Risk of low birth weight associated with family poverty in Korea

Bong Joo Lee [a,*], Se Hee Lim [b]

[a] *Department of Social Welfare, Seoul National University, 599 Gwanak-Ro, Gwanak-Gu, Seoul, South Korea 151-746*
[b] *Department of Social Welfare, Hallym University, 39 Hallymdaehak-gil, Chuncheon, Gangwon-do 200-782, South Korea*

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ABSTRACT

The primary purpose of our study is to examine the effects of family poverty on low birth weight using individual-level data from a longitudinal survey based on nationally representative sample in Korea. In this paper, we also aim to extend our understanding of the relationship between poverty and low birth weight by examining what factors mediate the effects of poverty on low birth weight. We find that there is a significant relationship between family poverty and the likelihood of low birth weight. Even after controlling for other sociodemographic variables in our models, we find that family poverty is a strong predictor of a low birth weight birth. We also find that mother's depression partially mediates the effect of poverty on low birth weight. Our results suggest that more prevention-based prenatal services are needed for low income pregnant women in Korea. Comprehensive prenatal services that include parental education, counseling, nutritional services, screening services, and home visitation can be an effective policy tool to prevent low birth weight births.

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1. Introduction

The recent trend of low birth weight suggests that the status of Korean children's health is deteriorating. The rate of low birth weight increased about 60% from 2.56% in 1993 to 4.13% in 2004 in Korea (Ministry of Health and Welfare & Seoul National University Institute of Social Welfare, 2007). Along with increasing low birth weight, infant mortality rate increased approximately 50% from 3 per 1000 live births in 1990 to 4.6 per 1000 live births (Ministry of Health and Welfare & Seoul National University Institute of Social Welfare, 2007).

Although major child health indicators show deteriorating status of children's health, there has been very little empirical research on causes for such a trend in Korea. Based on research in other countries that showed family's socioeconomic characteristics as major risk factors associated with low birth weight, there only has been large speculation as to socioeconomic factors might have been the primary reasons for increasing low birth weight in Korea. Only recently, there has been some research interest in examining the relationship between low birth weight and family's socioeconomic status in Korea. Son (2004) and Lee and Hong (2003) showed differences in low birth weight rates across income and education levels using birth certificate data reported to the Korea National Statistical Office. Their findings are significant in that they showed low birth weight is not only a medical concern but also a social problem related to inequality in Korea. However, there were limitations to the previous studies.

Recent studies by Son (2004) and Lee and Hong (2003) relied on cross-sectional, aggregate-level data from the secondary data sources. Such a strategy is limited in their ability to identify the independent effects of various demographic and socioeconomic factors on low birth weight. Aggregate-level analyses often fail to disentangle the data into its components, and therefore the results are not comparable across different subpopulations. Cross-sectional data are also limited in identifying the time order of events of interest such as family income status and child birth.

These methodological limitations suggest the need for a different approach. The primary purpose of our study is to examine the effects of family poverty on low birth weight using individual-level data from a longitudinal survey based on nationally representative sample in Korea. In this paper, we also aim to extend our understanding of the relationship between poverty and low birth weight by examining what factors mediate the effects of poverty on low birth weight.

2. Previous research

The rate of low birth weight is a primary indicator of children's health in a society. It is also a major summary indicator of a country's public health. The World Health Organization (WHO), in fact, uses low birth weight rate as a primary indicator of public health along with mother's prenatal nutritional status, working condition, and prenatal care (UNICEF & WHO, 2004). WHO specifies low birth weight as weight at birth less than 2.5 kg. The definition is based on a study result that showed the risk of infant death is 20 times greater for babies born with weight less than 2.5 kg compared to those with birth weight 2.5 kg or higher (Kramer, 1987).

* Corresponding author. Tel.: +82 2 880 5724; fax: +82 2 875 5724.
E-mail addresses: bongjlee@snu.ac.kr (B.J. Lee), shlim32@hanmail.net (S.H. Lim).

Low birth weight is known to be associated with infant death, retarded growth, cognitive development, and school achievement of a child. It is also associated with risk of chronic disease at later life.

Low birth weight due to restricted fetal growth affects the individuals throughout life and is associated with poor growth in childhood and a higher incidence of adult diseases, such as type 2 diabetes, hypertension and cardiovascular diseases. An additional risk for girls is having smaller babies when they become mothers (UNICEF & WHO, 2004). Reichman (2005) estimated that black babies continue to be twice as likely as white babies to be low birth weight and although the most serious birth weight-related disabilities affect a very small share of children, low birth weight explains at most 3–4% of the racial gap in IQ scores. Low birth weight babies are more likely to have significantly more severe bronchial asthma symptoms between 8-year-olds and 18-year-olds than the control group (Jeoung, Kim, Lee, & Lee, 2006).

These consequences have a lasting impact on individual's outcomes, net of socioeconomic conditions. Conley and Bennett (2000) showed that low birth weight had negative effects on educational progress, even after factoring out family-specific conditions. The effect of being born with low birth weight is dramatic in the fixed-effects model. A low birth-weight child is substantially less likely to graduate from high school by 19 years of age, with the probability of graduation reduced by 74%, as compared with his or her siblings. The effect associated with adverse birth outcomes is significantly more pronounced at very low birth weight than at moderately low birth weights (Boardman, Power, Padilla, & Hummer, 2002).

Most studies show that low socioeconomic status is associated with increased risk of low birth weight (Frederik & Adelstein, 1978; Berkowitz, 1981; Paneth, Wallenstein, Kiely, & Susser, 1982; Horon, Strobino, & MacDonald, 1983; Elbourne, Prichard, & Dauncye, 1986; Liberman, Ryan, & Menson, 1987).

Berkowitz (1981) showed that women on lower socioeconomic levels have been found to be at significantly higher risk of preterm delivery, even when controlling for other known risk factors such as pregnant weight, weight gain, alcohol and tobacco consumption, race, parity, and source of prenatal care. This association persists across various measures of socioeconomic status, including occupation of the mother and/or father, income, and education (Hughes & Simpson, 1995). Conley and Bennett (2000) found that as income-to-needs ratio increases 1, rate of low birth weight decreases by 13%. This income effect remained significant even after controlling for the level of mother's education, gender, birth order, and race/ethnicity. Delayed childbearing also has been identified as a primary risk factor in many empirical studies. Specifically advanced maternal age more than 34 years has been found to be strongly associated with increased risk of low birth weight. A recent study shows that the rate of low birth weight for advanced maternal age (≥35 years) is 60% greater than those mothers aged 20 to 34 for the first child. For the birth order greater than the first child, the rate increased about 16% for advanced maternal age group (Khoshnood, Wall, & Lee, 2005).

Lower birth weight was associated with mothers who had smoked during pregnancy (Rush & Cassano, 1983; Phung et al., 2003); drinking is also significantly related to low birth weight delivery (Pamuk & Mosher, 1988).

Schreck (1999) showed that black women in New York City are nearly twice as likely as white women to have a low birth weight baby, but differences in risk among black women appear when their place of birth is examined. He explained that this may be the result of their early health experiences. Mother's work or work conditions were associated with low birth weight. Working more than 5 consecutive days, demanding posture, whole-body vibration, and high strain combined with low or moderate social support remained associated with preterm delivery, with odds ratios ranging from 1.3 to 2.6 (Croteau, Marcoux, & Brisson, 2007).

Previous literatures in Korea, with exceptions of Son (2004) and Lee and Hong (2003), have focused on medical factors in understanding the causes of low birth weight (Park, Park, Lee, & Moon, 1991; Kim, Park, & Lee, 1993; Hong & Park, 1999; Park, Kim, & Bang, 2002). According to these researches, short gestational weeks, toxemia of pregnancy, premature rupture of membranes, low maternal weight gain during pregnancy, short height, maternal age and smoking are related to low birth weight delivery.

These medical studies, however, are limited in that they have not considered socioeconomic factors. A few studies that have looked at socioeconomic factors have only examined the effect of educational level or employment status. Son (2004) and Lee & Hong (2003) are focused on the effects of socioeconomic factors. Lee & Hong (2003) showed that there was a difference in the risk for low birth weight by social strata in Korea. After adjustment for major independent variables including maternal age and birth order, the risk for low birth weight of the fifth social class was significantly higher than that of the first social class. Son (2004) showed that parent with lower education have higher low birth weight rates compared with parents with university level of education. The differences in birth weight by parent's social class, especially parent's educational level became stronger between 1995 and 2001.

The pathways how low socioeconomic status represented by poverty affects low birth weight can be considered in various ways (Institute of Medicine, Committee to Study the Prevention of Low Birthweight, 1985; Starfield & Budetti, 1985; Newacheck, 1988; Klerman, 1991). First, vulnerable social economic status is a result of low income. Low income can result in economic deprivation such as inadequate nutrition, housing, and access to health services. Economic deprivation, itself, in turn can result in low birth weight. Second, mental health problem such as depression associated with low socioeconomic status can be a pathway. Economic hardship can result in conflicts in family and social relationships that can eventually lead to low level of life satisfaction and high level of stress. Stressful events during pregnancy may result in preterm births through changes in hormone levels, which in turn causes low birth weight births (Whitehead, Hill, Brogan, & Blackmore-Prince, 2002). Increased stress is a major factor leading to psychological problems including depression (Kwon, 1996; Park, 2003; Kim & Shin, 2004; Kim, 2007). Many studies also report that poverty is strongly related to depression (Bell, 1990; Mirowsky & Ross, 2001; Park & Lee, 2004; Eom, 2008). Third, unhealthy behaviors found more in the low income population can increase the risk of low birth weight births among low income mothers. Low income women can rely more on unhealthy behaviors such as drinking and smoking when they are denied adequate housing, nutrition, and employment (Shiono & Behrman, 1995). It is reported that the rate of smoking is higher among low income population (DHS, 2002), and that the percentage of mothers who drank alcohol during pregnancy varies between each income group (DHS, 2003). Rush and Cassano (1983) found that smoking is significantly related to low birth weight even after controlling for socioeconomic factors. Pamuk and Mosher (1988) also reported that drinking during pregnancy increases the risk of low birth weight births.

3. Data and methods

3.1. Data

The study uses data from the Korea Welfare Panel from 2006 to 2008. The Korea Welfare Panel Data is an annual survey of following 7072 nationally represented samples of Korean households from 2006. Specifically, we pulled data on newborn children from 2006 to 2007 and their mother's characteristics during the pregnancy period from 2005 to 2006. Taking advantage of longitudinal dataset, we linked mother's pregnancy period characteristics of 2005 to the