Maternal Nonstandard Work Schedules and Adolescent Overweight

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Objectives. We investigated whether nonstandard work schedules by mothers were associated with adolescent overweight.

Methods. We conducted multiple regression analyses using a sample of mother–child pairs (n = 2353) from the National Longitudinal Survey of Youth to examine the association between the number of years mothers worked at nonstandard schedules and adolescent overweight at age 13 or 14 years. Separate analyses were also conducted by family income and family type.

Results. Child's body mass index increased significantly if mothers worked either a few years or many years at nonstandard schedules. Risk of overweight was also significantly associated with 1 to 4 and 10 or more years of maternal nonstandard work schedules. In both cases, results were driven by those families with predicted incomes in the 2nd quartile ("near-poor"), with a few or many years of nonstandard work schedules also associated with increased risk of adolescent overweight in 2-parent families.

Conclusions. Results indicate the importance of the overlooked association between maternal nonstandard work schedules and adolescent overweight at age 13 or 14 years. Nonstandard work schedules among near-poor families and in 2-parent families may disrupt the work–family balance, affecting adolescent overweight. (*Am J Public Health.* 2008;98:1495–1502. doi:10.2105/AJPH.2007.123885)

Overweight among young people is one of the most publicized public health issues of the current generation. Although only about 5% of children in the United States aged 2 to 19 years were considered overweight in 1974,[1] by 2003 to 2004 this figure was 17.1%[2]. Among adolescents aged 12 to 19 years, overweight rose from 5% in 1960 to 11% from 1988 to 1994,[3] and recently increased from 14.8% in 1999 to 2000 to 17.4% in 2003 to 2004.

Overweight has been linked to a host of physical, social, and psychological problems for adolescents including type 2 diabetes,[4] sleep problems,[5] asthma,[6] hypertension, and depression,[7] among others. Moreover, overweight in childhood and adolescence has been found to be associated with adult overweight[8–10] and numerous health and social problems that attend to it.

Although genetic and environmental factors and their interactions are generally identified as being responsible for increases in adolescent overweight, the large increases among a relatively stable population suggest changes in the environment are largely responsible.[11] Furthermore, although a growing caloric imbalance[12] (expending fewer calories than are consumed) prompted by a more sedentary lifestyle is understood to be at the root of the obesity epidemic for both young people and adults,[13] the exact nature of this imbalance remains unclear.

Some have suggested that among other causes, parental work may be associated with adolescent overweight[1,14,15] through a greater reliance on fast food (e.g., if parental work hours interfere with the time needed to prepare healthy meals)[16] or television watching by children.[1] Whereas one early study found no association between maternal work and nutrient intake by children,[17] recent analyses have demonstrated a positive association between American maternal work hours and child overweight by age 11 years.[18,19] A study of Canadian children aged 6 to 11 years found similar results, although no association was found with fathers' work hours.[20] Finally, a recently published British study found that maternal work was positively associated with early childhood overweight.[21]

Parental nonstandard work schedules ("nonstandard shifts") may be particularly likely to place children at risk of overweight. We defined "nonstandard" as work shifts other than day shifts (see "Methods" section). For example, parents working evening or early morning hours may have less time or energy to take children to sports practice or games and may be more likely to provide their children with pre-prepared foods or fast food. Although some previous studies have examined associations between maternal nonstandard shifts and children's well-being,[22–24] none have examined how such work is related to children's overweight. Given estimates that over one third of dual-earner households have at least 1 parent working nonstandard shifts,[25–27] it is vital to examine this relationship.

Given the evidence just reviewed, we hypothesized that maternal nonstandard shifts are positively associated with children's body mass index (BMI; calculated as weight in kilograms divided by height in meters squared) and overweight at age 13 or 14 years. Although childhood and adult overweight are only moderately correlated, research has found overweight at 13 or 14 years of age and adulthood adiposity to be highly correlated.[10] Adolescence is a period when young people are at high risk for becoming overweight[11]; moreover, independent of adult weight, adolescent overweight is associated with adulthood morbidity such as colorectal cancer and gout for men and arthritis in women,[28] making it a period of critical importance when considering the public health implications of the overweight epidemic.[29]

METHODS

Data

We used data from the National Longitudinal Survey of Youth–Child Supplement (NLSY-CS),[30] a sample of births to the female participants of the 1979 National Longitudinal Survey of Youth.[31] Mothers from this

group were aged 14 to 22 years at the time of the first survey in 1979. Data from the 1979 National Longitudinal Survey of Youth was collected annually until 1994 and every other year thereafter. The NLSY-CS began in 1986 and collected information biannually from mothers regarding their children. In 1988, the NLSY-CS began to directly survey children aged 10 to 14 years.

Our study sample consisted of all children in the NLSY-CS whose mothers had ever worked since their birth and who could be followed longitudinally to age 13 or 14 years, with no missing data for height and weight at age 13 or 14 years. The sample consisted of 2353 children from 5 cohorts born between 1982 and 1991 who reached 14 years of age between 1995–1996 and 2003–2004, the last year of publicly available data. To our knowledge, this study is the first to make use of a full 14 years of data from the NLSY-CS to examine the relationship between maternal work and child overweight.

Table 1 provides demographic characteristics for the total sample and by maternal shifts. As shown in Table 1, mothers who had only worked standard schedules were relatively more advantaged compared with those who had ever worked nonstandard schedules, whereas mothers who did not work during some years were the least advantaged.

Measures

Child overweight. We assessed this outcome using both continuous and discrete measures of BMI. BMI has been identified as a valid measure for assessing overweight in adults as well as in children and adolescents.[32,33] In a previous study, self-report data like that used for maternal and child height and weight in the 1979 National Longitudinal Survey of Youth were found to accurately identify adolescent overweight in 96% of cases.[34] As a discrete measure, adolescents were considered overweight if their BMI was above the age- and gender-specific 85th percentile as specified by the National Center of Health Statistics guidelines.[32] This cutoff included adolescents who were overweight (≥95th percentile) and at risk of being overweight (85th–94th percentiles). For simplicity, adolescents from the 85th percentile and higher were defined as overweight for our study because youths from both the at-risk and the overweight groups were important targets for public health interventions and the inclusion of the at-risk group increased the statistical power of the analyses.

Parental work schedules. The 1979 National Longitudinal Survey of Youth collected detailed data on work schedules.[31] The shift usually worked by the respondent at her current or most recent job was reported every year starting in 1979 and every other year starting in 1994. Five choices were available: "day shift" (anytime between 6 AM and 6 PM), "evening shift" (anytime between 2 PM and midnight), "night shift" (anytime between 9 PM and 8 AM), "split shift" (consisting of 2 distinct periods each day), and "hours vary." However, from 1986 through 1989, respondents were asked instead to identify the beginning and end times of their shift at their current or most recent job. In addition to this, beginning in 1990, another question was asked with 7 choices to determine "shift usually worked by the respondent at current or most recent job": "regular day shift," "regular evening shift," "regular night shift," "shift rotates" (e.g., changes periodically from days to evenings or nights), "split shift," "irregular hours," and "other."

We created a variable representing the number of years a mother had worked nonstandard shifts by the time her child was aged 13 or 14 years, coded for each year as 1 if a mother worked at hours other than regular day shifts and 0 otherwise. Thus, this variable was the sum of the years a mother had worked at nonstandard shifts by the time her child was aged 13 or 14 years. A value of 0 represents only working standard shifts as opposed to nonstandard shifts. An initial graphing of the data indicated a curvilinear relationship between the number of years a mother worked at nonstandard shifts and both child's BMI ($r=-0.02$; not significant) and overweight ($r=-0.04$; $P<.05$). Thus, the squared and cubed terms of the number of years a mother worked nonstandard shifts were also included in all analyses. Mothers were coded as not working if during an interview year they either responded "they did not work" or their average hours worked per week were 0. From 1983 onward, mothers reported on their spouse's or partner's work schedule, and we created a corresponding variable in a similar fashion.

Parental work hours. Because average maternal work hours over the child's lifetime has been found to be associated with child overweight in previous analyses,[18–20] we created dummy variables indicating whether mothers worked an average of 1 to 20 hours, 21 to 30 hours, 31 to 40 hours, and 40 or more hours per week over the child's first 13 or 14 years. We also created a continuous variable for the spouse's or partner's average weekly work hours (as reported by mothers) by the time a child was aged 13 or 14 years. To explore potential interaction effects between maternal nonstandard schedules and work hours, we conducted additional analyses including interactions between the years of nonstandard shifts and variables representing full-time and part-time work by mothers. However, no significant effects were found for these interactions.

Family income. Previous analyses found that the association between maternal work hours and child overweight was limited to families with higher socioeconomic status.[18,19,21] Following a similar procedure by Ruhm,[19] who predicts what he terms "socioeconomic status," we constructed a variable of predicted family income by regressing net family income in the year of childbirth on mother's age at childbirth, mother's years of education at childbirth, child's race or ethnicity, whether the mother was married at childbirth, and mother's cognitive ability as measured by the Armed Forces Qualifying Test (AFQT). The internal consistency of the AFQT has been reported as greater than 0.90,[35] and AFQT scores are highly correlated with other measures of cognitive ability including the Verbal Reasoning and Numerical Ability Composite of the Differential Aptitude Test (0.84), and the mathematics (0.76), language (0.80), and reading (0.83) composites of the California Aptitude Test.[36]

We further divided families into 4 quartiles, which allowed us to examine how the relationship between parental work schedules and child overweight might differ by family income. Using quartiles also allowed us to divide families into those under the poverty line (quartile 1) and those above but near the poverty line (quartile 2), who are often disadvantaged because of ineligibility for various types of public assistance programs.[37]

TABLE 1—Descriptive Characteristics of the Sample for Children Whose Body Mass Index (BMI) Was Available at Age 13 or 14 Years: National Longitudinal Survey of Youth and Child Supplement, 1979–2004.

Characteristics	Mothers Who Ever Worked (n = 2353 Children from 1753 Families)	Mothers Who Ever Worked Nonstandard Shift (n = 1740)	Mothers Who Never Worked Nonstandard—Only Standard (n = 262)	Mothers Who Never Worked Nonstandard—Some Years Standard and Some Not Working (n = 351)
Child characteristics				
Race/ethnicity				
Non-Hispanic White, %	51.30	51.49	58.40	45.01
Non-Hispanic Black, %	28.94	29.89	21.37	29.9
Hispanic, %	19.76	18.62	20.23	25.07
Male, %	49.89	49.66	51.53	49.86
Low birthweight, %	6.97	7.18	5.34	7.12
First born, %	38.16	36.55	51.53	36.18
BMI at Age 13 or 14 Years, kg/m^2, mean (SD)	22.22 (5.26)	22.36 (5.41)	21.80 (4.72)	21.86 (4.87)
Child at risk of overweight or overweight,[a] %	34.25	35.29	31.30	31.34
Mother characteristics at childbirth				
Age, mean (SD)	25.23 (3.51)	25.07 (3.51)	26.66 (3.11)	24.93 (3.53)
Years of education, mean (SD)	12.53 (2.17)	12.42 (2.15)	13.55 (2.02)	12.30 (2.18)
Married, %	70.80	68.68	86.64	69.52
Mother characteristics before childbirth				
Net family income, constant 2004 dollars (SD)	48 245 (89 348)	47 499 (101 631)	62 322 (35 535)	41 437 (34 721)
Logged net family income, constant 2004 dollars (SD)	10.38 (.940)	10.32 (0.95)	10.89 (0.59)	10.26 (0.96)
AFQT-revised percentile score, mean (SD)	38.17 (27.29)	37.96 (27.10)	48.38 (25.84)	31.59 (27.12)
BMI in 1981, mean (SD)	22.12 (3.56)	22.18 (3.64)	21.75 (2.90)	22.11 (3.62)
Adult work characteristics when child is aged 13 or 14				
Years worked, mean (SD)	7.83 (2.94)	8.00 (2.77)	9.87 (1.40)	5.46 (3.10)
Years mother worked nonstandard shift, mean (SD)	2.44 (2.40)	3.30 (2.22)	0	0
Hours mother worked per week, mean (SD)	27.75 (13.04)	27.86 (12.79)	38.39 (6.09)	19.25 (12.03)
Average hours mothers worked per week, %				
1–20	29.66	29.20	2.29	52.42
21–30	21.72	23.62	6.10	23.94
31–40	29.45	28.10	51.15	19.94
40 or greater	19.17	19.08	40.46	3.70
Years spouse or partner worked nonstandard shift, mean (SD)	2.02 (2.50)	2.06 (2.47)	2.19 (2.85)	1.69 (2.31)
Hours spouse or partner worked per week, mean (SD)	43.81 (8.60)	44.00 (8.67)	43.56 (6.39)	43.01 (9.67)
Other variables				
No. of years mother spent as a single parent, mean (SD)	2.78 (3.65)	2.90 (3.63)	1.54 (2.88)	3.07 (4.07)
No. of years mother spent in poverty, mean (SD)	2.16 (3.00)	2.30 (2.99)	0.21 (0.61)	2.91 (3.49)
How often child eats with both mother and father, mean (SD)	3.15 (1.23)	3.09 (1.25)	3.36 (1.04)	3.27 (1.25)
Mother's report of television hours watched by child, mean (SD)	4.26 (3.04)	4.37 (3.06)	3.55 (2.86)	4.31 (3.03)

Note. CI = confidence interval; AFQT = Armed Forces Qualifications Test.
[a]Children are considered at risk of overweight or overweight when their BMI is at or above the 85th percentile.

Covariates. Previous analyses have found that young, low-income, less educated, and single mothers are more likely to work nonstandard shifts.[38] To partially address potentially omitted variable or selection bias, we controlled for an extensive set of child and family characteristics that have been shown to be associated with family processes and adolescent development in all models. These include factors measured at or before childbirth, such as whether the child is male, whether the child was low birthweight (less than 2500 g), whether the child was first born, child's race or ethnicity, mother's age, mothers' years of

education, mother's marital status, the natural log of net family income, mother's AFQT score, and mother's BMI in 1981. We also controlled for a number of factors by the time a child was aged 13 or 14 years, including the spouse's or partner's average work hours, the number of years that the mother had been a single parent, the years a family had lived under the poverty line, and the years a spouse or partner had worked nonstandard schedules.

Additionally, we included 2 variables that have been found to be likely mechanisms for child overweight: frequency of child's television watching and eating together with parents. Child's television watching (mother's report of how many hours of television the child watches on a typical weekday, top coded to 24) has been associated with childhood overweight.[39–42] How often the child eats with both the mother and father (coded as 0=never, 1=once a month or less, 2=once a week, 3=several times a week, 4=once a day, 5=more than once a day) has been associated with the consumption of healthy food and nutrients among adolescents.[43,44] For all analyses, both variables were averaged across all years of available data to create a mean measure for when the child is aged 13 or 14 years. Table 1 provides descriptive statistics for all analyzed variables.

Empirical Strategy

We utilized a series of ordinary least squares (OLS) regressions for the continuous outcome variable (i.e., BMI) and logistic regressions for the dichotomous outcome variable (i.e., child overweight) to examine the association between maternal work schedules and child overweight, taking into account the covariates described in the previous section. We also conducted subanalyses to examine whether the association between maternal shift work and child overweight differed by family income and whether a child had ever lived with a single mother. Because the sample comprised 2353 children from 1703 families, standard errors in all analyses were adjusted for nonindependence using the cluster function in Stata version 9 statistical software (StataCorp LP, College Station, TX). For simplicity, we focused on the results for the parental work schedule variables (results for all other controls are available as a supplement to the online version of this article at http://www.ajph.org.)

RESULTS

Table 2 presents the unstandardized OLS regression coefficients with 95% confidence intervals of maternal work schedules on child's BMI at age 13 or 14 years. As seen in column 1, our results for the total sample suggest that the 3 nonstandard shift variables were significantly associated with child's BMI at 13 or 14 years of age, although the cubed term was only marginally significant. Specifically, after holding all other variables constant at their mean 1 to 5 years of shift work was significantly associated with predicted increases in child BMI at age 13 or 14 years, but this positive relationship was reversed if mothers worked nonstandard schedules for 6 to 9 years. However, a child's predicted BMI at 13 or 14 years of age increased within 10 years of nonstandard shifts by mothers.

Columns 2 through 5 of Table 2 present the OLS regression coefficients by family income. Our results indicate that the relationship between maternal nonstandard shifts and child's BMI seen in column 1 was largely driven by children in the second family-income quartile (family incomes near but above the poverty line). Columns 6 and 7 of Table 2 present OLS regression coefficients by family type and indicate that the main results from column 1 do not appear to be related to this variable.

Table 3 presents odds ratios with 95% confidence intervals representing the logistic regression estimates of maternal work schedules on children's risk of being overweight at age 13 or 14 years. As shown in column 1, all 3 maternal nonstandard shift variables were significantly associated with the odds of a child being overweight at age 13 or 14 years for the total sample. Specifically, 1 to 4 years of mothers working nonstandard schedules were significantly associated with an increased risk of a child being overweight at age 13 or 14 years. Additional years from 5 to 9 reduced this risk, but 10 years of nonstandard shifts was once again associated with increased risk of overweight. Results by family income confirmed that maternal nonstandard shifts were only significantly associated with the odds of a child being overweight in families with predicted incomes in the second quartile of the distribution.

Table 3 shows that although no significant associations were found between family type and BMI, mothers' years of nonstandard shifts were significantly related to child's risk of overweight in 2-parent families. The pattern of results for 2-parent families was comparable to that for the full sample. As in the full sample, between 1 and 4 years and 10 years of such shift work for children living in 2-parent families was associated with increased risk of overweight, whereas 5 to 9 years of such work posed a lower risk. Although we did not find a significant association for single-mother families, the directions and magnitudes of the coefficients for the maternal nonstandard shift variables for this group were similar to those found for 2-parent families.

To ease interpretation of the results, Figure 1 presents presents plots of predicted values for the OLS and logistic regression dependent variables by years of maternal nonstandard shifts after setting all other variables equal to their means. The 2 panels of the figure portray results only for those groups in which a significant relationship was evident. Figure 1a shows OLS estimates of predicted BMI for the total sample and for those families with predicted incomes in the second quartile of the distribution. In both cases, predicted BMI peaked initially around 2 years of nonstandard shifts by mothers, decreased to a low point around 7 years of nonstandard shifts and subsequently began to increase. Although indicative of relatively small effect sizes, these results suggest that when compared to children whose mothers did not work nonstandard shifts, a child may have a higher BMI if her or his mother works nonstandard shifts for either only a few years or almost every year by the time the child turns 13 or 14 years.

Figure 1b presents the logistic regression estimates of the predicted probability that a child is overweight for the total sample, families with predicted second-quartile incomes, and children who always lived in a 2-parent household. For all groups, the results indicated that children's predicted probability of being overweight increased when mothers worked nonstandard shifts for 1 to 4 years

TABLE 2—Ordinary Least Squares Regression Estimates of Maternal Work Schedules on Child's Body Mass Index (BMI) at Age 13 or 14 Years: National Longitudinal Survey of Youth and Child Supplement, 1979–2004

		Predicted Income				Mother's Parental Status	
Variable	Model 1: Full Sample (N = 2353), b (95% CI)	Model 2: Quartile 1 (n = 451), b (95% CI)	Model 3: Quartile 2 (n = 549), b (95% CI)	Model 4: Quartile 3 (n = 627), b (95% CI)	Model 5: Quartile 4 (n = 726), b (95% CI)	Never a Single Parent (n = 1157), b (95% CI)	Ever a Single Parent (n = 1196), b (95% CI)
No. of years mother worked nonstandard shift by the time child was aged 13 or 14 y	0.526** (0.023, 1.028)	1.133* (–0.129, 2.395)	1.397** (0.284, 2.510)	–0.216 (–1.181, 0.750)	0.342 (–0.418, 1.102)	0.428 (–0.259, 1.114)	0.561 (–0.185, 1.307)
No. of years mother worked nonstandard shift by the time child was aged 13 or 14 y (squared)	–0.156** (–0.310, –0.003)	–0.347* (–0.738, 0.045)	–0.402** (–0.742, –0.062)	–0.083 (–0.206, 0.372)	–0.099 (–0.320, 0.122)	–0.113 (–0.317, 0.091)	–0.163 (–0.393, 0.067)
No. of years mother worked nonstandard shift by the time child was aged 13 or 14 y (cubed)	0.011* (–0.001, 0.023)	0.026 (–0.005, 0.058)	0.029** (0.003, 0.055)	–0.009 (–0.031, 0.013)	0.007 (–0.010, 0.024)	0.007 (–0.009, 0.022)	0.012 (–0.006, 0.030)
R^2	0.130	0.176	0.193	0.126	0.144	0.123	0.147

Note. CI = confidence interval. Models controlled for whether the child was male, had low birthweight (< 2500 g), was first born, the child's race/ethnicity, mother's age at childbirth, mother's years of education at childbirth, mother's marital status at childbirth, the natural log of net family income in the year of childbirth, mother's Armed Forces Qualifications Test score, mother's BMI in 1981, the number of years a mother was a single parent by the time the child was aged 13 or 14 years, the number of years a family lived under the poverty line by the time the child was aged 13 or 14 years, the number of years a spouse or partner performed shift work by the time the child was aged 13 or 14 years, the average hours worked by spouse or partner by the time the child was aged 13 or 14 years, child television-watching hours, and how often a child ate together with both mother and father.
*P ≤ .10; **P ≤ .05.

TABLE 3—Logistic Regression Estimates of Maternal Work Schedules on the Risk of Child Being at Risk of Overweight or Overweight at Age 13 or 14 Years: National Longitudinal Survey of Youth and Child Supplement, 1979–2004

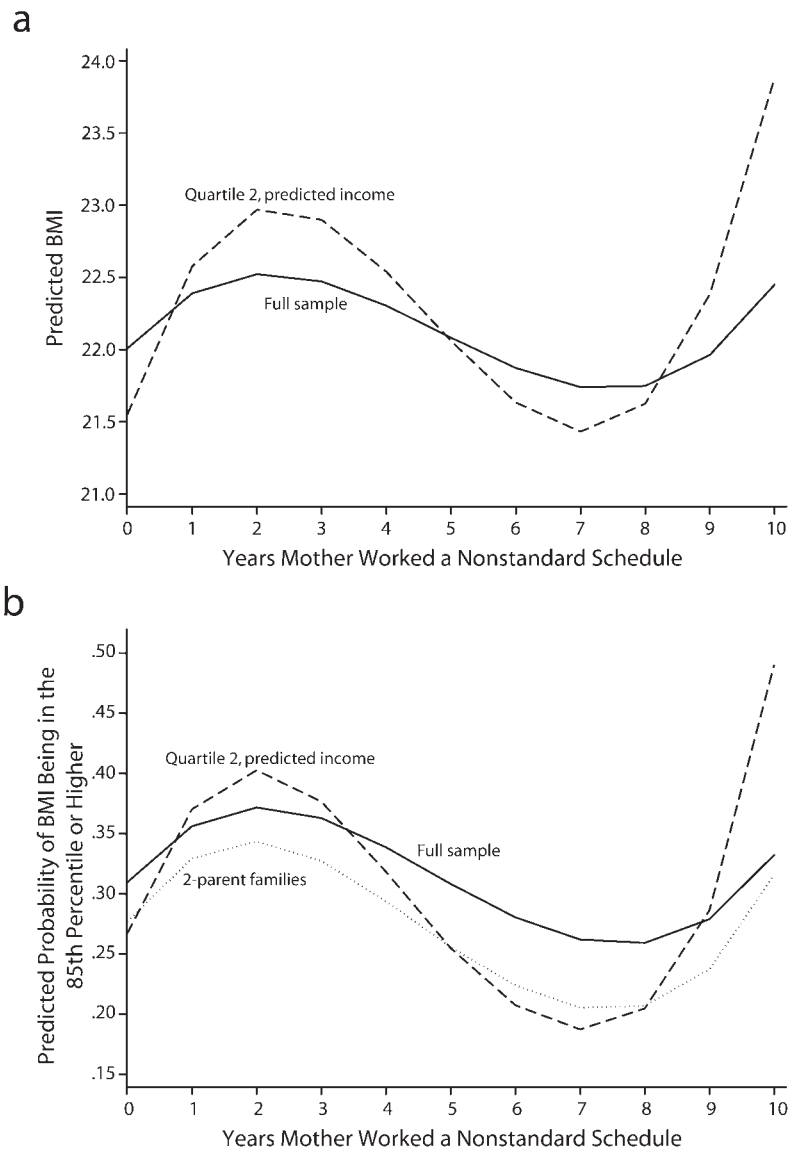
		Predicted Income				Mother's Parental Status	
Variable	Model 1: Full Sample (N = 2353), OR (95% CI)	Model 2: Quartile 1 (n = 451), OR (95% CI)	Model 3: Quartile 2 (n = 549), OR (95% CI)	Model 4: Quartile 3 (n = 627), OR (95% CI)	Model 5: Quartile 4 (n = 726), OR (95% CI)	Never a Single Parent (n = 1157), OR (95% CI)	Ever a Single Parent (n = 1196), OR (95% CI)
No. of years mother worked nonstandard shift by the time child was aged 13 or 14 y	1.341* (1.071, 1.679)	1.664 (0.971, 2.854)	1.974** (1.200, 3.262)	1.047 (0.684, 1.603)	1.183 (0.766, 1.828)	1.433* (1.032, 1.989)	1.250 (0.912, 1.712)
No. of years mother worked nonstandard shift by the time child was aged 13 or 14 y (squared)	0.914** (0.854, 0.979)	0.861 (0.728, 1.018)	0.803** (0.688, 0.937)	0.991 (0.871, 1.127)	0.959 (0.840, 1.095)	0.888* (0.803, 0.983)	0.945 (0.861, 1.038)
No. of years mother worked nonstandard shift by the time child was aged 13 or 14 y (cubed)	1.006* (1.001, 1.012)	1.011 (0.998, 1.025)	1.016* (1.004, 1.029)	0.999 (0.989, 1.009)	1.002 (0.992, 1.013)	1.008* (1.000, 1.017)	1.003 (0.996, 1.011)
Pseudo-R^2	0.075	0.091	0.129	0.086	0.116	0.092	0.076

Note. OR = odds ratio; CI = confidence interval. Models controlled for whether the child was male, had low birthweight (< 2500 g), was first born, the child's race/ethnicity, mother's age at childbirth, mother's years of education at childbirth, mother's marital status at childbirth, the natural log of net family income in the year of childbirth, mother's Armed Forces Qualifications Test score, mother's BMI in 1981, the number of years a mother was a single parent by the time the child was aged 13 or 14 years, the number of years a family lived under the poverty line by the time the child was aged 13 or 14 years, the number of years a spouse or partner performed shift work by the time the child was aged 13 or 14 years, the average hours worked by spouse or partner by the time the child was aged 13 or 14 years, child television-watching hours, and how often a child ate together with both mother and father.
*$P \leq .05$; **$P \leq .01$.

or for almost all years during the first 13 or 14 years of a child's life. This pattern was particularly pronounced for children in families with incomes in the second quartile of the income distribution.

DISCUSSION

Complementary to previous studies that have focused on work hours in examining the relationship between parental work and child overweight,[18–21] our analysis reveals a new factor contributing to this relationship. Specifically, the shift worked by mothers appears to be pertinent, particularly for families with incomes that put them in the near-poor category.



Note. BMI = body mass index.

FIGURE 1—Association of number of years of maternal nonstandard work shifts with predicted values of BMI (a) and probability of child overweight (b): National Longitudinal Survey of Youth–Child Supplement, 1979–2004.

Our results are robust in controlling for an extensive set of child, parental, and family characteristics, including mothers' work hours and potential mechanisms such as child's television watching and the frequency of children and parents eating meals together.

We may only speculate as to the mechanism underlying our results. The findings for those families with incomes in quartile 2 seem to confirm prior evidence that those living near the poverty line are relatively disadvantaged; indeed, their ineligibility to receive various types of government assistance may put them at an even greater disadvantage than those officially living in poverty.[37] Families in this group had a median family size of 4 and income of nearly $24 900 (in 2004 dollars) in the year of childbirth and a median family size of 4 and income of about $32 400 when the child was aged 13 or 14 years. Although these amounts place these families above the federal poverty line ($18 850 for a family of 4 in 2004), they also place them out of the eligibility range for a number of public programs. Another explanation may be that these mothers are forced into jobs requiring nonstandard shifts, which might be disruptive to family meal preparation and activity routines. Indeed, a significantly higher proportion of mothers from this group had ever worked an evening shift by the time a child was aged 13 or 14 years (43.5%) than those in the third or top income quartiles (36.8 and 22.9, respectively). However, the available data offer no direct proof that these mothers were forced into their jobs.

The significant association between maternal nonstandard shifts and child overweight for 2-parent families and for families with incomes near the poverty line underscores the difficulties faced by two-parent working poor families. Our findings also highlight that mothers working nonstandard shifts for only a few years or almost all of the time may provide different home environments, which in turn may have implications for children's BMI. The former group may include mothers who had to temporarily work nonstandard shifts because of some unexpected situation (e.g., spouse's unemployment) that disrupted the existing family arrangement. The latter group may represent a long-term arrangement wherein children do not consistently have adults available for dinner or breakfast or to help them participate in sports, which may have profound implications for food consumption and activity levels.

Despite the fact that predicted BMI and probability of overweight were higher for children whose mothers worked a few or many years at nonstandard shifts, it is important to note that in most cases around 5 to 9 years of maternal shift work was associated with decreased BMI and a lower probability of overweight when compared with families in which mothers never worked nonstandard shifts. This may have been caused in part by a family's ability to adjust to mothers' work schedules. Nonetheless, beyond this point, we observed that additional years of maternal nonstandard shifts were associated with predicted increases in BMI and risk for child overweight, which suggests the potential

long-term effects this work may have on children.

Still, the exact mechanisms behind the relationship between maternal work schedules and child overweight remain unclear. No clear patterns were evident between television watching or family meals and child overweight, and taking into account these potential pathways did not explain the links between maternal work schedules and child overweight.

Not all parents have the option of choosing their shifts; for many parents, particularly mothers working in low-income, low-skilled positions, a nonstandard shift is a job requirement that can upset the work–family balance. Nonetheless, appropriate solutions are possible. Community-based programs might be offered to inform families about how to best prevent overweight. For instance, mothers from at-risk families might be educated on how to prepare inexpensive and healthy meals in a short amount of time or how to prepare food in advance (e.g., by cooking the week's meals on days off).

Despite its limitations, this study contributes toward a better understanding of the continued incidence of overweight among youth by illuminating the role played by parental work schedules. Nonetheless, additional fine-grained research is needed to further our understanding of how parental work schedules may affect child health. For instance, exploring nonstandard shifts in different employment sectors (e.g., health care fields) would be useful; it is possible that health care workers may be more knowledgeable and skillful in providing healthy meals and encouraging physical activity despite working nonstandard shifts. This may offset the effects of a parent's work schedule on a child's well-being. With a sizable proportion of parents working nonstandard shifts, more research is warranted to more fully understand the implications that work–family arrangements may have for adolescent and child overweight. ■

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Contributors

D.P. Miller conceptualized the study, conducted the analysis, and led the writing of the article. W-J Han framed the analysis, developed the coding scheme, and assisted in the writing of the article. Both authors interpreted findings and reviewed drafts of the article.

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Human Participant Protection

Because this study employed only the analysis of deidentified secondary data, no protocol approval was needed.

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