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보건학 석사 학위논문

**Influence of Household Environment
and Food Security on
Children's Physical Growth**

가구환경 및 식품 안정성이 유아 신체성장에
미치는 영향

2015년 8월

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보건학과 보건정책관리전공

김 지 현

Influence of Household Environment and Food Security on Children's Physical Growth

지도 교수 이 태 진

이 논문을 보건학 석사 학위논문으로 제출함
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서울대학교 대학원
보건학과 보건정책관리전공
김 지 현

김 지 현의 석사 학위논문을 인준함
2015년 7월

위 원 장 김 홍 수 (인)

부위원장 유 승 현 (인)

위 원 이 태 진 (인)

Abstract

Background

The guardians' care and the amount and quality of resources are crucial for managing young children's growth. However, gap in growth between children with different household environment still remains as major public health concerns among young Korean children who are facing rapid social changes. Considering that children's growth is ultimately defined by the amount and quality of nutrition, the effect of household food security on children's growth and interaction between their household environments should be studied

Objective

This study aimed to identify the transition of children's stunted growth and overweight growth between 2009 and 2012. The relationship between household food security and household income level was studied. In addition, the influence of parental socioeconomic status (SES) and child care environment and how it is changed by the food security in the household were analyzed.

Methods

This study used the 4th (2009) and 5th (2010-2012) Korean Health and Nutritional Examination Surveys for data. Study participants were children aged 24 to 60 months old, except the one who had missing height or weight information or diagnosed with congenital heart disease. The significant influence of household income level on household food security was analyzed using logistic regression after controlling such variables as the characteristics of the head of the household, family member, household type, and external assistance related to food supplement or child care.

Household food security reflecting household's nutritional environment and economic circumstances, parental SES except household income level, and child care environment were used as the independent variables in the study of the influence of household environment on children's physical growth. The 2006 World Health Organization's Children Growth Standards was used to identify normal and abnormal height and weight. A two-stage stratified systematic sampling method was applied in both logistic regression analyses.

Results

The prevalence of stunted growth was lower than 2% in each year but the prevalence of overweight growth was higher than that of stunted growth in each year and the annual changes of the prevalence of overweight was more rapid to that of stunted growth. Household income level had a significant influence on determining household food security; the lower the household income, the more the household is likely to be in a food insecure status. Household food security, parental SES and child care environment exerted significant effects on both children's height and weight. In particular, household food security, mothers' educational level, and the use of child care facility were the most influential factors to children's stunted growth, while the frequency of having meals with family member was distinctively significant to children's overweight growth. Household food security and mothers' educational level remained as the most influential factor on children's stunted growth in all of the study models that applied interaction terms. In contrast, the frequency of having meals with family member remained as significant factor to children's overweight growth after applying interaction between household food security and household environment. However, there were no significant interaction terms between household food security,

parental SES, and child care environment.

Conclusions

This study demonstrated that food secured environment, mothers' educational level, and caregivers' responsive care were important variables for young children's normal growth. Therefore, multidimensional reviews of children's household environments should be considered in child growth study. National policy in regard to child care assistance should take an approach in researching children's nutritional environment and providing child care assistance service programs to household in food insecure status.

Keywords: Young Children, Stunting, Overweight, Household Environment, Household Food Security.

Student Number: 2013-21836

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I. INTRODUCTION

A. Study Background

Children have enormous potential for the development of a health condition during the course of their lives. Children's potentials for achieving a balanced health are supported not only by genetic inheritance but also through their environments. According to Article 27 of the UN Convention on the Rights of the Child, children are entitled to have an adequate standard of living during the early stage of development, and countries are obliged to recognizing the rights of children; provide special care, such as medical assistance and nutritional provision; and managing children's social well-being. In particular, due to their immature physical and mental states, young children's welfare is highly dependent on the extent of their guardians' care and the amount and quality of the resources provided. Therefore, the secured protection of children is crucial for balanced health management and improvement in social well-being.

Furthermore, young children's health has crucial implications with respect to predicting health in adulthood. A causal relationship between growth problems and poor quality of life has been frequently reported. Failure to obtain normal growth in the early stage of childhood can cause serious illness in both childhood and adulthood (Wadsworth et al., 1997; Cameron et al., 2002). Malnutrition, the most representative

sign of failure to receive the required resources, is related to weakened immunity and susceptibility in infectious disease (WHO, 1995).

Although children's growth is of considerable importance, many children are continuously unable to achieve normal growth status. Differences in the standards of living increase the disparity in growth between children, which ultimately leads to health inequality. In Korea, despite four decades of economic development and improvements in general living conditions, the gap in growth between children from high and low income families remains major public health concerns (Kim et al., 2008). A study conducted in 2011 reported that height differences between children aged 10 to 16 years increased according to the gap between their household incomes (Kim et al., 2011). With respect to weight, although the prevalence of underweight has decreased substantially, that of overweight has shown trends in the opposite direction (International Food Policy Research Institute, 2014). Adequate and qualified provision of nutrition and guidance of having proper diet habit were the most crucial determinants for children's growth (Oh et al., 2003; Vereecken et al., 2004). Low income has been identified as a major cause of abnormal growth for children in several international studies (Kim et al., 2011). In addition, according to the national reports showing recent social trends (Ministry of Health and Welfare 2008, Statistics Korea 2010; Ministry of Gender Equality and Family 2010), other variables such as increased numbers of dual earner households and income gap between households were

important for balanced management of nutritional environment for young children. It was reported that parents from dual earner households had twice lesser average hours per day for looking after family member than that of single earner household (Statistics Korea, 2010) and 21.2% of dual earner households were having difficulty with managing their young children's nourishment (Ministry of Gender Equality and Family, 2010). A total of 41.4% of dual earner households were rely on the child care facility to replace their absence for parenting. However, for those dual earner households not using the child care facilities, 29.5% were due to low income of the household (Ministry of Gender Equality and Family, 2010).

In addition, household income gap was also a possible determinant of causing nutritional environment disparity between young children. It was found that 47.5% of low income households who earned less than one million KRW per month had a difficulty in managing their children's nutrition and health (Ministry of Gender Equality and Family, 2010). In particular, there was distinctive differences in overall satisfaction in dietary life and balanced eating among households with different income levels; low income households had a difficulty in securing adequate amount of food (24.6%) and managing balanced diet (28.8%), compared to that of middle and high income households (Ministry of Health and Welfare, 2008).

With these social and dietary life factors, children are exposed to intensively complicated environments which would give significant influences on children's

physical growth. Although young children are more sensitive than older children to the quality of the surrounding environment, most child-growth studies conducted in Korea have focused on school-aged children. Child health studies focused on infants and young aged children are scant (Park et al., 2007). In some studies done with young children, only nutrient level and dietary habits had been generally used to assess health conditions security (Son et al., 1999; Seo et al., 2009).

Although duration of poverty was related to children's growth environment (Park et al., 2007), it alone may not explain the children's growth because many factors like receiving proper education, having decent dwelling environment, and taking proper nutrition can also be influential (Joung et al., 2014). Therefore, young children's growth potential should be approached with multidimensional perspectives by taking parents' socioeconomic positions, household's nutritional environment, and child care environment. The challenge faced by young children with respect to new social changes and nutritional stability, household environment should be considered to represent their circumstances. However, regarding that children's growth is ultimately defined by the amount and quality of nutrition, it is crucial to analyze influence of household's nutritional circumstance and the interactions between their parental SES and child care environment on children's growth. Therefore, rather than merely measuring the influence of parental SES on children's growth, this study aimed to

analyze both the influence of parental SES and child care environment and how it is altered by household food security.

B. Study Objectives

Therefore, the objectives of the study were as follows;

(1) To analyze the transition in children's stunted growth and overweight between 2009 and 2012,

(2) To analyze the relationship between household income level and household food security so as to demonstrate the effects of household food security on young children's physical growth as a possible indicator,

(3) To analyze the effects of household food security, parental SES, and child care environment on children's stunted growth and overweight,

(4) To analyze the impact of household food security and the interaction with parental SES and child care environment on children's stunted growth and overweight.

II. THEORETICAL BACKGROUND

A. Children's Growth

Anthropometry is used universally to assess fundamental health conditions in children. The representative indicators of abnormal height and weight conditions include stunting, underweight, and overweight. Based on physical measurement results, future public health policy and clinical decisions could be designed to health (WHO, 1995). The 2006 World Health Organization Child (WHO) Growth Standards for children aged 0-60 months are international tools used to compare children's growth patterns and evaluate nutrition related conditions, such as malnutrition and obesity, by reflecting optimal growth after standardizing gender and ages (Garza et al., 2004).

1. Stunting

Stunting refers to the failure to reach appropriate height due to prolonged exposure to negative environmental factors such as chronic malnutrition (WHO, 1986). According to the WHO's Nutrition for Health and Development Guideline, stunting is presented if height for age z-scores that are less than 2 standard deviations (SDs) below the mean. Height is considered normal if height for age z-scores are more than 2 SDs below the mean. Stunting reflects general social welfare levels on a national basis, and high level of stunting in a population reflects poor socioeconomic conditions (WHO, 1995). Several studies have found that sustained stunting during early childhood could

result in poor cognition and low achievement at school in adolescence (Molinari et al., 2002; Walker et al., 2007). Problematic growth conditions during childhood can continue throughout adulthood. Some studies have reported that higher level of stunting and overweight in childhood, lead to a shorter and more rapid weight gain trajectory in adulthood (Sachdev et al., 2005; Gigante et al., 2009). Abnormal growth not only leads to biological health problems but also determines the individual's future SES. For instance, some studies have found a high probability of lower income and educational levels for individuals who experienced stunted growth in childhood relative to those without stunting (Victoria et al., 2008; De Onis et al., 2012).

2. Overweight

Overweight refers to the gain of weight in excess of the ideal for one's height, due to the lack of balanced dietary intake in terms of amount and quality (UNICEF, 2013). According to the 2006 WHO Child Growth Standards, overweight is measured using weight for height z-scores. Z-scores that are more than 2SDs from the means reflect overweight, while normal weight is reflected by z-scores that falls between -2SD and 2SD from the mean. Overweight is a common children's growth problem in most countries. According to an OECD Health Report published in 2014, the prevalence of overweight in children has increased in most OECD countries, including those in which low and middle income households are prominent, with the exception of India (OECD/WHO, 2014). As with stunting, overweight in childhood can result in a high

risk of chronic illness, such as coronary heart disease, diabetes, or high blood pressure (Cameron et al., 2000; Eriksson et al., 2001; Power et al., 2003). Based on these findings, abnormal growth during early childhood is highly likely to lead to health problems, in both childhood and adulthood, and decline in quality of life.

B. Food Security

Food security refers to a household's capability of acquiring sufficient food to satisfy dietary energy and nutritional requirements for healthy life in socially acceptable ways (Anderson et al., 1990). The household food insecurity means family members' high risk of experiencing poor nutritive condition that falls below the recommended dietary allowances (Rose et al., 1997; Keenan et al., 2001). However, each family member could experience different effects of food insecurity depends on their physical and psychological state. In particular, household's food security holds special meaning for young children, who requires thorough dietary management for physical and psychological development (Siddiqi et al., 2007; Choi, 2008). With respect to children's surrounded environment, the importance of analyzing the relationship between growth status and household food security has been supported by previous studies (James et al., 1997; Trichopoulou et al., 2002). According to this concept, estimates of household food security combined with anthropometric estimates of children and household environment can provide a reasonable background for the

construction and implementation of policies to improve nutritional background (Andersen, 2009). The importance of the level and quality of children's food intake has been studied as a crucial variable in their growth. Several previous studies have reported that there is a higher possibility of gaining weight and consuming low quality food in children aged 4-12 years from food insecure households (Oh et al., 2003). Young children from food insecure household have high risk of experiencing overweight growth due to their physical immaturity (Kim et al., 2009; Dubois et al., 2006). Similarly, the importance of ensuring food security was also supported that children from food insecure household had lower length body measurement relative to those who were in food secure household (Saha et al., 2008).

Economic constraint of household has an important implication in defining the level of household food security because income is a fundamental resource for individuals to alleviate hunger by obtaining food resource. The significant relationship between household's income level and household food security has been exerted. Previous studies supported that household economic difficulty could deprive children's chances to live under nutritionally favorable conditions (Maxwell et al., 1992; Oh et al., 2003; Andersen, 2009). Casey et al reported that children from food insecure household not only had a high risk of experiencing overweight growth but also living under a poor income condition which falls below the federal poverty line (Casey et al., 2006). The significance of household income level on household food security remained after

adjusting multiple household environmental factors such as household type and parents' occupation (Tarasuk, 2001). In addition, a national report of characteristics of household food insecurity in Canada found that low income households who highly depend on regional social assistance had higher risk of becoming food insecure status relative to high income households (North, 2001). Therefore, the concept of household food security should be understood by considering the possible influence of household's economic condition on individuals' accessibility to food resource.

C. Parental Socioeconomic Status

Socioeconomic status (SES) refers to social and economic factors that influence the status of individuals or groups within a population (Lynch et al., 2000). Based on this concept, there have been multiple socio-epidemiological and health equity studies conducted to define specific social factors that influence health disparity. However, considering the occurrence of rapid social changes and variance in historical context between countries, studies that examine new variations have been suggested as further research (The Korean Society for Equity in Health, 2007).

1. Parental Educational Levels and Children's Growth

There have been several studies conducted to examine the significance of parental educational levels on children's growth. One such study found that adults who had parents with higher educational levels and household incomes were significantly taller

relative to those whose parents had achieved lower educational levels (Webb et al., 2007). In particular, mothers' educational levels have been examined extensively due to their strong influences on children's growth. Barrera (1988) and Thomas et al., (1991) posited that mothers' educational levels are strongly related to children's height, even after the extent of the infrastructure of the local community was considered. In addition, there have been some reports of association between mothers' educational levels and children's weight. An analysis conducted by the German Socio-Economic Panel found a significant relationship between low educational levels in mothers and short stature with high BMI in their adulthood (Heineck, 2006). Further, children with mothers who were unable to complete a higher education degree have demonstrated a higher risk of obesity (Strauss et al., 1999).

However, in Korea, only a few studies have been conducted to examine the influences of parental educational level on growth in early childhood. Children younger than 3 years of age who were raised by parents with low educational levels have been found to be more likely to have a high BMI. This result suggests that Korea is currently experiencing a transition in general body shape, which follows the pattern observed in developed countries (Park et al., 2007). However, another study reported that there was no significant relationship between parental educational level and the physical growth of children aged 3-12 years from low income groups (Oh, 2002).

2. Household Income Level and Children's Growth

Reports of linear relationship between income and children's height are common (Strauss et al., 1999; Heineck, 2006; Webb et al., 2007). However, in studies examining children's weight, inconsistent relationships have been reported, based on the economic status of the country. In developed countries, such as the UK and Australia, and some middle income countries, such as Brazil, children from high income household are less likely to become overweight, while those from low income households are at high risk of becoming overweight (Stamatakis et al., 2005; Monteiro et al., 2007; Wake et al., 2007). In contrast, in developing countries, the relationship between income and children's weight lies in the opposite direction. In case of the urban regions of Congo, children from low economic level of the household were at high risk of their growth becoming stunted, but weight and income were not significantly related (Delpuech et al., 1999). However, in Pakistan, boys from middle-income families were found to be more likely to become overweight relative to those from low or high income families (Hakeem, 2001). In contrast, the results of a study conducted by Currie et al. (2006) did not support either of these findings, indicating that there was no significant association between income and children's weight.

In Korea, studies have focused mainly on the relationships between income and growth in school aged children or adolescents. In addition, even though the study participants were young children, most studies have examined on their emotional or

communicative development (Kim et al., 2009; Kang et al., 2013). Only a limited number of studies have focused on the influence of income on young children's growth. According to a study conducted by Park et al. (2007), children from high income families were highly likely to be taller and of normal weight (Park et al., 2007).

3. Parent's Occupation and Children's Growth

The occupation of the head of the household can represent dependence or the entire household's SES and is a common factor influencing children's environments (The Korean Society for Equity in Health, 2007). Father's occupation was considered in a study examining parents' SES and children's morbidity and mortality (Galobardes et al., 2004). Mothers' occupations were also studied as factors influencing the prevalence of overweight in children. A study result showed that children with self-employed mothers were at higher risk of becoming overweight, regardless of their mother's educational levels (Lamerz et al., 2005). In addition, it was studied that children with salaried mother were at lower risk of becoming wasting (Delpeuch et al., 1999). An occupation is generally considered to be the result of one's final level of education and a source of income and defines household social class (Shin, 2004; Galobardes et al., 2006). A low social class usually translates into limited access to the resources required to sustain living conditions and to maintain health management (Liberatos et al., 1988). Further, risky health behavior is observed more frequently in low social classes (Power et al., 1997). Household social class could determine individuals' BMI levels

throughout their lives. Previous cohort studies reported that a group raised in a low social class displayed higher BMI levels in both childhood and adulthood, relative to those observed in other groups (Laitinen, 2001; Yoon, 2002). Assuming that occupation represents the household social class, children's weight would vary according to the occupation of the head of the household. Individuals with blue collar occupations are generally categorized into lower social classes due to comparatively lower levels of education and income relative to those with white collar occupations (Liberatos et al., 1988).

D. Child Care Environment

1. Caregivers' Responsive Care for Children during Meal time

Household environment is the first social background for children where their basic lifestyle and behavior can be stimulated. Children can learn from their family members' behavior who spend most of the time with them (Pyun et al., 2010). In particular, considering that mothers generally take care of preparing meals for family, their nutritional knowledge and dietary behaviors could give considerable influence on children's dietary intake (Park et al., 2003). Young children cannot have a balanced diet by themselves because of lack of nutritional knowledge and high tendency to choose food, only depending on their preference (Nicklas et al., 1998). Considering that children's picky eating habit causes malnourished condition to children and lead to

negative influence on growth, care givers' proper guidance is crucial for young children to manage healthy eating habits and adequate nutritional intake (Valentine, 2000). Mother's intervention on children's dietary intake can change more than 70% of their children's eating habit (Son et al, 1996). The lesser children had meal with their mothers, the harder the children can eat qualified nutrition (Moon et al., 1987). In addition, Pyun et al (2010) showed that mothers' regular eating habits and moderate meal tempo give positive effect on young children's dietary life pattern (Pyun et al., 2010). Therefore, young children's dietary intake could be differed by family meal environment such as the frequency of having meals with family members.

2. Child Care Time of Dual Earner Household

Care means the provision of time and support of the needs of family members, such as feeding young children and supporting for their development (Engle et al., 1999). Without such responsive care, children could exposed to high risk of suffering unhealthy consequences such as diagnosed with malnutrition or acute disease (WHO, 1997; Anderson et al., 2003). Mothers' absence could give a significant negative influence on children's growth because regulated environment such as, removing hazardous elements and providing adequate nourishment to children, cannot be promptly provided. Therefore, considering the rapid increase of single-parent households and women's participation in social activity, mother's employment status is considered as one of the major component of household's child care environment in

the recent child health study. Mother's employment status was studied as factor influencing the prevalence of children's abnormal growth. According to studies examining the influence of mother's employment on children's weight, children with employed mothers spent less time in the care of their mothers, which increased their potential for becoming overweight (Anderson et al., 2003; Garcia et al., 2006; Brown et al., 2010). In addition, an adverse relationship between the time that parent spent with their children and children's BMI was observed in another study (Benson et al., 2011). Only few Korean studies have examined the influence of mother's employment on children's levels and quality of dietary intake. Results showed that although mother's employment did not exert a significant influence on children's growth and bone density, calcium and vitamin A intake were significantly low among children from dual earner household (Choi et al., 2004). Similarly, children from dual earnerhouseholds displayed significantly low intake of vitamin A, calcium, potassium, and zinc and ate breakfast less frequently (Lee, 2008).

3. External Assistance for Child Care: Use of Child Care Facility

Since the Child Care Act was instituted in 1991, the director of child care facility is obliged to manage balanced and hygienic meals that one lunch and two times of refreshments should be provided to children (Ryu et al., 2003; Sin et al., 2005). Meals provided from child care facilities should satisfy the 45% of daily recommended dietary intake, rather than merely lessen children's hunger by giving snacks (Lee et al.,

2001). There were very few studies about the relationship between child care facilities and young children's health in Korea. Moon et al showed that lunch at child care facility could help young children not only having proper eating habit but also keeping meal regularity under instructor's guidance and communication (Moon et al., 2008). There were different results of nutrient intake among young children who were enrolled in child care facilities. In Seoul, the evaluated results of dietary composition, followed by Public Child Care Information Centers, showed relatively fair nutrient status, except calcium which was lower than the standard (Yeoh et al., 2014). On the contrary, young children attending the child care facility in Anyang city showed higher level of nutrients intake than the recommended daily allowance, except for calcium, calories and zinc (Ryou et al., 2004). Therefore, considering parents' high dependency on the child care facility and the facility's duty of managing children's diet, it would be important to study about the relationship between child care facilities and young children's growth.

4. Nutritional Education for Parents

Public food assistance programs, which include both provision of food supplements and nutritional education for parents, have potential effects on relieving children's unbalanced diet (Barrett, 2003). Frank et al reported that children from low income households, who were benefited from Home Energy Assistance Program, had lower risk of having unbalanced nutritional condition and abnormal weight status relative to

those who did not received the services (Frank et al., 2006). Similar to this result, Yamano et al also supported that food aid in rural Ethiopia gave positive influence on managing young children's nutritional condition (Yamano et al., 2005).

Nutriplus Program in Korea, the representative national food assistance service to support food supplement, nutritional education, and nutritional evaluation for children, can be regarded as an influential factor on children's growth environment. Despite of the potential effects of Nutriplus Program on children's growth, there have been only a few studies on the relationship between the program and children's growth (Kim et al., 2009). The results of provision of nutrition supplement for young children and nutritional education to parents from low income household in Yeojoo and Daejeon cities reported that young children who received the program had improved their nutrition adequacy ratio and physical growth (Park et al., 2009; Park et al., 2013). However, some studies found that the dietary life pattern of household from Daejeon and Pohang city changed to original state after the program was finished (Kang et al., 1992; Kang et al., 2011).

III. METHODOLOGY

A. Data Resource

This study used the 4th (2009) and 5th (2010-2012) Korean Health and Nutritional Examination Surveys (KNHANES), conducted by the Korean Ministry of Health and Welfare.

The KNHANES is a national scale sample of survey data that provides basic statistics to facilitate the understanding of the population's health and nutritional status. It is intended to produce data for the development of health promotion programs based on the representativeness and reliability of national-unit statistics. The survey targeted entire households from randomly sampled provinces, cities, towns, and villages, and included household members who were older than 1 year of age. Elderly nursing home residents, prison inmates, soldiers, and foreigners were excluded from the survey.

B. Study Participants

The study participants were children aged 24-60 months. According to the definition provided in child care law by the Korean Ministry of Health, the early stage of childhood includes children younger than 5 years of age. However, children younger than 24 months old experience their first growth spurt when an unstable growth rate occurs. Considering the biological mechanisms of growth in infancy and cessation of

the growth spurt at approximately 3 years of age (Karlberg, 1990), this study focused on children older than 24 months.

Children's ages were measured in months because growth in the early stage is rapid, and growth parameters measured a few days apart produce considerably different values. Therefore, in child health studies, calculation of children's ages in exact days is highly recommended (Waterlow et al., 1977).

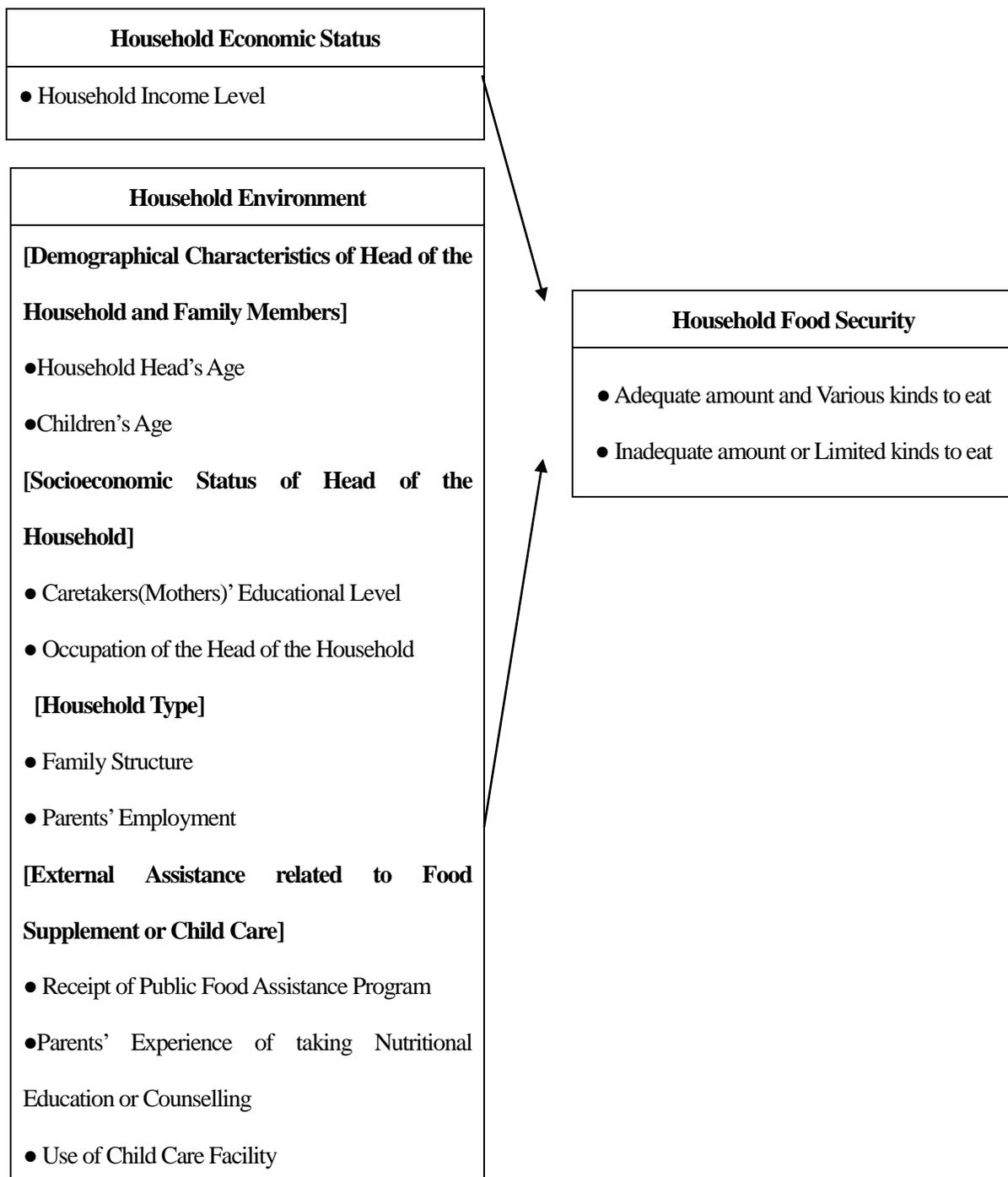
Study participants were excluded if their height or weight information was not recorded. In addition, based on the studies showing a strong relationship between congenital heart disease and growth impairment, children with congenital heart disease were excluded from this study (Shin, 1996; Lee et al., 2010).

C. Study Model

There are two study models for this study; (1) the relationship between household income level and household food security and (2) the influence of parental SES and child care environment, and interactions with household food security.

In Model 1, it was formulated using the study published by Korea Institute for Health and Social Affairs (Kim et al., 2009). The characteristics of children and head of the household, household type, and external assistance related to food supplement or child care were considered as controlled variables. There was only mother-child family structure among single parent household which already reflects the gender of the head of the household. Therefore, gender of the head of the household was not considered in the characteristics of the head of the household. In addition, family member diagnosed with chronic disease was not considered due to small number of observations.

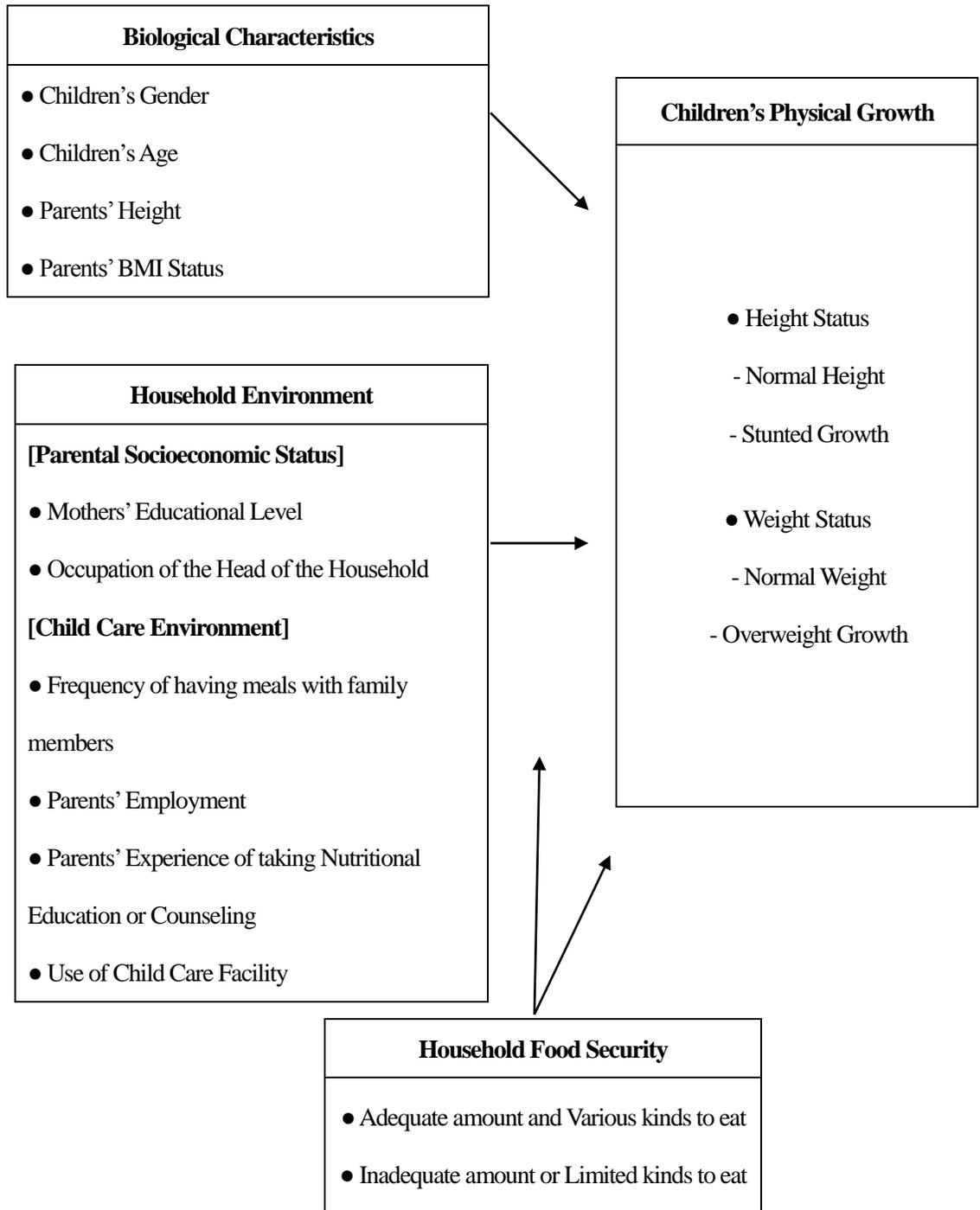
[Study Model I]



Model 2 was based on the UNICEF's conceptual framework of care for nutrition and independent and controlled variables were selected by referring to previous studies. The UNICEF's conceptual framework helps to monitor the circumstances that could influence on children's malnutrition. There were three major streams for the causes of malnutrition; (1) immediate causes in individual level, (2) underlying causes in family and community, and (3) basic causes in social structure and process (Black et al., 2008). For this study, only the underlying causes within the UNICEF's conceptual framework was considered because the main purpose of this study was to analyze the influence of household food security and household environment on children's physical growth. Therefore, household food security, parental SES, and child care environment were selected as independent variables.

Household income level was not considered as a determinant of parental SES because household food security connotes both household's economic constraint and household's nutritional environment. Therefore, after showing the relationship between household income level and food security in Model 1, household income level was replaced by household food security in Model 2. In addition, there were small number of observation in stunted children from single parent household and the exact types of food supplement program were unable to confirm due to limited survey question. Therefore, on the contrary to Study Model 1, family structure and receipt of public food assistance program were not included in Study Model 2.

[Study Model II]



D. Variables

1. Food Security

The nutrition survey section was used to obtain household's food security information which concerned the household's satisfaction with the amount and variety of food consumed within the preceding year. There was one survey question concerning household's food security in the KNHANES surveys conducted between 2005 and 2011, however, the surveys conducted since 2012 have included 18 detailed items concerning household nutritional environment. In order to measure household's food security in a unified manner, one survey item was used. There were 4 possible responses to the item; "(1) sufficient amount and different types of food to eat, (2) sufficient amount but not always different types of food to eat, (3) sometimes insufficient amount of food to eat, and (4) often insufficient amount of food to eat". In this study, very few households reported difficulty in obtaining sufficient food. Therefore, food security status was classified into two major groups; the food secured group, which included households that had sufficient food and various types of food, and the food insecure group, which included households with limited variations in food or inadequate amounts of food.

2. Parental SES

(1) Mothers' Educational Level

Mothers' educational levels were obtained via the "reclassified educational level code" item, which determined final educational levels based on graduate status. In this study, mothers' educational level was divided into two groups; higher than university level education and senior high school education or lower. Further specification for junior high school education and lower than elementary school education were not considered due to the small sample size.

(2) Occupation of the Head of the Household

The head of each household was identified according to a survey ID code, composed of district number, residence number, and household member number. The household member number, "01" was used to identify the head of the household.

The "reclassification of occupation, unemployment, and economic inactivity, aside from military service" survey item was used to define parental occupation type. Occupations were categorized into two major groups; white collar and blue collar. White collar occupations included (1) managers and professionals, and (2) office workers, while blue collar occupations included (3) sales and service workers, (4) agricultural, forestry, and fishery workers, (5) licensed technicians and mechanics, and

(6) physical laborers. Unemployed groups, including students and housewives, were excluded due to the small sample size.

(3) Average Household Income per Family Member

Average monthly income was based on self-reported records. Wages, pensions, government subsidies, real estate profits, and other forms of non-labor incomes collected within the preceding year were measured. Equivalent income was used to adjust for the effects of family size, therefore, monthly household income was divided by the square of family size, employing a 0.5 equivalence scale (OECD, 2012). The results were separated into quintiles with the first quintile referring to the poorest group.

3. Child Care Environment

(1) Parents' Employment

Working status for fathers and mothers' was checked using the "current economic activity status" item. Households with two employed parents were classified as dual earner households, and those with one employed parent were referred to as single earner households. In addition, households with partial information regarding one parent's employment status were classified as single earner households, and those with no information regarding parental employment status were considered to have missing values.

(2) Family Structure

Family structure was checked by using the items of classifying the types of family generation. Children who live with both parents were grouped into household with both parents, and those with single parent were referred to as single parent household. However, households without information regard to family member were considered to have missing values,

(3) Frequency of having meals with family member

The frequency of having meals was quantified by counting children's response of having breakfast, lunch, or dinner with their family members within the most recent year. Children were categorized into 3 groups; all three meals, two times of meal, and only one time of meal or none. However, children with no information were considered as missing values.

(4) Parents' Experience of taking Nutrition Education or Counselling Service

Parents' experience of taking nutritional education or counselling service was questioned whether they have such services provided by public health centers, hospitals, school, welfare facilities, and community service centers. However, non-response from the parent was considered as a missing value.

(5) External Child Care Assistance: Child Care Facility

The use of child care facility was checked by using children's level of education. The use of child care facility was questioned whether children were attending nursery school or daycare center. However, non-response from the study participant was considered as missing value.

4. Children's Physical Growth Status

Normal height and weight were determined according to the 2006 World Health Organization Child Growth Standards. Height for age z-scores (HAZ) and weight for height z-scores (WHZ) were used to identify normal and abnormal height and weight. In this study, underweight was not considered as children's abnormal weight growth because there were very small number of observations ($n=2$). In addition, currently underweight is not considered as major growth concern in recent Korean children's health due to its very low prevalence among general Korean children population (International Food Policy Research Institute, 2014). Therefore, only overweight growth was considered as the representative case of abnormal weight growth.

The criteria for each status are described in Table 1.

Table 1. Criteria for Dependent Variables

Dependent Variables		Measurements
Height	Normal	$-2SD \leq HAZ$
	Stunting	$HAZ < -2SD$
Weight	Normal	$-2SD \leq WHZ < 2SD$
	Overweight	$2SD \leq WHZ$

5. Children’s Demographical and Parents’ Biological Characteristics

In order to control the influence of children’s genetic inheritance, parent’s height and weight as well as children’s biological characteristics such as gender, birth weight, and age were included as controlled variables. Children’s age group was divided into 24-35 months, 36- 47 months, and 48-60 months. Mothers’ experience of breast feeding was classified into either a positive or a negative group. Low birth weight was excluded for further analysis due to small number of observations. The bases for grouping parental biological characteristics are as follows. The criteria of father’s height were less than 165 cm, between 165 cm and 175 cm, and more than 175 cm. Mother’s height was classified into less than 155 cm, between 155 cm and 165 cm, and more than 165 cm. Parent’s weight was divided into three groups; underweight, normal, and obese. BMI level less than 16 was grouped into underweight and BMI level more than 25 was classified into obese.

E. Statistical Analysis

The following analytical methods were used to identify the effects of parental SES and child care environment, and changes in the significance of effects, upon inclusion of household food security and interaction terms, were measured. A stratified multistage probability sample design from the South Korean population was used in KNHANES. Therefore, a two-stage stratified systematic sampling method was used in the statistical analysis. STATA version 12.0 was used to perform statistical analysis.

(1) Distribution of children's height and weight growth status were identified by applying sample weights which represent the Korean population by accounting the complex survey design in each stunting, overweight, and normal height and weight growth.

(2) The relationship between parental SES, child care environment, and household food security were assessed using Phi coefficient correlation and Cramer's phi-prime correlation coefficient analysis.

(3) Logistic regression analysis was performed to determine the influence of household income level on the likelihood that household would experience food insecure status. This study model included characteristics of head of the household and family members, household income level, household type, and external assistance related to food supplement or child care.

$$\bullet \text{Model 1} = \text{Log} \left[\frac{\text{Pr}(Z=1)}{\text{Pr}(Z=0)} \right] = \rho_0 + \rho_1\gamma_1 + \rho_2\gamma_2 + \rho_3\gamma_3 + \rho_4\gamma_4 + \rho_5\gamma_5 + \sigma$$

Z=Household Food Security (Z=0: Food Secured Status, Z=1: Food Insecure Status)

γ_1 =Demographical Characteristics of Head of the Household and Family Members.

γ_2 =Socioeconomic Status of Head of the Household, γ_3 = Household Type, γ_4 = External

Assistance related to Food Supplement and Child Care, γ_5 =Household Income Level

(4) Logistic regression analysis was performed to determine the influences of parental SES, child care environment, and household food security on the likelihood that children would experience stunted growth or be of normal height, and children would become overweight or be of normal weight.

$$\bullet \text{Model 2} = \text{Log} \left[\frac{\text{Pr}(Y_1, Y_2=1)}{\text{Pr}(Y_1, Y_2=0)} \right] = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4Z + \varepsilon$$

Y1=Height (Y1= 1: stunting, Y1=0: normal), Y2=Weight (Y2= 1: overweight, Y2=0: normal)

X1=Children's and parents' biological characteristics, X2=Parental SES (Except household income level),

X3=Child Care Environment

(5) Changes in the effects of parental SES and child care environment according to household food security were measured by including the interactions between food security and parental SES and child care environment as independent variables.

$$\bullet \text{Model 3 - Model 8} = \text{Log} \left[\frac{\text{Pr}(Y_{1,2}=1)}{\text{Pr}(Y_{1,2}=0)} \right] = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4Z + \beta_5X_5 + \varepsilon$$

X5= Interaction term

Model 3: $X_5 = \text{Mother's educational level} * \text{Household Food security}$,

Model 4: $X_5 = \text{Occupation of the Head of the Household} * \text{Household Food security}$,

Model 5: $X_5 = \text{Frequency of having meals with Family members} * \text{Household Food security}$,

Model 6: $X_5 = \text{Use of Child Care Facility} * \text{Household Food security}$

Model 7: $X_5 = \text{Number of Working Parents} * \text{Household Food security}$

Model 8: $X_5 = \text{Parents' experience of taking Nutritional Education or Counselling} * \text{Household Food security}$

IV. RESULTS

A. General Characteristics of the Study Participants

Results showed that most of children were boys (51.18%), age ranged from 36 to 47 months old (33.28%), and were breastfed (54.31%). Regarding parents' demographical characteristics, head of the household were more than 35 years old (50.87%) and mothers who were more than 160cm tall (51.49%), and normal BMI status (78.16%) were the highest. With respect to parental SES, most mothers completed university education (56.80%) and head of the household had white collar occupations (55.82%). The household's income level for the 1st (22.97%) and 4th quintiles (17.80%) were the highest and lowest, respectively. In regard to household food security and child care environment, the highest proportion of household was in food insecure condition (53.63%). The frequency of meal that children had with their parents per day showed that two times of meal were the highest (61.02%), while one time of meal were the lowest (12.29%). The proportion of children who were using child care facility (79.44%) was the highest. However, only few proportion of households were benefited from public food assist program (6.81%). The proportion of dual earner households was more than 25% (28.37%). There were only mother and child family structure among single parent household (3.83%).

Table 2. General Characteristics of Study Participants

Variables	Category	N	Population Based Wt. %ⁱ
Gender (N=1,292)	Male	679	51.18
	Female	613	48.82
Monthly age (N=1,292)	24 ≤ x ≤ 35	386	28.93
	36 ≤ x ≤ 47	438	33.28
	48 ≤ x ≤ 60	468	37.79
Breast Feed (N=1,282)	Yes	700	54.31
	No	589	45.69
Household Head's Age (N=1,292)	More than 35 years old	653	50.87
	Less than 35 years old	639	49.13
Mother's Height (N=1,254)	Less than 160	595	48.51
	More than 160	659	51.49
Mother's BMI (N=1,244)	Normal	987	78.16
	Obese	257	21.84
Mothers' Edu. Level (N=1,234)	At least university Edu	732	56.80
	At most senior high school Edu.	502	43.20
Household Head's Occupation (N=1,014)	White Collar	595	55.82
	Blue Collar	419	44.18
Household Income Level (N=1,280)	5 th Quintile	236	18.43
	4 th Quintile	228	17.80
	3 rd Quintile	232	18.17
	2 nd Quintile	290	22.63
	1 st Quintile	294	22.97
Household Food Security (N=1,239)	Various kinds and enough amount of food	583	46.37
	Limited kinds or inadequate amount of food	656	53.63
Frequency of having Meals with Family Members (N=1,240)	One time	228	19.29
	Two times	759	61.02
	Three times	253	19.69
Use of Child Care Facility (N=1,280)	Yes	997	79.44
	No	283	20.56
Parents' Employment (N=1,032)	Single Earner Household	738	71.63
	Dual Earner Household	294	28.37
Family Structure (N=1,292)	Household with Single Parent	49	3.83
	Household with Both Parents	1,243	96.17
Receipt of Public Food Assistance Program (N=1,240)	Yes	65	6.81
	No	1,175	93.19
Parents' Experience of taking Nutritional Edu. or Counseling (N=1,244)	Yes	97	8.55
	No	1,147	91.45

ⁱ Two-stage stratified systematic sampling weights were applied for obtaining percentages.

B. Distribution of Stunting and Overweight: 2009-2012

1. Height: Normal and Stunted

The distribution of nutritional status according to height for age z-scores from 2009 to 2012 was as follows. In general, the proportion of participants of normal height was more than 98% within these periods. In contrast, the overall prevalence of stunted growth was lower than 2%. Based on WHO prevalence cut-off values, this stunted trend reflected less serious health concerns and moderate levels of social well-being in the study population (WHO, 1995). However, the direction of changes in the prevalence of stunted growth was variable. In 2010, the prevalence of stunted growth (0.99%) decreased relative to that of the preceding year (1.13%). However, it increased sharply to 1.98% in 2012 which ranked the highest within the periods.

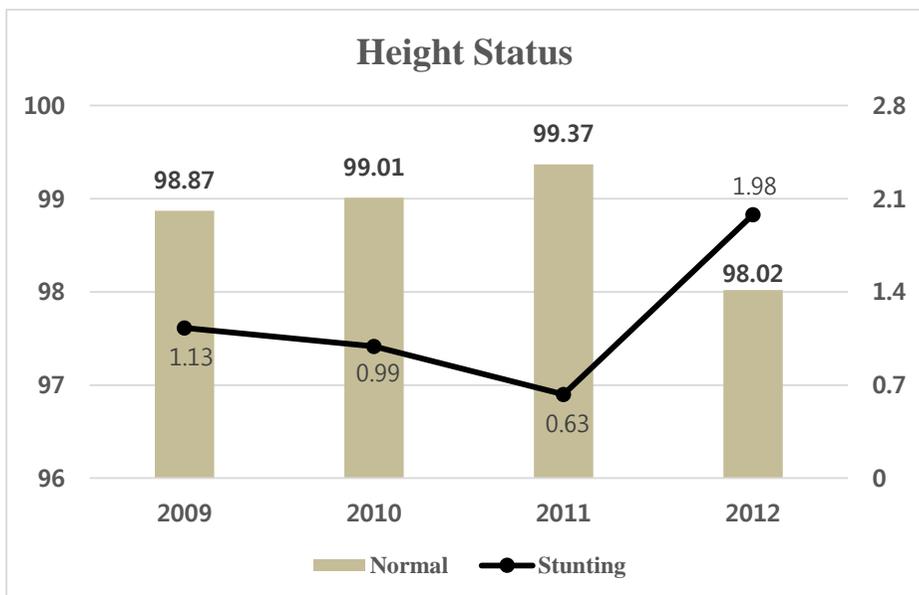


Figure 1. Distribution of Height Status from 2009 to 2012

2. Weight: Normal and Overweight

Similar to the height for age status observed, more than 85% of children displayed normal weight for height z-scores from 2009 to 2012. However, the prevalence of overweight for each year was higher relative to that of stunted growth. The prevalence of overweight for each year was higher relative to that of stunted growth. The prevalence of overweight was lowest in 2012 at 2.09% and highest in 2010 at 11.23%. In addition, the annual transition of the prevalence of overweight was much faster relative to that of stunted growth. Relative to the prevalence of overweight of 2009 (5.75%), it increased sharply in 2010 and decreased in 2011 (4.38%). Subsequent to two consecutive years, the prevalence of overweight was in decreasing phase.

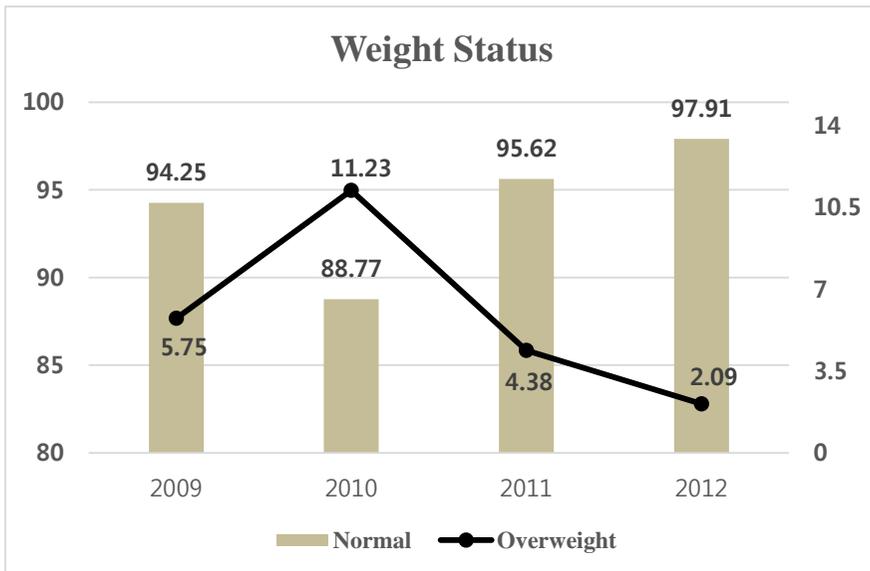


Figure 2. Distribution of Weight Status from 2009 to 2012.

C. Correlation Analysis between Variables

Phi coefficient correlation and Cramer's phi-prime analysis were conducted to address the relationships between independent and dependent variables and the issue of collinearity between independent variables in each household food security, height status, and weight status.

1. Correlation between Variables: Household Food Security and Household Income Level

Food security had statistically significant relationships with mothers' educational level (0.134), occupation of the head of the household (0.098), household income level (0.116), family structure (0.070), children's age (0.068), and head of the household's age (0.057). In regard to the relationship between independent variables, mothers' educational level, occupation of the head of the household, head of the household's age, and the use of child care facility had statistically significant and strong relationships between other independent variables. Mothers' educational level had relationship between occupation of the head of the household (0.327) and household income level (0.290). With respect to occupation of the head of the household, relationships were observed between household income level (0.315) and parents' employment (0.205). If correlation coefficients are lesser than 0.8, collinearity problem would not be considered (Pedhazur, 1997). Therefore, all variables were included in the analysis.

Table 3 Correlation between Variables: Household Food Insecurity

Variables	A)	B)	C)	D)	E)	F)	G)	H)	I)
A) Household Food Security	1.000								
B) Caretakers' (Mothers') Edu. Level	0.134***	1.000							
C) Occupation of the Head of the Household	0.098 [†]	0.327 [†]	1.000						
D) Household Income Level	0.116***	0.290 [†]	0.315 [†]	1.000					
E) Household Head's Age	0.057**	0.037	0.037	0.071 [†]	1.000				
F) Children's Age	0.068*	0.006	0.037	0.044	0.124 [†]	1.000			
G) Family Structure	0.070**	0.063**	0.015	0.042*	0.196 [†]	0.011	1.000		
H) Receipt of Public Food Assistance Program	0.041	0.039	0.100***	0.061***	0.031	0.002	0.051*	1.000	
I) Parents' Employment	0.036	0.056*	0.205 [†]	0.081 [†]	0.086***	0.045	0.081***	0.009	1.000

* p<0.1 ** p<0.05 ***p<0.01 †p<0.001

2. Correlation between Variables: Stunting and Overweight

Parents' height conditions were included in the analysis of children's height status. On the contrary, parents' weight conditions were included in the analysis of children's weight status.

Children's height status had statistically significant relationships with mothers' height (0.067). However, children's weight status had more statistically significant relationships between independent variables; children's gender (0.068), mothers' BMI level (0.077), fathers' BMI level (0.082), and mothers' educational level (0.089). The strongest relationships between independent variables were observed in children's age and breastfeeding experience (0.582) and the frequency of meals having with family member and the use of child care facility (0.552) in both stunting and overweight cases. There was also statistically significant and relatively strong relationship in the occupation of the head of the household and children's age. Occupation of the head of the household had relationship between mothers' educational level (0.327) and parents' employment (0.205). In regard to children's age, there were relationship between the frequency of meals having with family members (0.253) and the use of child care facility (0.295). All the relationship between independent variables and controlled variables were less than 0.8. Therefore, all variables were included in the analysis.

Table 4 Correlation between Variables: Stunted Growth

Variables	A)	B)	C)	D)	E)	F)	G)	H)	I)	J)	K)	L)
A) Height Status	1.000											
B) Gender	0.009	1.000										
C) Children's Age	0.035	0.040	1.000									
D) Breastfeeding Experience	0.006	0.001	0.582 [†]	1.000								
E) Mother's Height	0.035	0.018	0.008	0.004	1.000							
F) Father's Height	0.050	0.034	0.016	0.008	0.062 [*]	1.000						
G) Mother's Edu. Level	0.067 ^{**}	0.002	0.006	0.015	0.089 ^{***}	0.065 ^{**}	1.000					
H) Occupation of the Head of the Household	0.006	0.037	0.026	0.066 ^{**}	0.076 ^{**}	0.022 ^{**}	0.327 [†]	1.000				
I) Food Security	0.039	0.023	0.048 [*]	0.026	0.007	0.069	0.134 [†]	0.098 ^{***}	1.000			
J) Parents' Employment	0.025	0.005	0.045	0.045	0.052 [*]	0.052	0.056 [*]	0.205 [†]	0.036	1.000		
K) Frequency of having Meals with Family Member	0.009	0.018	0.253 [†]	0.252 [†]	0.024	0.034	0.048	0.071 [*]	0.043	0.151 [†]	1.000	
L) Use of Child Care Facility	0.016	0.031	0.295 [†]	0.272 [†]	0.014	0.016	0.002	0.098 ^{***}	0.022	0.127 [†]	0.552 [†]	1.000

* p<0.1 ** p<0.05 ***p<0.01 †p<0.001

Table 5 Correlation between Variables: Overweight Growth

Variables	A)	B)	C)	D)	E)	F)	G)	H)	I)	J)	K)	L)	M)
A) Weight Status	1.000												
B) Gender	0.068**	1.000											
C) Children's Age	0.026	0.040	1.000										
D) Breastfeeding Experience	0.034	0.001	0.582 [†]	1.000									
E) Mother's BMI	0.077***	0.045	0.036	0.009	1.000								
F) Father's BMI	0.082**	0.019	0.029	0.047	0.002	1.000							
G) Mother's Edu. Level	0.089***	0.002	0.006	0.015	0.143 [†]	0.136 [†]	1.000						
H) Occupation of the Head of the Household	0.008	0.037	0.026	0.066**	0.140 [†]	0.046	0.327 [†]	1.000					
I) Food Security	0.002	0.023	0.048*	0.026	0.019	0.002	0.134 [†]	0.098***	1.000				
J) Parents' Employment	0.044	0.005	0.045	0.045	0.045	0.045	0.056*	0.205 [†]	0.036	1.000			
K) Frequency of having Meals with Family Member	0.060	0.018	0.253 [†]	0.252 [†]	0.029	0.071*	0.048	0.071*	0.043	0.151 [†]	1.000		
L) Use of Child Care Facility	0.017	0.031	0.295 [†]	0.272 [†]	0.005	0.024	0.002	0.098***	0.022	0.127 [†]	0.552 [†]	1.000	
M) Parents' Experience of Nut. Education	0.018	0.013	0.015	0.039	0.017	0.021	0.008	0.064**	0.008	0.047	0.076**	0.080***	1.000

* p<0.1 ** p<0.05 ***p<0.01 †p<0.001

D. Relationship between Household Food Insecurity and Household Income Level

Household income levels and family structure were significant factors in determining food insecure household. Among them, household income level was most statistically significant factor on household food security. Single parent household had significant influence on household food security (odds ratio [OR]: 3.868, 95% confidence interval [CI]: 1.294-5.555; p-value [p] < 0.05). The lower the household income level, the more household would become food insecure status. The odds ratio for experiencing food insecure status was the significantly higher in household income in the 1st quintile (OR: 2.972, 95% CI: 1.668-5.296; p < 0.001), the 2nd quintile (OR: 2.759, 95% CI: 1.584-4.807, p<0.001), and 3rd quintile (OR: 2.021, 95% CI: 1.188-3.437, p<0.05) to that of household income in the 5th quintile. However, there were no statistically significant relationship between household food security and household income in the 4th quintile (OR: 1.247, 95% CI: 0.728-2.135, p=0.381).

Table 6 Logistic Regression Analysis: Household Food Insecurity

Characteristics		Model 1	
		O.R	95% C.I
Head of the Household's Age (Less than 35 years old)	More than 35 years old	1.182	0.816-1.711
Child's Age (Ref: 24 ≤ x ≤ 35)	36 ≤ x ≤ 47	1.343	0.918-1.864
	48 ≤ x ≤ 69	1.281	0.935-1.754
Mothers' Edu. Level (Ref: At least Univ. Edu)	At most Senior High School Edu.	1.285	0.870-1.899
Occupation of the Head of the Household (Ref: White Collar)	Blue Collar	1.047	0.719-1.524
Parents' Employment (Ref: Single Earner Household)	Dual Earner Household	1.203	0.801-1.807
Family Structure (Ref: Household with Both Parents)	Household with Single Parents	3.868**	1.294-5.555
Receipt of Public Food Assistance Program (Ref: No)	Yes	1.153	0.376-3.530
Household Income Level (Ref: 5 th Quintile)	1 st Quintile	2.987 [†]	1.673-5.332
	2 nd Quintile	2.686 [†]	1.556-4.638
	3 rd Quintile	1.985**	1.174-3.355
	4 th Quintile	1.276	0.747-2.179

* p<0.1 ** p<0.05 ***p<0.01 †p<0.001

E. Influence of Parental SES, Household Food Security, and Child Care Environment on Children's Physical Growth

1. Influence of Parental SES, Household Environment, and Household Food Security on Children's Height.

Parents' experience of taking nutritional education or counseling was not considered in the analysis of stunted growth because there was only one child with stunted growth whose parents taken the service. Therefore, this variable was only considered in the analysis of overweight growth. Mother's educational level, household food security, and the use of child care facility were the most noticeable influential factors on children's height status. The effects of other variables differed between models. However, none of the interaction terms were significant in all models.

In Model 2, the odds ratio for experiencing stunted growth was significantly higher for children of mothers educated to senior high school level or lower relative to that for children of mothers educated to university level (OR: 4.501, 95% CI: 0.831-24.368, $p < 0.10$). In addition, it was significantly higher for children in conditions with inadequate amounts or limited variation of food than those raised without such restrictions (OR: 3.506, 95% CI: 0.839-14.645, $p < 0.10$). However, the odds ratio for experiencing stunted growth was significantly lower for children who were

attending a child care facility relative to those who were not (OR: 0.187, 95% CI: 0.04-0.861, $p < 0.05$).

In Model 3, the odds ratio for experiencing stunted growth was lower for children who were attending a child care facility relative to those who were not (OR: 0.187, 95% CI: 0.039-0.865, $p < 0.05$). However, the effects of the interaction between mother's educational level and household food security was not significant (OR: 1.153, 95% CI: 0.066-30.091, $p = 0.922$).

In Model 4, the odds ratio for experiencing stunted growth was significantly higher for children with mothers educated to senior high-school level or lower relative to that for children with mothers educated to university level (OR: 4.668, 95% CI: 0.879-24.776, $p < 0.10$). Different from the results for Model 3, the odds ratio for experiencing stunted growth was significantly higher for children from food insecure household relative to that of children from food secure household (OR: 6.146, 95% CI: 0.837-45.121, $p < 0.10$). In addition, it was significantly lower for children who were attending child care facility relative to those who were not (OR: 0.183, 95% CI: 0.041-0.833, $p < 0.05$). The effects of the interaction between occupation of the head of the household and household food security was not significant (OR: 0.226, 95% CI: 0.012-3.976, $p = 0.309$).

The results for Model 5 indicated that children from dual earner household had higher odds ratio for experiencing stunted growth relative to that of children from single earner household (OR: 12.027, 95% CI: 0.741-19.509, $p < 0.10$). The odds

ratio for experiencing stunted growth was also significantly higher for children with mothers educated to senior high school level or lower relative to that for children with mothers educated to university level (OR: 4.536, 95% CI: 0.837-24.589, $p < 0.10$). With respect to household food security, the odds ratio for experiencing stunted growth was higher for children from food insecure household had higher relative to that of children from food secure household (OR: 10.501, 95% CI: 0.956-15.533, $p < 0.10$). However, it was lower for children who were attending child care facility relative to those who were not (OR: 0.217, 95% CI: 0.051-0.908, $p < 0.10$). The effects of the interaction between parents' employment and household food security was not significant (OR: 0.174, 95% CI: 0.007-4.210, $p = 0.208$).

In Model 6, the effects of mother's educational level and the use of child care facility were significant with respect to children's height status. The odds ratio for experiencing stunted growth was significantly higher for children from mothers educated to senior high school level or lower relative to that for children with mothers educated to university level (OR: 5.157, 95% CI: 0.989-26.888, $p < 0.10$). In regard to the use of child care facility, it was lower for children who were attending child care facility to become stunted relative to those who were not (OR: 0.217, 95% CI: 0.046-1.003, $p < 0.10$). The effect of the interaction between the frequency of having meals with family members and household food security were not significant in both 2 times (OR: 9.323, 95% CI: 0.192-45.111, $p = 0.258$) and 1 time (OR: 0.307, 95% CI: 0.006-20.738, $p = 0.625$).

In Model 7, the odds ratio for experiencing stunted growth was significantly higher for children from mothers educated to senior high school level or lower relative to that for children with mothers educated to university (OR: 4.444, 95% CI: 0.841-23.494, $p < 0.10$). However, the interaction between the use of child care facility and household food security was not significant (OR: 1.217, 95% CI: 0.072-20.457, $p = 0.891$).

Table 7 Logistic Regression Analysis: Stunted Growth

Characteristics		Model2		Model3		Model 4		Model 5		Model 6		Model 7	
		O.R	95% C.I										
Gender (Ref: Male)	Female	1.371	0.437-4.293	1.364	0.416-4.481	1.459	0.471-4.526	1.331	0.424-4.168	1.553	0.433-5.564	1.382	0.408-4.677
Breastfeeding Experience (Ref: No)	Yes	0.134**	0.027-0.643	0.134**	0.027-0.651	0.114***	0.023-0.556	0.135**	0.027-0.661	0.124***	0.026-0.572	0.132**	0.028-0.622
Child's Age (Ref: 24 ≤ x ≤ 35)	36 ≤ x ≤ 47	0.196	0.021-1.824	0.197	0.021-1.874	0.193	0.021-1.827	0.204	0.023-1.802	0.188	0.021-1.723	0.195	0.021-1.801
	48 ≤ x ≤ 60	0.081**	0.012-0.519	0.081***	0.012-0.522	0.069***	0.011-0.426	0.083***	0.012-0.541	0.063***	0.009-0.419	0.079***	0.012-0.505
Father's Height (Ref: More than 173 cm)	Less than 173 cm	3.517*	0.799-15.475	3.517*	0.801-15.425	3.474	0.770-15.672	3.642*	0.810-16.372	3.062	0.692-13.553	3.496	0.774-15.784
Mother's Height (Ref: More than 160 cm)	Less than 160 cm	4.794***	1.501-15.312	4.801***	1.559-14.819	4.793**	1.445-15.900	4.505***	1.461-13.887	5.173***	1.628-16.435	4.788***	1.512-15.158
Mother's Edu. Level (Ref: At least Univ. Edu)	At most senior high school Edu.	4.501*	0.831-24.368	4.063	0.300-55.-11	4.668*	0.879-24.776	4.536*	0.837-24.589	5.157*	0.989-26.888	4.444*	0.841-23.494
Occupation of the Head of the Household (Ref: White Collar)	Blue Collar	0.526	0.108-2.543	0.524	0.110-2.495	1.547	0.133-17.880	0.476	0.098-2.301	0.560	0.112-2.800	0.531	0.116-2.436
Household Food Security (Ref: Food Secured Status)	Food Insecure Status	3.506*	0.839-14.645	3.173	0.254-39.619	6.146*	0.837-45.121	10.501*	0.956-15.533	1.659	0.130-21.117	3.149	0.476-20.803
Parents' Employment (Ref: Single Earner Household)	Dual Earner Household	3.251	0.522-19.143	0.524	0.110-2.495	3.224	0.550-18.902	12.027*	0.741-19.509	3.407	0.552-21.030	3.205	0.553-18.578

Frequency of having Meals with Family Member (Ref: 2 times)	1 time	3.371	0.574-19.773	3.381	0.568-20.091	3.107	0.602-16.036	3.107	0.552-17.475	0.572	0.019-16.564	3.411	0.612-19.008
	3 times	1.801	0.120-26.971	1.784	0.127-25.038	1.707	0.132-21.959	1.814	0.140-23.431	3.234	0.246-42.475	1.804	0.121-26.861
Children attending Child Care Facility (Ref: No)	Yes	0.187**	0.040-0.861	0.185**	0.039-0.865	0.183**	0.041-0.833	0.217**	0.051-0.908	0.217*	0.046-1.003	0.162	0.016-1.581
Interaction Terms	At most senior high school education or less * Limited kinds or inadequate amount of food			1.153	0.066-20.074								
	Blue collar * Limited kinds or inadequate amount of food					0.226	0.012-3.976						
	Dual Earner * Limited kinds or inadequate amount of food							0.175	0.007-4.210				
	1 time of meal having with family member * Limited kinds or inadequate amount of food									9.323	0.192-45.119		
	3 times of meal having with family member * Limited kinds or inadequate amount of food									0.366	0.006-20.738		
	Not attending child care facility * Limited kinds or inadequate amount of food											1.217	0.072-20.457

* p<0.1 ** p<0.05 ***p<0.01 †p<0.001

2. Influence of Parental SES, Household Environment, and Household Food Security on Children's Weight

Numbers of meals that children accompanied their parents was the most common factor on children's weight status. Mothers' educational level and household food security were statistically significant factors only in Model 3. However, similar to children's height status, none of the interaction terms were significant in all models.

In Model 2, the odds ratio for experiencing overweight growth was significantly lower for children who eat 2 times of meals accompanied with their parents per day relative to that for children who eat 3 times of meals accompanied with their parents per day (OR: 0.195 95% CI: 0.041-0.925, $p < 0.05$).

The results of Model 3 showed that odds ratio for experiencing overweight growth was significantly higher for children with mothers educated to senior high school level or lower relative to that for children with mothers educated to university level (OR: 3.014, 95% CI: 0.839-10.824, $p < 0.10$). In addition, children from food insecure household had higher odds ratio for experiencing overweight growth to that for children from food secure household (OR: 2.358, 95% CI: 0.869-6.398, $p < 0.10$). However, it was lower for children who eat 2 times of meal accompanied their parents relative to that for children who eat 3 times of meal accompanied their parents (OR: 0.217, 95% CI: 0.046-1.014, $p < 0.10$). The effects of the interaction between mothers' educational level and household food security was not significant

(OR: 0.295, 95% CI: 0.055-1.562, $p=0.151$).

In Model 4, the odds ratio for experiencing overweight growth was significantly lower for children who eat 2 times of meal accompanied their parents relative to that for children who eat 3 times of meal accompanied their parents (OR: 0.207, 95% CI: 0.044-0.966, $p < 0.05$). However, the effects of the interaction between occupation of the head of the household and household food security was not significant (OR: 0.548, 95% CI: 0.092-3.236, $p = 0.506$).

The results of Model 5 also showed that the odds ratio for experiencing overweight growth was significantly lower for children who eat 2 times of meal accompanied their parents relative to that for children who eat 3 times of meal accompanied their parents (OR: 0.201, 95% CI: 0.041-0.976, $p < 0.05$). The effects of the interaction between parents' employment and household food security was not significant (OR: 2.048, 95% CI: 0.338-12.392, $p = 0.434$).

With respect to Model 6, the odds ratio for experiencing overweight growth was significantly lower for children who eat 2 times of meal accompanied their parents relative to that for children who eat 3 times of meal accompanied their parents (OR: 0.138, 95% CI: 0.027-0.698, $p < 0.05$). The effects of the interaction between the numbers of meals that children accompanied their parents and household food security was not significant in both 2 times (OR: 1.757, 95% CI: 0.280-11.025, $p = 0.546$) and 1 time (OR: 0.725, 95% CI: 0.065-8.071, $p = 0.794$).

In Model 7, the odds ratio for experiencing overweight growth was significantly

lower for children who eat 2 times of meal accompanied their parents relative to that for children who eat 3 times of meal accompanied their parents (OR: 0.196, 95% CI: 0.040-0.953, $p < 0.05$). The effects of the interaction between the use of child care facility and household food security was not significant (OR: 2.491, 95% CI: 0.357-17.373, $p = 0.356$).

Lastly, in Model 8, similar to the previous models, the odds ratio for experiencing overweight growth was significantly lower for children who had 2 times of meal with their family members relative to that for children who had 3 times of meal with their family members (OR: 0.194, 95% CI: 0.041-0.914, $p < 0.05$). The effects of the interaction between the parents experience of taking nutritional education or counseling and household food security was not significant (OR: 1.277, 95% CI: 0.134-12.153, $p = 0.831$).

Table 8 Logistic Regression Analysis: Overweight Growth

Characteristics		Model2		Model3		Model 4		Model 5		Model 6		Model 7		Model 8	
		O.R	95% C.I	O.R	95% C.I	O.R	95% C.I	O.R	95% C.I	O.R	95% C.I	O.R	95% C.I	O.R	95% C.I
Gender (Ref: Male)	Female	0.536*	0.271-1.058	0.564*	0.287-1.108	0.543*	0.271-1.090	0.538*	0.273-1.057	0.543*	0.275-1.071	0.537*	0.274-1.053	0.533*	0.268-1.059
Breastfeeding Experience (Ref: No)	Yes	0.952	0.212-4.264	0.895	0.213-3.757	0.872	0.201-3.799	0.963	0.202-4.573	0.974	0.215-4.411	0.933	0.210-4.129	0.966	0.211-4.424
Child's Age (Ref: 24 ≤ x ≤ 35)	36 ≤ x ≤ 47	0.666	0.238-1.864	0.666	0.242-1.831	0.671	0.242-1.854	0.675	0.241-1.891	0.650	0.235-1.795	0.663	0.237-1.853	0.661	0.238-1.833
	48 ≤ x ≤ 60	0.901	0.148-5.451	0.788	0.145-4.264	0.813	0.138-4.769	0.894	0.142-5.619	0.911	0.147-5.627	0.872	0.145-5.226	0.908	0.146-5.619
Father's BMI (Ref: Normal)	Obese	1.823	0.829-4.006	1.897	0.881-4.084	1.826	0.836-3.986	1.835	0.848-3.971	1.824	0.818-4.065	1.804	0.813-4.001	1.823	0.829-4.008
Mother's BMI (Ref: Normal)	Obese	2.476**	1.077-5.691	2.521**	1.101-5.770	2.487**	1.082-5.719	2.491**	1.065-5.829	2.260**	1.022-4.999	2.480**	1.071-5.745	2.452**	1.073-5.606
Mother's Edu. Level (Ref: At least Univ. Edu)	At most senior high school Edu.	1.482	0.619-3.544	3.014*	0.839-10.824	1.451	0.625-3.370	1.486	0.628-3.512	1.476	0.611-3.564	1.449	0.599-3.505	1.501	0.623-3.613
Occupation of the Head of the Household (Ref: White Collar)	Blue Collar	1.101	0.411-2.945	1.058	0.402-2.784	1.546	0.464-5.145	1.160	0.422-3.183	1.071	0.409-2.798	1.124	0.421-3.003	1.108	0.417-2.944
Household Food Security (Ref: Food Secured Status)	Food Insecure Status	1.300	0.567-2.973	2.358*	0.869-6.398	1.719	0.717-4.122	0.923	0.259-3.279	1.094	0.275-4.353	0.631	0.130-3.051	1.258	0.509-3.104
Parents' Employment (Ref: Single Earner Household)	Dual Earner Household	2.142	0.751-6.101	2.106	0.760-5.838	2.102	0.719-6.143	1.473	0.347-6.242	2.098	0.758-5.803	2.068	0.751-5.692	2.148	0.753-6.122
Frequency of having Meals with family members	1 time	0.392	0.082-1.858	0.420	0.088-1.997	0.402	0.081-1.978	0.398	0.081-1.963	0.461	0.067-3.150	0.395	0.084-1.851	0.386	0.083-1.799
	3 times	0.195**	0.041-0.925	0.217*	0.046-1.014	0.207**	0.044-0.966	0.201**	0.041-0.976	0.138**	0.027-0.698	0.196**	0.040-0.953	0.194**	0.041-0.914

(Ref: 2 times)															
Children attending Child Care Facility (Ref: No)															
Yes	2.520	0.451-14.087	2.526	0.456-13.977	2.411	0.435-13.373	2.357	0.412-13.471	2.581	0.515-12.929	1.675	0.238-11.785	2.517	0.450-14.057	
Parents' Experience of taking Nutritional Education or Counseling (Ref: No)															
Yes	1.500	0.461-4.880	1.308	0.390-4.380	1.433	0.455-4.512	1.487	0.445-4.965	1.581	0.485-5.173	1.443	0.449-4.637	1.258	0.509-3.104	
At most senior high school education or less * Limited kinds or inadequate amount of food															
			0.295	0.055-1.562											
Blue collar * Limited kinds or inadequate amount of food															
							0.548	0.092-3.236							
Dual Earner * Limited kinds or inadequate amount of food															
									2.048	0.338-12.392					
1 time of meal having with family member * Limited kinds or inadequate amount of food															
										1.757	0.280-11.025				
3 times of meal having with family member * Limited kinds or inadequate amount of food															
										0.725	0.065-8.071				
Not attending child care facility * Limited kinds or inadequate amount of food															
												2.491	0.357-17.373		
Not taken Nutritional Education or Counseling * Limited kinds or inadequate amount of food															
													1.277	0.134-12.153	

Interaction Terms

* p<0.1 ** p<0.05 ***p<0.01 †p<0.001

V. DISCUSSION

A. Household Food Security

Analysis between household food security and income level showed a significant influence of low income level on household food insecurity. This implies that children from low income household have a high risk of exposing unfavorable nutritional condition due to parents' limited choice of obtaining adequate amount and various kinds of food. Similar results have been addressed in previous studies (Rose, 1999; Kim et al, 2009). However, other variables such as occupation or educational level of the head of the household were found to be insignificant in this study. Therefore, it can be interpreted that household food security is a condition created by combining both household's nutritional environment and economic status.

Household food security showed significant influence on children's height growth in most of the models, except the one which considered interaction between household food security and mothers' educational level, the frequency of having meals, and the use of child care facility. However, household food security was only influential to children's weight growth in the model which included the interaction between household food security and mothers' educational level. It was noteworthy that household's food insecurity had more significant relationship between children's height growth which was also supported by previous studies (Milman et al., 2005; Baig-Ansari et al., 2006). Regarding that height growth is the result of chronic

malnutrition, unsatisfied dietary intake could be a significant factor for deteriorating children's nutritional accumulation in long term. The unstable nutritional environment could give substantial negative effects on children's growth because children are in the stage of rapid growths, as shown in a previous study (Kim et al., 2009). Therefore, adequate amount and various kinds of food should be guaranteed to meet the needs of children's nourishment in long term. Considering that nutrition is the fundamental determinant for children's growth, both household's socioeconomic status and nutritional environment should be considered to evaluate the proper growth environment for children (Drewnowski et al., 2004; Attree, 2005; Nord et al., 2008). Therefore, household food security must be considered as a core factor to assess children's health.

B. Household Environment

Mothers' educational level and the use of child care facility were the most significant household environmental factors on children's height growth. On the contrary, the frequency of having meals with family members was the only influential variable on children's weight growth. Mothers' educational level and food security were additional significant factors in the model which analyzed the effects of interaction between household food security and mothers' educational level on children's weight growth. Parental educational levels exert a long term influence on their nurturing behavior and can specifically reflect nurturing environment rather

than household income level (Park et al., 2005). Based on these characteristics, parental educational level is related to children's height, which reflects cumulated nutritional conditions in the long term. Considering that mothers are more directly involved in raising their children, their educational levels have a stronger influence on children's environments. Mothers' educational level implies not only mother's acquired knowledge but also the ability to obtain information required to provide needed care, such as maintaining a balanced diet, responding to emergencies, and enlisting child-care assistance (Barrera, 1988; Benson et al., 2011). In particular, young children are entirely dependent on their parents' decisions and use of health inputs which are substantial factors in providing a suitable caring environment (Barrera, 1990). Therefore, mothers' decisions regarding the provision of adequate amounts of high quality resources exert a strong impact on children's growth potential, until they are capable of making independent decisions.

Among child care environmental factors, the frequency of having meals with family members was significantly influential to children's overweight growth; the more frequent children had meals with family members, the lesser children would experience overweight growth. Similar to this result, previous studies also reported that children's food intake can be more efficiently managed when caregivers directly observe and manage children's eating habit by sharing meal time together (Moon et al., 1987; Son et al., 1996; Valentine, 2000; Pyun et al., 2010). This can be interpreted that responsive care from their family members can give positive

influence on children's growth in short term. Considering that children's dietary habit and preference on particular food are formed during the early childhood period (Matheson et al., 2002), parents' careful guidance on children's dietary habit and nutrient intake during meal time can give a positive influence on children's normal growth. Therefore, the results of this study suggest that caregivers' proper guides on providing adequate and qualified nutrition to children during meal time could reduce the problem of overweight growth. In addition, it was found that children's normal height growth was significantly influenced by the use of child care facility. It is attributable to the fact that the child care facility in Korea is obliged to take care of children's dietary life and replace parents' temporary absence from child care. Without giving responsive care to children in needed time, there could be a substantial growth problem to children. One of the major problems that parents' limited time share with children is the poor control of the amount and quality of food. Regarding the annual national reports, dual earner household spend lesser time with their children and find more difficult to manage their children's nutrition, relative to single earner household (Ministry of Gender Equality and Family, 2010; Statistics Korea, 2010). The negative consequences of parents' limited time for child care have been reported that children from working parents household often skip breakfast and usually eat food based on their preference rather than nutritional value because of parents' limited time spending for child care (Lee, 2008). In addition, children from employed mothers were more likely to consume junk food and lesser physical

activity, relative to those from single earner household (Brown et al., 2010). However, if parents' absence can be replaced by other caregivers, such as the child care facility, children could have well-managed eating habit and balanced nutrition. Considering the results of previous studies that the choice of food and dietary life pattern can be considered as one of the cultural behavior, children's eating behavior can be learned not only from family members but also other social environment, such as school or facility (Birch, 1972; Murcott, 1982). Therefore, the child care facilities can be regarded as an external assistance for child care. However, in order to specify the types of child care services that influence particular mechanisms involved in children's growth, further studies investigating the influence of the external assistance on child care are needed.

The insignificance of interaction terms in all study models reflects stronger effects of household food security on children's growth relative to that of parental SES and child care environment. In other words, children exposed to poor dietary environments may find it more difficult to consume basic nutrients even though parents make efficient and appropriate decisions and are responsive in child care. Therefore, the confines of limited resources should be considered a foundational factor in establishing a solid growth environment for children.

C. Implications and Limitations

This study showed novel perspectives in the analysis of young children's growth and possible direct and indirect environmental factors that have not been the focus of many Korean child health studies. In addition, physical growth status was used to determine children's health, while previous studies used children's cognitive development status as an indicator. The study also used the national data for participants taken from the entire Korean population. Using such representative data, this study sought to consider current social characteristics and identify factors that influence children's growth, which can generally be applied to young Korean children. However, survey answers may lack in accuracy due to responders' recall bias and evasion of certain questions.

With respect to the results, the study supported the importance of household food security, mothers' educational levels, the frequency of having meals with family members, and the use of child care facility on children's growth which similar to that in previous studies. Household food security, which reflects the proper situation for providing adequate and qualified dietary intake to children, played the most crucial role in determining children's height. Therefore, the allocation of income for purchasing nutrient foods is important on children's growth. Current governmental policies for young children should, in addition to the financial assistance to households, be focused on researching household's nutritional environment and

providing practical service programs, such as increasing food supplements program to household with vulnerable groups, providing basic nutritional information to parents, and subsidizing low income household to purchase fundamental food resource to maintain children's growth potential. Mother's educational level, which assumed to be related with knowledge and decision making ability, played the most crucial role in determining children's height. Therefore, practical information sources related to child care or nutrition should be provided for mothers at public level. In this case, it will be important not only construct various channels but also efficiently advertise the availability of child care services and information. The study also emphasized the importance of the frequency of having meals with family members and the use of child care facility. Parent's lack of time sharing with children may exert negative impact on the stability of children's growth environments. Currently, employment status of both parents is considered as one of conditions for giving priority to children to enter public child care facilities. However, considering that only limited numbers of children are able to use the public service, alternative child care service should be arranged. For instance, nanny referral services in public level could be one of the replacements for working parents who were unable to use public child care facilities. In addition, national child care programs for working parent with young children such as, flexible parent leave and grant for encouragement of using substitute workers, should be mandatorily enforced so that working parents could practically receive benefit and actively participate in child care.

However, methodological limitation of this study is that the confidence intervals for the odds ratio comparing children's normal versus stunted growth were wide. This is due to the fact that there were a small number of stunted children in the study. Even though the odds ratios were statistically significant, the confidence interval suggests that the magnitude of the effect could be changed. Thus, a larger study is needed to generate a more precise estimate of the influence of household food security and household environment on children's height growth. As for the food security in the survey, it was restricted to households' subjective perspective on food provision. In particular, 'various' is not described adequately on the survey sheet, and individuals may understand the meaning of the variety of food in different ways. To identify whether household is receiving sufficient food resources in nutritionally acceptable ranges, it is necessary to investigate the exact types and amounts of food provided to children. Also, additional research about the date and user reviews in regard to children's experience of receiving the service such as provision of meal from the child care facility, should be conducted. It was not possible to confirm what types of meals and refreshments that children usually eat at the facility due to insufficient questions on the survey sheet. In order to clarify the significance of the child care facility, more detailed information such as, food that the facility provide to children and parents' satisfaction on the use of child care service should be included.

Despite these limitations, this study identified some important characteristics for children's growth; direct casual relationships with household food security, parent's responsive care, and external assistance for child care requiring multidimensional reviews. This study revealed that young children showed different growth patterns in accordance with household's food security level, some of the parental SES, and household type factors. Also demonstrated was the fact that young children's growth was more dependent on the stable nutritional supply followed by household environment.

VI. CONCLUSION

This study was designed to assess the current trends of children's growth between 2009 and 2012, to investigate the effect of parental SES and child care environment, and to analyze influence of household food security on children's growth. KNHANES and WHO Children Growth Standards were used for data analysis. Logistic regression analysis using a two-stage stratified systematic sampling method was applied.

The results obtained were as follows;

- (1) The prevalence of stunted growth was lower than 2% in each year but the transitions in the prevalence of stunted growth were unstable. However, the prevalence of overweight growth was higher than that of stunted growth in each year and the annual changes of the prevalence of overweight was more rapid to that of stunted growth.
- (2) Household income level had a significant influence on determining household food security; the lower the household income, the more the household is likely to be in a food insecure status.
- (3) Household food security, mothers' educational level, and the use of child care facility showed the strongest relationship with children's stunted growth. On the contrary, household food security and the frequency of having meals with family members were the most influential factors on children's overweight growth.

(4) After applying the interaction terms, such variables as household food security, mothers' educational level, the use of child care facility, and the frequency of having meals with family members on children's physical growth were remained as significant factors. However, interaction terms between parental SES and food security and household type showed no significance.

In conclusion, this study identified the importance of household's secured nutritional environment and caregivers' responsive care on young children's normal growth. Therefore further studies concerning young children's health should be conducted including macroscopic reviews of children's exposure to risks and household, community, and national assistance.

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국문초록

가구환경 및 식품 안정성이 유아 신체성장에 미치는 영향

김 지 현

보건학과 보건정책관리전공

서울대학교 보건대학원

연구배경

유아기의 신체적 성장은 제공되는 자원의 양과 질에 따라 큰 영향을 받는 것으로 알려져 있다. 그러나 최근 급격한 사회 변화 속에서 유아의 성장환경은 새로운 영향을 받고 있고 이러한 가정환경 변화에 따른 유아들의 성장 불평등이 여전히 주요한 보건학적 문제점으로 남아있다. 유아기의 성장이 궁극적으로 섭취하는 영양의 양과 질에 따라 결정된다는 점을 감안할 때, 유아의 성장환경을 구성하는 주 요인들의 영향이 가구의 식품안전성에 따라 어떻게 변화되는지를 연구할 필요가 있다.

연구목적

본 연구는 2009년부터 2012년까지 유아의 저신장과 과체중의 변화 양상을 살펴보고자 한다. 가구의 식품 안전성과 가구 내 소득수준간의 관계를 파악하고 부모의 사회경제적 지위와 양육 환경이 유아의 성장에 미치는 영향을 파악하고 이 요인들의 영향이 가구 내 식품 안전성에 따라 어떻게 변화하는지 분석하고자 한다.

연구방법

본 연구는 국민건강영양조사 제 4기 (2009) 그리고 제 5기 (2010-2012) 자료를 사용하였다. 연구 대상은 24개월에서 60개월의 연령을 가진 유아들로 신장 또는 체중의 정보가 결여되었거나 선천성 심장질환을 진단받은 자들은 제외하였다. 가구주 및 가구원들의 특성, 가구 유형, 그리고 식품 보조 프로그램 수혜여부를 보정한 뒤, 가구 내 소득수준이 가구의 식품안정성에 미치는 영향을 로지스틱 회귀분석을 통해 구하였다. 가정환경과 가구의 식품안정성이 유아의 신체 성장에 미치는 영향을 분석할 때, 가구의 식품 안정성, 부모의 사회경제적 지위, 그리고 영양과 관련된 양육환경이 독립변수로 간주되었다. 신장과 체중의 정상 및 비정상을 구분하기 위하여 세계보건기구가 배포한 2006 World Health Organization Children Growth Standards를 사용하였다. 아동의 저신장 혹은 정상 신장 그리고 과체중 혹은 정상 체중이 될 가능성에 부모의 사회경제적 지위, 가구 유형, 그리고 식품 안정성이 미치는 영향을 로지스틱 회귀분석을 통해 분석하였다. 모든 로지스틱 회귀분석들은 복합표본 자료분석 방법을 적용하였다.

연구결과

저신장 유아의 비율은 매년 2% 미만인 것으로 나타났지만 불안정한 추세를 보여주고 있었다. 반대로 과체중 유아의 비율은 저신장 비율보다 높았고 저신장보다 더 급격하고 불안정한 변화추세를 보이고 있었다. 가구 내 소득수준과 가구의 식품 안정성 간에 유의한 관계가 있었는데, 소득수준이 낮을수록 가구의 식품 안정성이 불안한 것으로 나타났다. 가구의 식품 안정성, 부모의 사회경제적 지위, 그리고 양육환경 모두 유아의 신장 및 체중에 유의한 영향을 주는 것으로 나타났다. 특히, 가구의 식품 안정성, 모의 교육수준, 그리고 보육시설 이용 유무는 유아의 저신장 성장에 가장 큰 영향을 미치는 것으로 나타난 반면, 유아의

가족동반식사 횟수가 유아의 과체중 성장에 뚜렷한 영향을 주고 있었다. 식품 안정성과 부모의 사회경제적 지위 및 양육 환경을 식품 안정성과 상호작용한 교호항들을 고려한 분석결과에서도 가구의 식품 안정성, 모의 교육수준, 그리고 보육시설 이용 유무유아의 가족동반 식사 횟수가 주요한 역할을 하는 것으로 분석되었다. 그러나 교호항들은 모두 유의하지 않은 것으로 나타났다.

결론

본 연구는 유아가 정상적인 성장을 하기 위해서는 장기적인 측면에서 가구의 식품안정성 보장 및 모의 교육수준을 고려해야 하고 유아가 식사를 할 때 이를 적절하게 관리할 수 있는 보호자 동반 여부와 보호자 부재 시 이를 대체할 수 있는 여건을 마련하는 것이 중요하다는 것을 확인하였다. 그러므로 유아의 정상적인 성장 환경을 고려할 때 가구 내 소득수준에 따른 양육환경 변화 양상에 주목해야 하며 국가적 차원에서 부모의 양육을 보조할 수 있는 실질적 서비스 프로그램이 제공되어야 할 것이다.

주요어: 유아, 저신장, 과체중, 가정환경, 식품 안정성

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