**Maternal Nonstandard Work Schedule, Children's Dietary Patterns, and Their Body Mass Index**

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**Abstract**
This paper examines the impact of maternal nonstandard work schedule (e.g., evening, night and irregular shifts) on their children's body mass index (BMI) with a particular focus on the Korean population. I further examine the extent to which children's dietary pattern (e.g., frequency of skipping breakfast and meals away from home) moderates the effect of maternal nonstandard work schedule on children's BMI. Using a nationally representative sample of children (age 2 – 18), I find that, when mothers work at nonstandard times, the odds of their children being overweight or obese are 85% higher than those whose mothers work at standard times, and this association is mediated by frequency of meals away from home. The adverse effect of maternal nonstandard work schedules is more significant for adolescents. However, these associations are not evident for children (under age 12), indicating mechanisms which precipitate obesogenic environment may operate differently by age group.

**Extended abstract:**

**Introduction**

As many societies are transitioning from industrial and post-industrial economics to service economies, so-called "24/7 economy" has driven a rise in nonstandard work schedules (Presser, 2005; Strazdins et al., 2004). These nonstandard shifts, such as evenings, and nights, weekends, or schedules that frequently change additionally, raised concerns about its impact on children's BMI, which has largely overlooked in the literature to date. Compared to women working at "traditional" work schedule (e.g., Monday through Friday, 9:00AM to 5:00PM), nonstandard work schedules may disrupt sleep patterns and increase work-family conflict due to the arrangement of schedule falling outside the daytime shift range. In fact, women working at these "nontraditional" work schedules may be more likely to feel fatigue, depression, and stress, which contribute to the adoption of "obesogenic environment" (i.e., more sedentary lifestyle and less healthy eating habits)). Although some studies examined the adverse effect of maternal nonstandard work schedules on childhood obesity, they are limited to high-income Western countries with inconsistent findings across cultures (Miller and Han, 2008; Morrissey et al., 2011). Given that many Asian countries having experienced a similar trend of increase female labor force participation as western countries in the past decades, this is an unfortunate gap in the literature. Generalizing the findings from these studies to a specific Asian context is difficult because of its own particular social, cultural and institutional contexts (Ahn, 2013).

Korea provides a particularly relevant setting for studying the effects of maternal nonstandard work schedule on children's BMI in a non-Western context. *First*, unlike western countries where epidemic trend of childhood obesity corresponds to the increase in maternal employment rate (Wang and Lobstein, 2006*)*, an increase in observed prevalence of overweight and obesity in Korea does not coincide with the change in the female labor force participation in Korea. For example, the prevalence of childhood obesity in Korea 70% increased between 1997 and 2005 (Oh et al., 2008), while the female employment rate remains about the same as two decades ago at just 55 percent. *Second*, despite of rapid economic growth and its economic success within the past few decades, women's employment in Korea has remained in the '*M-shape*' patterns over the life course, indicating Korean women in certain age groups exit the labor market and later reenter (Chin, 1995; Chin et al., 2012; Cooke, 2010). Unlike the 'inverted U-shape' pattern observed in high-income Western developed countries (Lee, Jang, & Sarkar, 2008), 'M-shape' in Korea may suggest a different nature of the relationship between maternal employment and children's weight. Perhaps because Korean mothers tend to stay at home to raise their own children during early childhood, maternal employment may not be a strong predictor of children's weight (age 2-12). In turn, Korean stay-at-home mothers may be free from time constraint due to work-home conflict but rather play a preventive role in providing and encouraging healthier home environment in early childhood. Once reentering the work force, however, limiting their time for both personal and domestic activities may be consequential for employed mothers, generating difficulties of preparing home meals and supervising their children's daily activities which precipitates obesogenic home environment. *Third*, the surge of the labor force participation of Korean married women in their 40s has been accompanied by the collapse of lifetime-employment systems and the escalated job insecurity in Korean firms, which used to ensure that a single (male) worker's income could support a middle-class family. To make matters worse, a large proportion of these women are reentering into non-standard employment (Cooke, 2010). According to Korea Labor Institute, the percentage of mothers working at nonstandard times has gradually increased as only 11.4% of Korean mothers were employed at nonstandard times in 2002, 14.1% in 2007, and 18.2% in 2012 (Korean Labor Institute, 2012). Over a decade, the numbers of mothers working at evening, night, or irregular shifts got doubled. Given these distinctive features regarding maternal employment in Korea, I seek to understand whether the adverse effect of maternal nonstandard work schedules on children's BMI is also evident in Korea. I hypothesize that (1) maternal nonstandard work schedules may be positively associated with children's BMI even after adjusting for individual socio-demographic characteristics as well as genetic factors, and that (2) children's dietary patterns may mediate this association. I believe this may be due to children's poor dietary

patterns accompanied by less homemade meals (i.e., breakfast and dinner) and more frequent dining-out meals responsive to time constraints of mothers. I aim to further investigate this association by age group (e.g., children vs. adolescents)

**Data**

I use the Fifth KNHANES V 2010, a nationally representative sample of Korean households collected by the Korea Centers for Disease Control and Prevention (KCDCP). One useful feature of these data is that the KNHANES collects a wide variety of health-related information including nutrition and dietary diary and health examination (e.g., weight/height, breastfeeding, birth weight, health behaviors), and an array of socio-demographic characteristics. The analytical sample consists of all children and adolescents who met three selection criteria: 1) participated in data collection of health examination of height/weight, 2) participated in data collection of dietary diary for breakfast, dinner and dining-out meals and 3) members of two parent families only (N=2,035). Data on age, education, breastfeeding, birth weight, household income, marital status, and dietary patterns were used. Children's BMIs were measured and classified as overweight or obese using the age- and sex- specific percentile for BMI from 2007 Korean CDC National Growth Chart. Due to a small sample size, overweight and obese are collapsed into one category.

**Preliminary results**

Table 1 suggests the association between parental work schedule and children's weight is largely driven by maternal work schedules, while paternal work schedules are not evident. This seems particularly reasonable for a condition in Korea where the gendered division of household labor is predominant and mothers continue to assume primary responsibilities for childcare, despite increased labor force participation of mothers. Furthermore, Table 1 shows that the younger children are, the lower the odds of being overweight. Consistent with 'M-shape', this may suggest that Korean mothers are more likely stay at home at the younger children's age until they enter middle school, which may contribute healthier home environment and, therefore, prevent childhood obesity.

To further examine differential effects by children's age reflecting 'M-shape' of female labor force participation in Korea, I test whether age-stratified analyses account for the differences in the impact of maternal work schedule on children's weight. Table 3 suggests that it is adolescence, which is transparently most vulnerable to mother's work schedule. For the younger children's age group, this association no longer remained, and the impact of mothers working at nonstandard work schedules is no longer statistically significant when stratified by age. In contrast, the odds of an adolescent being overweight when mothers working at nonstandard work schedules were much higher than any case holding all other covariates constant (OR=3.26, 95% CI = 1.33-8.00). It is possible that because adolescences generally have more independence and less adult supervision over their time use and food choices than preschool and school age children, maternal work schedule precipitates poorer and unhealthier food choices. In accordance with Table 1, the effect of meals away from home makes a significant contribution to the model. (OR=1.86, 95%=1.16-2.87). These initial results indicate that having a mother who works at nonstandard work schedule was strongly associated with children being overweight. More importantly, including one of theorized mediators, meals away from home, appears to mediate this association. Accordingly, this analytical strategy allows for an assessment of the extent to which children's dietary patterns are partly responsible for the rise in the likelihood of children being overweight along with their mother's work schedule. Future work will explore associations linking maternal nonstandard work schedule to children's BMI stratified by family structure with a particular focus on multigenerational household, since it is not clear whether grandparents will be preventive (e.g., supervising snacking) or a risk for childhood obesity (e.g., spoiling their grandkids). I believe this will allow me to incorporate the role of grandparent on children's dietary patterns when mothers are absent at home, which may confound children's weight status.

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Table 1. The association between mother's work schedules and child overweight

| | Model 1<br>OR (95% CI) | Model 2<br>OR (95% CI) | Model 3<br>OR (95% CI) | Model 4<br>OR (95% CI) |
|---|---|---|---|---|
| *Mother's work schedule* | | | | |
| Standard – referent | | | | |
| Nonstandard | 1.85*(1.03, 3.34) | 1.96*(1.07, 3.58) | 1.93*(1.06, 3.48) | 1.95*(1.07, 3.56) |
| Not employed | 0.99 (0.63, 1.56) | 1.10 (0.69, 1.74) | 1.11 (0.70, 1.75) | 1.09 (0.69, 1.74) |
| *Determinants of Diet* | | | | |
| Breakfast with family | | 0.94 (0.59, 1.49) | | |
| Dinner with family | | | 1.61 (0.82, 3.13) | |
| Meals away from home | | | | 1.33* (1.04, 1.68) |
| *Socio-economic Characteristics* | | | | |
| Children's age | 0.85*** (0.80, 0.90) | 0.86*** (0.80, 0.91) | 0.83*** (0.77, 0.89) | 0.86***(0.81, 0.92) |
| Female | 0.35*** (0.25, 0.51) | 0.31*** (0.21, 0.46) | 0.31*** (0.21, 0.46) | 0.31*** (0.21, 0.46) |
| Father's work schedule | | | | |
| Standard -referent | | | | |
| Nonstandard | 1.22 (0.69, 2.15) | 1.30 (0.74, 2.28) | 1.23 (0.70, 2.16) | 1.28 (0.73, 2.26) |
| Not-employed | 0.90 (0.31, 2.59) | 0.97 (0.34, 0.28) | 0.97 (0.35, 2.65) | 0.97 (0.34, 2.77) |
| Mother's education≥12 | 0.89 (0.57, 1.39) | 0.87 (0.55, 1.38) | 0.87 (0.55, 1.37) | 0.87 (0.55, 1.38) |
| Father's education ≥12 | 0.73 (0.45, 1.17) | 0.69 (0.42, 0.12) | 0.69 (0.42, 1.12) | 0.70 (0.43, 1.14) |
| Household income | | | | |
| 1st quartile – referent | | | | |
| 2nd quartile | 0.92 (0.31, 2.68) | 0.68 (0.21, 2.15) | 0.68 (0.22, 2.15) | 0.69 (0.22, 2.16) |
| 3rd quartile | 1.24 (0.48, 3.17) | 1.04 (0.37, 2.92) | 1.05 (0.38, 2.94) | 1.05 (0.37, 2.93) |
| 4th quartile | 1.27 (0.46, 3.47) | 1.08 (0.36, 3.24) | 1.06 (0.35, 3.20) | 1.09 (0.37, 3.26) |
| Child birth weight | 1.06 (0.69, 1.61) | 1.04 (0.67, 1.61) | 1.05 (0.68, 1.63) | 1.02 (0.65, 1.59) |
| Age of mothers at child's birth | 0.97 (0.92, 1.01) | 0.96 (0.92, 1.01) | 0.96 (0.92, 1.01) | 0.96 (0.92, 1.01) |
| Breastfeeding | 1.08 (0.71, 1.65) | 1.02 (0.67, 1.55) | 0.99 (0.66, 1.49) | 1.02 (0.68, 1.55) |
| Mother's weight status | | | | |
| Normal- referent | | | | |
| Overweight | 2.60***(1.58, 4.30) | 2.56*** (1.50, 4.37) | 2.58*** (1.51, 4.40) | 2.56*** (1.50, 4.38) |
| Obese | 1.96* (0.54, 7.09) | 2.60 (0.65, 10.29) | 2.63 (0.65, 10.58) | 2.72 (0.69, 10.76) |

*p<0.05, **p<0.01 ***p<0.001

Table 2. The association between mother's work schedules and child overweight by age

| | Children (Age 2- 12)[a] | Adolescence (Age 13-18) |
|---|---|---|
| | OR (95% CI) | OR (95% CI) |
| *Mother's work schedule* | | |
| Standard – referent | | |
| Nonstandard | 1.27 (0.63, 2.54) | 3.26* (1.33, 8.00) |
| Not employed | 0.98 (0.64, 1.52) | 1.51 (0.66, 3.46) |
| *Determinants of Diet* | | |
| Breakfast with family | 1.36 (0.82, 2.27) | 0.64 (0.31, 1.33) |
| Dinner with family | 1.82 (0.57, 5.79) | 1.49 (0.60, 3.71) |
| Meals away from home | 0.97 (0.80, 1.18) | 1.86** (1.16, 2.87) |
| *Socio-economic Characteristics* | | |
| Female | 0.50** (0.33, 0.78) | 0.22** (0.11, 0.44) |
| Father's work schedule | | |
| Standard -referent | | |
| Nonstandard | 1.07 (0.64, 1.52) | 1.68 (0.69, 4.08) |
| Not-employed | 0.73 (0.22, 2.40) | 1.69 (0.36, 7.82) |
| Mother's education ≥12 | 0.75 (0.50, 1.13) | 1.10 (0.53, 2.28) |
| Father's education ≥12 | 0.87 (0.52, 1.47) | 1.56 (0.24, 1.27) |
| Household income | | |
| 1st quartile – referent | | |
| 2nd quartile | 0.70 (0.25, 1.94) | 0.63 (0.12, 3.40) |
| 3rd quartile | 1.00 (0.38, 2.64) | 0.65 (0.13, 3.14) |
| 4th quartile | 0.94 (0.34, 2.65) | 0.72 (0.14, 3.76) |
| Child birth weight | 1.34 (0.86, 2.09) | 1.06 (0.49, 2.30) |
| Age of mothers at child's birth | 1.00 (0.95, 1.04) | 0.95 (0.89, 1.02) |
| Breastfeeding | 1.49 (0.97, 2.30) | 0.79 (0.37, 1.70) |
| Mother's weight status | | |
| Normal- referent | | |
| Overweight | 2.03* (1.16, 3.54) | 3.73*** (1.78, 7.81) |
| Obese | 2.32 (0.71, 7.54) | 9.77* (1.32, 72.56) |

*p<0.05, **p<0.01 ***p<0.001

[a] The wald test was conducted for the hypothesis that the coefficients of both ages are the same. Findings suggested that the coefficients are statistically different from each other.