:</i> CFI = .977, RMSEA = .038, χ^2 (df=6) = 109.563			

Note. CFI = Comparative Fix Index; RMSEA = root mean square error of approximation. Sample size is $N = 4175$.

^aOne variable loading on each latent factor was set equal to 1 for identification to set the metric for that factor.

 $p < .001$.

Table 2
 Summary of Key Findings for Night Shifts and Other Nonstandard Schedules by Full Sample, Developmental Stage, and Sub-Group

	Developmental Stage					Sub-Group				
	Full Sample	<Age 5	Ages 5 to 10	Ages 11 & 12	Boys	INR<15	Not Professional	Spouse <1/3rd	Spouse 1/3rd-2/3rd	Spouse >2/3rd
Panel A: Night Shift										
Years of Night Shift Work by Mothers → less time spent together → increased/risky behaviors	Drinking Smoking Drug Use	Smoking	Smoking				Drinking			Drinking Smoking Drug use
Years of Night Shift Work by Mothers → poorer home environment → increased/risky behaviors	Drinking Delinquent Having Sex		Drinking Smoking		Drinking		Delinquency			Drinking Delinquent Having Sex
Years of Night Shift Work by Mothers → lower maternal closeness → increased/risky behaviors						Delinquent				
Years of Night Shift Work by Mothers → increased/risky behaviors								Smoking Drinking		
Years of Night Shift Work by Fathers → lower paternal closeness → increased/risky behaviors				Delinquent						
Years of Night Shift Work by Fathers → increased/risky behaviors		Having Sex								
Panel B: Other Nonstandard Schedules										
Years of Working at Other Schedules by Mothers → increased knowledge of children whereabouts → decreased/risky behaviors	Drinking Smoking Delinquency				Drinking Smoking Delinquent Having Sex					Drinking Smoking Delinquent
Years of Working at Other Schedules by Fathers → increased knowledge of children whereabouts → decreased/risky behaviors	Drinking Smoking Delinquency		Drinking Smoking Delinquent		Delinquent		Drinking Smoking Drug use Delinquency			Drinking Smoking Delinquent
Years of Working at Other Schedules by Fathers → lower maternal closeness → increased/risky behaviors	Drinking					Delinquent				Drinking Smoking Delinquent
Years of Working at Other Schedules by Fathers → increased/risky behaviors					Drinking		Drinking			

Note. Adolescent risky behaviors indicated in the table represent a significant mediated pathways that are significant at $p < .05$ or better. Figures 2 and 3a–3c and Appendix Tables 2

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40			
31. Feel close to dad	3.01	1.04	0.16	0.01	-0.10	-0.05	0.11	0.15	0.04	0.04	0.04	-0.02	-0.02	-0.15	-0.27	-0.01	-0.08	0.02	-0.04	0.05	0.04	-0.05	-0.02	0.01	0.04	0.03	0.20	-0.11	-0.57	0.04	0.53	0.56													
32. Share ideas with mom	3.12	0.89	-0.02	0.00	0.04	-0.03	0.01	0.03	0.01	-0.01	0.01	-0.04	-0.02	-0.01	0.01	-0.01	-0.03	-0.02	-0.01	-0.00	-0.01	-0.09	-0.01	-0.02	-0.01	0.02	0.10	-0.15	-0.03	0.12	0.10	0.52	0.19												
33. Share ideas with dad	2.70	1.02	0.14	0.02	-0.07	-0.05	0.03	0.11	0.12	0.02	0.06	-0.04	-0.01	-0.11	-0.18	-0.04	-0.03	0.00	-0.03	0.06	-0.01	-0.04	-0.02	0.03	0.04	0.21	-0.09	-0.32	0.05	0.33	0.25	0.61	0.46												
34. Frequency of having meals together	2.75	1.31	0.00	0.08	-0.25	-0.07	-0.04	0.14	0.21	0.03	0.05	-0.06	-0.06	-0.19	-0.41	-0.05	-0.06	-0.01	-0.08	0.05	0.00	-0.05	0.02	0.06	0.03	0.47	-0.11	-0.25	0.03	0.24	0.09	0.26	0.08	0.22											
35. Time spent together	4.12	1.90	0.00	-0.00	-0.06	-0.13	-0.03	0.11	0.10	-0.04	0.14	-0.14	-0.03	-0.13	-0.08	-0.01	-0.08	0.03	0.00	0.09	0.03	0.00	0.01	-0.04	0.03	0.06	0.25	-0.17	-0.18	0.10	0.14	0.18	0.19	0.26	0.14										
36. Ever smoking	0.26	0.44	0.00	-0.01	-0.04	0.07	0.05	-0.18	-0.09	-0.18	-0.20	0.16	0.15	0.14	0.12	0.02	0.06	-0.00	0.02	-0.08	-0.00	0.07	0.01	-0.03	-0.02	-0.14	0.11	0.09	-0.13	-0.08	-0.09	-0.14	-0.11	-0.12	-0.06	-0.11									
37. Ever drinking alcohol	0.27	0.44	-0.00	0.05	-0.02	0.02	0.00	-0.06	-0.04	-0.14	-0.08	0.08	0.03	0.08	0.09	0.01	0.05	0.01	0.07	-0.02	0.02	0.10	-0.04	-0.00	0.02	0.01	-0.07	0.09	0.08	-0.14	-0.09	-0.10	-0.10	-0.08	-0.06	-0.09	0.46								
38. Ever using drugs	0.12	0.32	0.03	0.03	-0.02	0.02	-0.02	-0.05	-0.05	-0.09	-0.12	0.05	0.05	0.08	0.07	-0.02	0.03	0.00	0.01	-0.04	-0.00	0.03	0.02	0.00	-0.01	-0.01	-0.08	0.08	0.05	-0.07	-0.08	-0.10	-0.10	-0.09	-0.11	-0.04	-0.08	0.39	0.41						
39. % of delinquent behavior	1.04	1.42	0.14	0.02	0.07	0.05	0.01	-0.10	-0.10	-0.07	-0.12	0.05	0.02	0.12	0.11	0.00	0.03	-0.02	-0.04	-0.07	-0.01	0.02	0.00	-0.03	-0.02	-0.05	-0.14	0.15	0.07	-0.11	-0.17	-0.09	-0.09	-0.10	-0.10	-0.08	-0.06	0.32	0.34	0.56					
40. Ever having sex	0.14	0.35	0.14	-0.00	0.15	0.06	0.05	-0.18	-0.18	-0.11	-0.12	0.03	0.02	0.19	0.23	0.02	0.03	-0.02	-0.01	-0.06	-0.04	0.03	-0.02	-0.01	-0.06	-0.05	-0.17	0.07	0.09	-0.11	-0.08	-0.02	-0.09	-0.05	-0.07	-0.10	-0.05	0.26	0.22	0.17	0.24				

Note. Bolded numbers are significant at at least $p < .05$.

Appendix Table 2

Parameter Estimates of the Pathway From Parental Work Schedules To Mediators on Adolescent Risky Behaviors

IV → M	Unstandardized coefficient	Standard error	Standardized coefficient
Mother: Evening hours → M			
M = Time spent together	-0.045	0.031	-0.028
M = Maternal closeness	-0.003	0.016	-0.004
M = Paternal closeness	-0.006	0.013	-0.008
M = Parental knowledge about where the child was	-0.001	0.006	-0.002
M = Home Environment	-0.017	0.014	-0.023
Mother: Night hours → M			
M = Time spent together	-0.219 ***	0.057	-0.076
M = Maternal closeness	-0.047	0.027	-0.035
M = Paternal closeness	-0.036	0.021	-0.030
M = Parental knowledge about where the child was	-0.003	0.010	-0.005
M = Home Environment	-0.058 *	0.025	-0.045
Mother: Irregular hours → M			
M = Time spent together	0.001	0.026	0.001
M = Maternal closeness	0.001	0.013	0.001
M = Paternal closeness	0.009	0.011	0.015
M = Parental knowledge about where the child was	0.021 ***	0.005	0.063
M = Home Environment	-0.010	0.011	-0.016
Father: Evening hours → M			
M = Time spent together	0.048	0.039	0.022
M = Maternal closeness	-0.015	0.019	-0.015
M = Paternal closeness	-0.041 **	0.016	-0.045
M = Parental knowledge about where the child was	0.015	0.008	0.028
M = Home Environment	-0.037 *	0.019	-0.038
Father: Night hours → M			
M = Time spent together	-0.062	0.045	-0.028
M = Maternal closeness	-0.013	0.019	-0.012
M = Paternal closeness	-0.017	0.016	-0.018
M = Parental knowledge about where the child was	0.014	0.008	0.027
M = Home Environment	-0.023	0.019	-0.024
Father: Irregular hours → M			
M = Time spent together	-0.027	0.026	-0.019
M = Maternal closeness	-0.020	0.012	-0.030
M = Paternal closeness	0.000	0.012	0.000
M = Parental knowledge about where the child was	0.022 ***	0.005	0.066
M = Home Environment	0.008	0.013	0.013

Note. N = 4175. IV = independent variable; M = mediator. CFI=.957; RMSEA=.022; $\chi^2(df=60)=183.857$. Model controls for child's gender, race/ethnicity, having siblings, born low birth weight, mother's age, marital status, and education at birth, family income the year before birth, number

of years receiving welfare, number of years living in single-mother families, mother smoking during pregnancy, mother drinking alcohol during pregnancy, mothers' average weekly work hours, number of years mothers working at professional, sales, or service-sector jobs, and father's average weekly work hours. Standard errors were adjusted using bootstrapping to account for dependency across families.

*
 $p < .05$,

**
 $p < .01$,

 $p < .001$.

Appendix Table 3

Parameter Estimates of the Structural Equation Model of the Pathway From Mediators to Adolescent Risky Behaviors

M → DV	Unstandardized coefficient	Standard error	Standardized coefficient
M → Smoking			
M = Time spent together	-0.056 **	0.018	-0.096
M = Maternal closeness	-0.032	0.038	-0.026
M = Paternal closeness	-0.106 *	0.046	-0.077
M = Parental knowledge about where the child was	-0.217 ***	0.056	-0.088
M = Home Environment	-0.130 **	0.042	-0.099
M → Drinking			
M = Time spent together	-0.045 **	0.017	-0.081
M = Maternal closeness	-0.046	0.036	-0.039
M = Paternal closeness	-0.040	0.046	-0.031
M = Parental knowledge about where the child was	-0.257 ***	0.055	-0.109
M = Home Environment	-0.143 ***	0.041	-0.114
IV: Father's irregular hours → Drinking	0.063 **	0.021	0.080
M → Using drugs			
M = Time spent together	-0.051 **	0.021	-0.095
M = Maternal closeness	-0.128 **	0.041	-0.111
M = Paternal closeness	-0.095	0.056	-0.074
M = Parental knowledge about where the child was	-0.136 *	0.066	-0.060
M = Home Environment	-0.076	0.048	-0.063
M → Number of delinquent behavior			
M = Time spent together	0.002	0.015	0.002
M = Maternal closeness	-0.126 ***	0.030	-0.082
M = Paternal closeness	-0.097 **	0.038	-0.057
M = Parental knowledge about where the child was	-0.234 ***	0.049	-0.077
M = Home Environment	-0.132 ***	0.035	-0.082
M → Having sex			
M = Time spent together	-0.025	0.022	-0.046
M = Maternal closeness	-0.049	0.045	-0.042
M = Paternal closeness	-0.084	0.058	-0.064
M = Parental knowledge about where the child was	-0.106	0.077	-0.046
M = Home Environment	-0.179 ***	0.053	-0.145

Note. N = 4175. IV = independent variable; M = mediator. CFI=.957; RMSEA=.022; $\chi^2(df=60)=183.857$. Model controls for child's gender, race/ethnicity, having siblings, born low birth weight, mother's age, marital status, and education at birth, family income the year before birth, number of years receiving welfare, number of years living in single-mother families, mother smoking during pregnancy, mother drinking alcohol during pregnancy, mothers' average weekly work hours, number of years mothers working at professional, sales, or service-sector jobs, and father's average weekly work hours. Standard errors were adjusted using bootstrapping to account for dependency across families.

*
 $p < .05,$

**
 $p < .01,$

 $p < .001.$