Influence of Parents' Child-feeding Practices on Child's Weight Status among Chinese Adolescents in Beijing, China

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Chapter I Introduction

Background

The World Health Organization (WHO) Expert Consultation on Obesity, held in 1997, warned of an escalating epidemic of obesity that would put populations of most countries at risk of developing non-communicable diseases (World Health Organization [WHO], 2000a). Prevalence of obesity has escalated rapidly since that date in almost all counties. Along this trend, obesity among children increased sharply both in developed and developing countries. For instance, in the United States, approximately 17.1% of children and adolescents aged 2 to 19 years are obese based on data from the National Health and Nutrition Examination Survey (NHANES) 2003-2004 (Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006). In many developing countries, prevalence of obesity is catching up with industrialized societies and the rate of increase is even faster. In China, data from a series of national surveys show prevalence of overweight among Chinese school-age children (7-18 years old) was about 10% in urban areas in 2000, a five-fold increase since 1985 (≤ 2% in 1985) (Ji & Working Group on Obesity in China [WGOC], 2005).

Childhood obesity has become a public health concern because of the adverse health consequences. As studies show, childhood obesity has been associated with increased risk in cardiovascular diseases, type 2 diabetes, and metabolic disorders before or during early adulthood, and increases morbidity and mortality in adulthood (Ogden, Flegal, Carroll, & Johnson, 2002). Furthermore, health professionals are aware that rising trends in obesity among children and adolescents will put a heavy burden on health services.

Such rapid changes in numbers of obese children within a relatively stable population indicate genetic factors are not the primary reason for the change (Lobstein, Baur, Uauy, & IASO International Obesity Task Force [IOTF], 2004). Social and environmental changes are believed to contribute to the problem. The changing nature of the environment towards an increasingly obesogenic one has been described in *WHO Diet Nutrition and the Prevention of Chronic Diseases* (WHO, 2002). In modern industrialized societies, foods and drinks are more available and affordable than ever before, fewer people have jobs requiring hard physical labor, car ownership has increased rapidly, and homes have labor-saving gadgets. The pattern of change in diet, such as increased consumption of energy-dense diets high in fat, particularly saturated fat, and low in unrefined carbohydrates, combining with a sedentary lifestyle escalate the excessive weight gain (WHO, 2002).

As observed in industrialized countries, change in social environments, diet and life styles is taking place in China, especially in east coastal regions. In terms of economic achievement, China has made great progress. From 1979 (when economic reforms began) to 2008, China's real gross domestic product (GDP) grew at an average annual rate of nearly 10% (World Bank, 2009a). The GDP per capita doubled between 2002 and 2006. As a result of economic prosperity, living conditions, such as family income, availability of durable products, food and health care services, have improved to a great extent. For example, ownership of color TV sets has doubled in urban areas since 1990 (59 in 1990 per 100 household vs 137 in 2007) (National Bureau of Statistics of China, 2009a).

As Chinese enjoy economic prosperity and improved living conditions, a nutrition transition and epidemiologic transition are also taking place (Chen, 1999; Popkin & Du, 2003). Data from national dietary surveys and household food consumption surveys in the last 20 years

have documented an accelerated increase in consumption of meats, poultry, eggs, and edible oils. Currently, approximately 50% of the adult Chinese population has shifted towards an affluent diet high in fat content (Wang, Zhai, Du, & Popkin, 2008). Along with this dietary transition, there is a shift from a disease pattern dominated by infectious and deficiency disease to an epidemic of non-communicable chronic diseases. Prevalence of obesity has increased dramatically both among adults and children (Chen, 2008).

Chinese children have become more vulnerable living in such a rapid-changing environment. The increase in prevalence of overweight and obesity among Chinese children is faster than that in many developed countries (Ji & WGOC, 2005). In major cities, prevalence of childhood obesity reaches a particularly high level. For instance, more than 20% children were either overweight or obese in Beijing in 2004 using standardized international body mass index (BMI) classifications (Shan, Xi, Cheng, Hou, Wang, & Mi, 2010). Prevalence is even higher using Chinese BMI cut offs for school-aged children.

An ecological approach has been recommended for successful intervention with childhood obesity (Dietz & Gortmaker, 2001). Multiple sectors should be involved, including society, schools, communities, families and individuals (Lobstein et al., 2004). Mixed strategies should be used, including improvements in nutritional habits, raised levels of physical activity, as well as social support (WHO, 2002).

An important piece of the picture for effective intervention on childhood obesity takes place in the family, because parents and family environment play a critical role in shaping children's food preferences, eating behaviors, and energy intake (Birch & Fisher, 1998). Parents influence children's eating behaviors in several ways. As food providers, parents provide food environments for their children's experiences with food and eating. As role models, parents

influence their children through their own beliefs, attitudes, eating habits and food preferences. As caregivers, parents influence their children's eating habits through feeding practices.

Parents are responsible for making food available to their children and preparing family meals. Foods and drinks brought in to the family and family eating patterns established by parents strongly influence what and how children eat. Studies show children's preferences and intake patterns are largely a reflection of the foods available at home and familiar to them (Birch, 1999). Food availability has been reported as one of the most influential factors in children's food choices (Story, Neumark-Sztainer, & French, 2002). For example, extent to which fruits and vegetables are present and readily available and accessible in the home correlates positively with the level of their consumption by school-age children (Cullen et al., 2003). Likewise, availability of fast food and energy-dense snacks is positively associated with unhealthy intake patterns. A recent study in the US shows fast-food purchases for family meals were positively associated with intake of fast foods and salty snack foods for both parents and adolescents (Boutelle, Fulkerson, Neumark-Sztainer, Story, & French, 2007).

Whether a family eats together also can also have important effects on children's food consumption patterns. A growing body of research demonstrates children who eat meals with other family members consume more healthy foods and less energy dense food. Cross-sectional studies in Project Eating Among Teens (EAT) and other adolescent samples have reported that frequent family meals are associated with fewer skipped breakfast meals, higher intakes of fruit, vegetables, calcium-rich foods, and key nutrients (e.g. calcium and folate); and lower intake of soft drinks (Neumark-Sztainer, Hannan, Story, & Perry, 2003; Videon, & Manning, 2003). Larson and colleagues conducted a 5-year longitudinal study showing family meals during adolescence were associated with higher diet quality and healthful meal patterns during young

adulthood. That is, family meal frequency during adolescence predicted higher intakes of fruit, vegetables, dark-green and orange vegetables and lower intakes of soft drinks during young adulthood (Larson, Neumark-Sztainer, Hannan, & Story, 2007).

Parents' "child-feeding strategies" represent parents' approach to maintaining or modifying children's behaviors with respect to eating. For example, when parents are highly concerned about an overweight tendency of their child, they may restrict and monitor their child's consumption of "unhealthy" food (e.g. sweets). However, some studies show parental restriction on "forbidden foods" increases the child's preference for these foods, while pressuring children to eat a particular food was associated with decreased preference for that food (Fisher & Birch, 1999; Birch & Fisher, 2000). Thus, other studies have showed associations between 'controlling' feeding strategies and childhood obesity (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002), though the temporal direction of this relationship is unclear. Thus, feeding strategies used by parents may have important influence on children's eating patterns and weight.

However, parental control and regulation of children's eating behavior may not always be counterproductive. It may depend on how parents interact and communicate with their children regarding food and eating. When children are encouraged to eat healthy foods, but also given some choices about eating options with parental explanation and rationales, higher intake of healthy food such as fruits and vegetables, and lower intake of energy-dense food can be achieved. (Gable & Lutz, 2001; Kremers, Brug, Vries, & Engels, 2003).

Thus, experts encourage parents to:

decrease exposure to 'obesogenic' foods in the home by decreasing variety and quantities of calorie-dense items, high fat foods and purchased sweets; to establish

> designated times for family meals, provide companionship at mealtime, allocate individual portions, establish a positive atmosphere, and model appropriate food-related behaviors to promote improved dietary quality. (Golan, 2006, p. 69).

Parents are also encouraged to foster a healthy feeding style in which adults determine which foods are available at the home, how they are prepared and offered, and where they dine out, while children are encouraged to determine the amount eaten based on internal hunger cues (Satter, 1996).

China has been undergoing a rapid transition in economy and social environment over the past several decades. The rapid rise in economic productivity has resulted in changes in the Chinese diet and lifestyles (Du et al., 2002; Popkin & Du, 2003). Chinese people have been enjoying improved availability of various foods and food products, in particular animal-based foods and edible oil (mainly vegetable cooking oil), which were rationed and could be purchased only with food stamps prior to the 1980s (Zhai et al., 2002). Data from national dietary surveys and household food consumption surveys in the last 20 years have documented an accelerated increase in the consumption of meats, poultry, eggs and edible oil. A tendency toward a more sedentary lifestyle has been documented in many major cities in China (Popkin & Du, 2003). Increased use of public transport and motor vehicles, presence of labor-saving appliances at home, increased preference for sedentary leisure activities and dietary pattern changes are all linked to increased BMI among people in urban areas. Changes in urban communities have been more dramatic than the rural (Zhai et al., 2009).

Along with these changes, family structure among the Chinese urban population creates a unique family environment and parenting style. The family planning policy launched by the Chinese government in 1979 promotes married couples having one child. A modern family in

China is centered by the only child who tends to be indulged by parents and grandparents. Nowadays, Chinese children have much more freedom and choice in what they eat, and they may tend to be over-fed by parents, and especially grandparents, who experienced famine and food scarcity (Jiang et al., 2007). Dramatic increase in childhood obesity has been observed among Chinese children in the past decades (Ji & WGOC, 2008). However, at the same time, with the spread of mass media, there is a shift in cultural beliefs and a slim body image is gaining popularity among younger generations (Xie et al., 2006). Increased concerns about body image among Chinese young adults have been reported (Sakamaki, Toyama, Amamoto, Liu, & Shinfuku, 2005). Parents may exercise controlling strategies on feeding their child, based on their perceptions about body images and concerns about the risk of overweight. Changes during the rapid economic and nutritional transition may influence Chinese parents' child-feeding attitudes and behaviors, which, in turn, may affect their children's weight status.

Under the strong influence of parents, childhood is very important for development of eating habits as well as a potential intervention point for reducing the risks of obesity. Dietz (1994) has identified adolescence as one of the critical periods in development of obesity. Adolescence is a critical period of time for physical and behavioral development. Excess weight gain and imbalanced energy expenditure is more likely to manifest during adolescence, and a higher prevalence of obesity is observed among American adolescents than younger children (Ogden et al., 2006). There is a sharp decline of physical activities among American adolescents (Wang, Monteiro, & Popkin, 2002). Studies also show that obesity among adolescents is a stronger indicator of adulthood obesity than is obesity in younger children (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997).

Adolescents are in the process of separating emotionally and psychologically from their parents and establishing their own identity and, with it, behaviors that will impact their health in the long term (Story, Neumark-Sztainer, & French, 2002). Adolescents are experimenting in every aspect of their lives, including nutrition and dietary choices, as they strive towards autonomy (Hill, 2002). During this transition, however, they are not emotionally and financially independent. Even among older teens, family influence is still reported as the major influence on their behaviors (Story et al., 2002). Understanding adolescent food intake behaviors and the influence from the home gains particular relevance in the face of the obesity epidemic.

Problem Statement

Studies conducted to assess parental influence on children's eating behavior and adiposity mainly focus on Western populations. There is little known among Asian populations, especially among Chinese. With a rapid social and environmental change in China, family and parental influence on children's eating needs to be examined in detail. What role do parents play in shaping their child's eating? Is there any relationship among parents' feeding practices and children's weight status? What is the influence of the home food environment created by parents on their children's weight? Unanswered puzzles need to be clarified in order to combat the obesity epidemic among the Chinese youths.

Purpose of the Study

The purpose of this study was to examine the relationships between Chinese parents' child-feeding attitudes and practices and weight of their young adolescent. Particularly, the study assessed parental child-feeding attitudes and practices, including their concerns about their young adolescents' weight, and strategies regarding child feeding, and family food environment, which includes obesity-related foods available at home and family eating patterns. The study also

examined whether these child-feeding practices and family food environment are associated with the young adolescent's actual weight status. The study focused on the parent who cooks meals for the family most of the time, because this parent is thought to have the greatest influence on children's food choice and the families' food environment.

Needs for the Study

Most current studies of childhood obesity focus on genetic factors, socioeconomic and macro environmental factors. Parental influence and family environment related to child feeding have not been adequately researched. Though a growing body of research focuses on parents' child-feeding styles and obesity development among children, relationships between children's weight status and parents' child-feeding strategies are inconclusive. Yet, it seems evident that parents, as a key agent in the family, have profound influence on children's health in various ways. Parents shape children's food preference and eating behaviors through their own attitudes, behaviors and home food environment they create. Yet, those aspects have not been well understood, especially in many developing countries like China.

To curb the rising obesity epidemic in China before it is too advanced, factors contributing to the problem need to be better understood. Factors related to eating behavior and energy intake have been identified within the family. However, little data are available for analysis of family influence on children, especially, early adolescents in developing countries. Early adolescents are in a transition to autonomy. However, their foods are primarily prepared and provided by their parents and their eating behaviors mainly take place within the family. Parents' influence on their eating remains strong during early adolescence. It is also not known if factors such as parents' child-feeding practices that seem to be relevant in western countries are relevant in developing countries with different social structures, such as China. Such

information would help better understand the role of parents and family food environment in development of childhood obesity and provide insights for intervention in Chinese population.

Significance of the Study

This study aims to capture a snapshot of child-feeding practices within a rapidly changing background. This 'snapshot' will provide a clearer picture of feeding and eating practices in a modern Chinese family. The questionnaire for the study is based largely on an instrument used in US and Japan to investigate child-feeding practices and children's weight. Refinement of the questionnaire through the study should produce a useful tool for future research in China.

Research Questions

In order to examine the relationships between the parental feeding practices and weight status of young Chinese adolescents, the following questions were seen as relevant:

1. What is the relationship between parents' perception of their children's weight status and children's actual weight status?
2. To what extent are parents concerned about their children being overweight?
3. What is the relationship between parents' weight concern about overweight in their children and children's actual weight status?
4. To what extent do parents feel responsible for preparing their child's meals, and use specific feeding strategies to regulate young adolescents' food intake (e.g. restricting foods, pressure to eat and monitoring of high-calorie foods)?
5. What is the relationship between parents' child-feeding strategies and children's weight status?

6. To what extent do parents promote communication about healthy weight and eating with their children?
7. What is the relationship between parent-child communication and children's weight status?
8. What food environment do parents create at the home? Specifically:

   a. To what extent do parents limit availability of high-calorie foods (e.g. sweets, fried food, soft-drinks) and promote availability of fruits?

   b. To what extent do parents provide a positive eating environment (breakfast at home for child, dinner as a family, limited meals out and take-out foods)?
9. What is the relationship between family food environment and children's weight status?
10. Which feeding practices strongly predict children's weight status after taking SES factors and parents' BMI into account?

Research Methods

Sample

The targeted population in this study was parents of young Chinese adolescents in 7th grade and 8th grade who live in Beijing urban areas. In particular, the research focused on the parent who prepares the most family meals and is more responsible for feeding the child. About 400 participants were needed to meet the requirement of data analysis with a minimum response rate of 70%. Students enrolled in 7th to 8th grade were recruited as a means to approach their parents.

In order to select participants who can represent the population on social economic factors in Beijing urban areas, purposive sampling and convenient sampling strategies were used.

With the development of economy and urbanization, its population consists of immigrants from all over the mainland of China. There are four old urban areas where most Beijing natives live and four new urban areas where immigrants make up the majority of the population. One district out of the four old urban areas and one district out of four new urban areas were selected. Based on the availability of students' current check-up data and the recommendation from the Beijing Center for Disease Control and Prevention (Beijing CDC), two schools in each selected districts were selected from the school lists (provided by Beijing CDC). Class cohorts in 7th-8th grade were selected in these schools to meet the estimated sample size.

Research Design

A cross-sectional design was used in this study. Cross-sectional studies can be thought as providing a "snapshot" of frequency and characteristics of a health issue in a population at a particular point in time. It is a common research method, and useful way to gather information on important health related aspects of people's knowledge, attitudes, and practices.

A self-administered survey was conducted among parents of 7th to 8th graders. The survey was used to examine relationships between parental influence and weight status of young Chinese adolescents. Twenty-nine items were adopted from Birch's Child Feeding Questionnaires (CFQ) (Birch et al., 2001) to capture parents' attitudes and feeding strategies to regulate their children's intake of high-calorie foods, with additional items added based on literature to collect parent-child communication about healthy eating and weight and the family food environment. There were total 44 items on 10 subscales plus 16 demographics items in the survey. Translation-back-translation to ensure language validity in Chinese was conducted.

Human Subjects

Prior to data collection, approval from Southern Illinois University Carbondale's Human Subjects Committee was obtained by the researcher. Procedure of the study in China and both English and Chinese versions of the survey was submitted to the committee for review. As requested, a letter from a third party that was a graduate student and helped with translation was provided to indicate the Chinese version of the survey has the same information as the English one. Based on recommendations from dissertation committee, minor changes were made and the revised research procedure was approved by the Human Subjects Committee.

Data Collection

Permission to get into schools was obtained with support from Beijing CDC. A public health official from the department of School Health helped the researcher select and contact schools. The researcher went to schools, talked to provosts and school nurses, and asked for cooperation. The school nurses helped distribute questionnaires and explained instruction to students in selected classes. Students were asked to take the questionnaire home to their parents and to bring the questionnaires back in two days. The school nurses collected surveys and contacted the researcher to gather the surveys and student annual check-up data. The researcher visited schools to collect those questionnaires. When the researcher visited schools, students' height and weight from their annual check-up for the current year was abstained from school nurses with the permission from the school and consent from parents.

A pilot study was conducted to test the data collection procedure and to examine internal consistency and reliability of the instrument. A school was selected for pilot study based on the similarity to schools in the full study and cooperative school authorities recommended from the district CDC. Participants were recruited through students in 7th and 8th grades in the selected

middle school. This school was not included in those 4 selected schools for full data collection. Participants were asked to complete the survey a second time two weeks later. Internal consistency and test-retest reliability were assessed. The sample size of the pilot study was about 100 subjects to meet the requirement of reliability tests. The pilot study followed the same procedure of the full data collection as described above, but it was separated from the full data analysis.

Data Analysis

Descriptive statistics including frequencies, percentages, measures of central tendency and dispersion were calculated for demographic information and survey items. *t*-tests were used to identify disparities among groups. Age- and sex-specific BMI reference developed by International Obesity Task Force (IOTF) was used to classify overweight and obesity among young Chinese adolescents. Classification of underweight for adolescents recommended by WHO was used (WHO, 1995). Correlation analysis was conducted to test relationships between the subscales of feeding practices and children's weight status. Multiple-regression was used to identify strong predictors of children's weight status among feeding practices. BMI z-scores were used to indicate children's weight status in regression analysis as the dependent variable.

Assumptions

The following are assumed for this study:

1. Survey questions and response options are presented clearly in Chinese.
2. Parent understands the questions and reports information honestly.
3. Participants are aware completion of the survey is voluntary.
4. The child's weight and height reported by the parent, is reasonably accurate.

5. The parent with primary responsibility of family meals is the person with primary responsibility for what food comes into the home and for regulating child's eating behavior.
6. At a population level, body mass index captures body fat mass adequately.

Limitations

1. Causal relationships between variables cannot be determined, only associations inferred in this cross-sectional design.
2. Due, in part, to the purposive sampling strategy, families that respond may not be representative of the targeted population's generalizabiliy.
3. Children develop quickly during puberty and their weight and height at any point in time may not accurately reflect the long term trend. Muscle and bone to height relationship is changing during adolescence. Body composition at any one point in this time may not capture a stable representation of body fat level.

Delimitations

1. Only parents or caregivers of 7th to 8th grade students in public middle schools in Beijing are included in this study. Parents of children who are enrolled in private schools are not included in the study.
2. Selection of schools is based on the list available at the Beijing Center for Disease Control and Prevention. The list may not be the latest.
3. The questionnaire is translated into Chinese. Though translation-back-translation is conducted to ensure the accuracy, meaning of original items may be changed.

Definition of Terms

4-2-1-- Describes typical Chinese family today: “4” represents the parents and parents-in-law, “2” represents the husband and wife, and the “1” refers to the only child of the couple (Chinese Women’s Federation, 2006).

BMI – Acronym for body mass index, is a number calculated from a person's weight and height. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems. BMI is commonly used in classifying overweight and obesity at population levels. BMI is recommended to classify the overweight and obesity in both adults and children (CDC, 2009).

CFQ -- Acronym for Child Feeing Questionnaire developed by Dr. Lean Birch, which is used as a self-report measure to assess parental beliefs, attitudes, and practices regarding child feeding, with a focus on obesity proneness in children (Birch et al., 2001).

Child feeding practices -- parental beliefs, attitudes, and strategies used regarding child feeding, (Birch et al., 2001).

Child-feeding strategies-- Means by which parents attempt to foster or shape children’s eating behaviors toward nutritionally desirable dietary outcomes, such as encouraging or restricting children to consume a particular food (Birch && Fisher, 1998).

Childhood overweight and obesity --The World Health Organization defines overweight and obesity as abnormal or excessive fat accumulation that may impair health. However, measuring overweight and obesity in children is challenging because of the growth of the body and there is not a standard definition of childhood obesity applied worldwide (WHO, 2009). Experts recommend to use age- and sex- specific BMI cut offs to classify the childhood obesity at

population levels. The reference developed by International Obesity Task Force (IOTF) is based on several populations is commonly used at international levels (Cole, Bellizzi, Flegal, & Dietz, 2000). However, this reference of BMI for childhood overweight and obesity may underestimate prevalence in some populations, because body composition and growth patterns vary in different populations. Different BMI references for children have been developed in different populations. For example, using national data, Working Group on Obesity in China (WGOC) proposed an age- and sex- specific BMI references for school-aged children to classify the overweight and obesity among Chinese children.

CHNS -- China Health and Nutrition Survey, which examines effects of the economic, health, nutrition, and family planning policies and programs implemented by national and local governments to see how the social and economic transformation of Chinese society is affecting economic, demographic, health and nutritional status of its population. It was conducted in 1989, 1991, 1993, 1997, 2000, and 2006.

Domain specific parenting styles -- Costanzo and Woody proposed that parents do not have a single, consistent parenting style. Rather, they suggested that parenting styles differed within parents, across domains of the child's development, and across children within the same family (Costanzo & Woody, 1985).

Family Meal patterns: in most literature, family meal patterns refer to frequency of the meal that the family members eat together. They also may include place and time they choose to have family meals.

Food availability: the definition of availability in the Webster' International Dictionary is the quality or state of being available". Food availability refers to the state of food being present and

ready for consumption in the environment, communities and at home. It also refers to the presence or absence of types of foods.

GDP – Acronym for "gross domestic product" is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products (World Bank, 2009).

IOTF -- Acronym for International Obesity Taskforce, as part of International Association for the Study of Obesity is working with partners in the Global Prevention Alliance to support new strategies to improve diet and activity and prevent obesity and related chronic diseases with a special focus on preventing childhood obesity.

Nutrition transition -- used to describe the rapid change in diet, activities, and nutrition-related health problems during the shift away from a preindustrial agrarian economy and towards increasing Industrialization in lower and middle-income countries (Popkin, 1997).

Obesogenic environment -- sum of influences that surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations' (Swinburn, Egger, & Raza, 1999).

WOGC -- Acronym for Working Group on Obesity in China

Summary

The rising rate of childhood obesity has become a public health concern worldwide. Environmental and social changes are believed to contribute to the dramatic increase in the number of overweight or obese children. Many factors influence children's energy intake. It is thought that family environment and parents play a critical role in shaping children's' eating and weight. Parents influence children's eating behaviors in several ways as food providers, role

models, and caregivers. In particular, strategies used by parents regarding feeding their children may unintentionally promote risk of developing obesity in their children.

China has been undergoing a rapid change in nutrition and lifestyle. With a shift to a diet with high fat content, there is a sharp increase in prevalence of overweight and obesity among Chinese children living in urban areas. To curb the increase of obesity, related factors need to be well understood to develop effective intervention. However, family influence on children's weight status has not been well studied in the Chinese population.

This study will examine the association between Chinese parents' child-feeding attitudes and practices, and their adolescents' weight status among Chinese adolescents. This study will capture the change as a snapshot of child-feeding practices within a rapidly changing social and economic background. Findings from the study may provide insight for developing family-based intervention for obesity among Chinese children. The information from the study may guide public health professionals to develop tailored health education for both parents and students about healthy weight and healthy eating.

Chapter II Literature Review

Study Purpose

The purpose of this study was to examine the relationships between Chinese parents' child-feeding attitudes and practices and weight of their young adolescent. Particularly, the study assessed parental child-feeding attitudes and practices, including their concerns about their young adolescents' weight, and strategies regarding child feeding, and family food environment, which includes obesity-related foods available at home and family eating patterns. The study also examined whether these child-feeding practices and family food environment are associated with the young adolescent's actual weight status. The study focused on the parent who cooks meals for the family most of the time, because this parent is thought to have the greatest influence on children's food choice and the families' food environment.

Introduction

During the last several decades, prevalence of obesity has dramatically increased among both adults and children (WHO, 2002). In particular, childhood obesity has become a public health concern not only because childhood obesity has long-term and short term adverse health consequences, but also because childhood is a critical period of time for obesity development/prevention.

Excessive weight gain occurs when energy intake exceeds energy expenditure. Many dietary patterns and eating behaviors are identified as risk factors that influence the energy intake and promote obesity development. For instance, dietary surveys show low consumption of fruit and vegetables among young people increases the energy density of the overall diet (Bowman et al, 2004). Such eating behaviors are influenced by a number of factors.

A growing body of literature emerges to shed light on the problem and help health professionals understand the development of obesity-promoting eating behaviors among children. Food choice and eating patterns of children appear to be a function of individual, environmental, and social influences, including influences from parents, schools, mass media, and cultural norms. For the purpose of this study, literature review will focus on the family influence on children's eating behaviors related to obesity development. First, the global epidemic of childhood obesity will be examined as a broad context in which the research idea is developed. Second, parent and family influence on children's eating behavior and weight status will be discussed. The unique Chinese background will also be reviewed, including Chinese demographics, changes in diet and lifestyle, and epidemiologic shifts in disease. Finally, for the interests of this study, an instrument widely used in child-feeding practices was discussed.

Obesity Epidemic among Children

Prevalence of childhood obesity and secular trends

According to IOTF, data available from surveys of children aged 5-17 years, collected for the *WHO Global Burden of Disease Report*, indicate that the world-wide prevalence of overweight (including obesity) is approximately 10% , and the prevalence of obesity is 2-3% (Lobstein et al., 2004). This global average reflects a wide range of prevalence levels, with the prevalence of overweight in Africa and Asia averaging well below 10%, and in the Americas and Europe well above 20%.

The obesity epidemic first started in industrialized countries before spreading to developing countries. High prevalence of overweight and obesity among children has been observed in many developed countries. For example, in the United States, according to NHANES 2003-2004 (Ogden et al., 2006), approximately 17.1% of children and adolescents

aged 2 to 19 years are obese based on the 95th percentile or higher of BMI values in the 2000 CDC growth chart for the United States. This prevalence is about 3 to 4 times that in 1970s. The prevalence of overweight (define as BMI for age at 85th percentile or higher) is 26.2% for 2- to 5-year-olds, 37.1% for 6- to 11-year-olds, and 34.3% for 12- to 19-year-olds. The prevalence of overweight is substantially higher among minorities, especially Hispanic boys (25.3%) and non-Hispanic black girls (26.5%). Data from national surveys in Great Britain show that since 1980, prevalence of obesity in children has almost tripled (Rennie & Jebb, 2005). Recent data from the Annual Health Survey for England (HSE) in 2002 show that among 2- to 15-year olds, 22% of boys and 28% of girls are overweight or obese. In Spain, overweight prevalence among children aged 6–7 years rose from 23% to 35% in the period 1985/6–1995/6 (Moreno, Sarría, & Popkin, 2002). In France, surveys show an increase in childhood overweight (defined using local reference cut-offs) from 10% to 16% over the period 1992–2000 (Rolland-Cachera et al., 2002).

It is difficult to track trends of childhood obesity in developing countries because varied criteria for defining childhood obesity are used and there are a lack of systematic surveys in nationally representative samples, especially among those countries with very low income. Despite various population characteristics and the different criteria, a steady increase of childhood obesity has been observed in many developing countries.

Nationally representative data are available from some national surveys for children less than 5 years of age. Two analyses of such data have been published (Martorell, Kettel, Hughes, & Grummer-Strawn, 2000; de Onis & Blossner, 2000). Data from 50 countries for children aged 12-60 months were used by Martorell et al (2000). In their study of childhood obesity, obesity was defined as greater than two standard deviation above the mean, using the National Center for Health Statistics (NCHS) reference population (The data of the reference population was based

on three representative surveys conducted in the U.S. between 1960 and 1975 and adopted for international use by WHO for comparison cross populations and monitoring the growth of children). By definition, the prevalence of obesity in the reference population is 2.3%. With the exception of Pakistan, where 2.6% of children were obese, obesity was rare in South Asia (including representation of India) and in Thailand. Sub-Saharan Africa also had low levels of obesity, with only one country having high values, Malawi with 5.2%. Seven of 13 countries in Latin America and the Caribbean, one of two in the central east Europe region, and all four Middle Eastern and North African countries exceeded 2.3%.

Most of the available information for school aged children in developing countries is not from nationally representative samples. However, available information suggests the problem of overweight and obesity becomes more manifest among school children. There are many studies of school children in developing countries and many of these express concerns about the high rates of obesity found.

Most studies from the Middle East, for example, suggest that school children in this region are considerably heavier than the NCHS reference population (Musaiger et al., 2000). One study from Kuwait was representative of the country's elementary school population, aged 6-10, and provided data for 1985 and 1995 (al-Isa & Moussa, 2000). The prevalence of obesity (defined as weight/height equaled or exceeded the 95th percentile of the NCHS reference population) was 12.1% in 1985 and 21.1% in 1995. The prevalence for girls was 13.8% and 22.7% in 1985 and 1995, respectively.

Data from other developing countries also show increases in obesity among school-aged children. A cross-sectional study conducted in an urban area in a Mexican city, Chilpancingo, showed that overweight and obesity prevalence were 28.1% and 13.7% by using IOTF BMI

cutoffs, respectively (Moraes et al., 2006). Korea carried out national health and nutrition surveys of adults and children in 1995, 1998, and 2001and found substantial increases in prevalence of obesity over this short period of time (Kim, Ahn, & Nam, 2005). Wang et al. (2002) conducted a study using national representative data from four countries to examine the trends of overweight and underweight in older children and adolescents. The results showed that there was dramatic increase in overweight in two developing countries using IOTF BMI cutoffs. The prevalence of overweight increased from 4.1% to 13.9% in Brazil from 1975 to 1997), and 6.4% to 7.7% in China during 1991-1997; the annual rates of increase in the prevalence of overweight were 0.5% in Brazil and 0.2% in China.

Characteristics of ddistributions

Generally, North America and Europe have higher prevalence of obesity, while there is relatively low prevalence in some East Asian countries. For the overall population, Prentice (2006) conducted a study on prevalence of obesity across the world and made several observations: 1) there were very high rates of obesity in several Pacific Islands, with recorded rates in Nauru, where prevalence in some populations was almost 80%; 2) generally lower prevalence of obesity in East Asian countries, but with rapidly increasing rates in China, India, and other counties, especially in metropolitan areas; 3) a higher prevalence of obesity in North American than in Europe, but with the gap quickly closing (more than half of the 15 original members of the European Union had a prevalence of obesity in excess of 20% in 2002); 4) high prevalence of obesity in many Middle Eastern countries, with rates similar to those of the United States ; and 5) generally low prevalence of obesity in Africa, but with great heterogeneity (for instance, Ghana has a 3% prevalence of obesity compared with 21% in South Africa). Data about Latin-American countries were not presented in Prentice's review. However, the recent data

show prevalence of obesity in some Latin-American countries is very high, even higher than, the prevalence reported in some developed nations, and it seems to be increasing rapidly (Filozof et al., 2001).

The prevalence of obesity among children follows a pattern similar to the overall population. For children, Lobstein et al. (2004) made a summary observation about the general distribution: 1). there is an unequal global distribution of childhood obesity, with the highest rates in North America and the lowest in Sub-Saharan Africa, which also has the highest poverty. Among children and adolescents aged 5-17 years, the overall global prevalence of overweight defined by the IOTF criteria was approximately 10% with a 2% to 3% prevalence of obesity; 2). a concentration of childhood obesity among the poor in industrialized countries and in the more economically developed areas of poorer countries; and 3). more rapid increase in childhood obesity in some developing countries (e.g. urban areas of Brazil and China) than in developed countries. 4). prevalence in young children is relatively low compared to adolescents.

Measurement of childhood obesity

In different settings, different methods should be used to measure adiposity. There are many methods including direct and indirect measurements. This section will focus on methods which are suitable for screening, and different available criteria for defining childhood overweight and obesity will be discussed.

Direct measures of body composition provide an estimation of total body fat mass and various components of fat free mass. Such techniques include underwater weighing, magnetic resonance imaging (MRI), computerized axial tomography (CT or CAT) and dual energy X-ray absorptionmentry (DEXA). These methods are primarily used in clinic settings and for particular research, because they are considered to be the ‘gold standard’ to validate anthropometric

measures of body fat. They require sophisticated equipments and skills for operation, but they are not practical to be used on a large population due to the cost and limited conditions.

Indirect methods use anthropometric measures to estimate the relative adiposity or body fat. Those anthropometric measures commonly used include weight-for-height, BMI, waist circumference and Waist-to-hip ratio (WHR) and Skin-fold thickness. Typically, these methods are used in primary care settings for screening and for investigation in large populations, because they are low cost and easy to perform under varied conditions. However, their relative accuracy as a measure of adiposity must be validated against a 'gold standard' measure of adiposity.

Body Mass Index

BMI is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2), and is widely used as an index of relative adiposity at population levels. Among adults, the WHO recommends that a person with a BMI of 25 kg/m^2 or above is classified overweight, while one with a BMI 30 kg/m^2 or above is classified obese although revision of these guidelines are being proposed for certain populations (WHO, 2004). For children, various cut-off criteria have been proposed based on reference populations and different statistical approaches. Those criteria will be discussed later.

BMI has been compared with dual-energy X-ray absorptiometry in children and adolescents aged 4-20 years (Lazarus, Baur, Webb, & Blyth, 1996). BMI had a true positive rate of 0.67, and a false positive rate of 0.06 for predicting a high percentage of total body fat. Sardinha, Going, Teixeira, & Lohman (1999) reported a true positive rate of 0.83 for 10-11 year olds, 0.67 for 12-13 year olds and 0.77 for 14-15 year olds. Therefore, although some overweight children would not be correctly classified as being overweight when using BMI as a screening test, few children would be classified as overweight if they were not. However, BMI may not be

a sensitive measure of body fatness in those who are particularly short or tall or have an unusual body fat distribution, and may misclassify those with highly developed muscles. Hence, two people with the same amount of body fat can have quite different BMIs (Sardinha et al., 1999).

They may also be racial differences in the relationship between the body composition and BMI. One study in Whites and Asians shows differences of 2-3 BMI units in adults with the same body fat composition (Wang et al., 1994). Central obesity combined with thin limbs appears to feature in some Indian populations, giving a higher health risk for a given BMI (Yajnik, 2002). Therefore, BMI is a more useful measure at the population level than for assessing individuals.

Defining overweight and obesity among children

As discussed above, BMI is a functional index of body fat and highly recommended by experts to classify overweight and obesity at the population and community levels for both children and adults (Cole et al., 2000; Kuczmarski et al., 2000). BMI varies with age and gender among children. It typically rises during the first months after birth, falls after the first year and rises again around the sixth year of life. Therefore, a given value of BMI needs to be evaluated against age- and gender-specific reference values. Several countries, including France, the UK, Singapore, Sweden, Denmark and the Netherlands, have developed their own BMI-for-age gender-specific reference charts using local data. A local reference for Chinese children was also proposed in 2004 based on the Chinese population of school-aged children. In order to produce comparable results, several BMI references are used world widely. They include WHO reference, IOTF, US CDC 2000 reference.

WHO reference: A WHO Expert Committee recommended the use of different weight-for-height indexes to classify overweight and obesity in children and adolescents; specifically, to

use BMI in adolescents and weight-for-height Z-scores in children (WHO, 2000a). A z-score is based on the difference between the observed value and the median reference value of a population. For adolescents (aged 10-19 years), they define "overweight" using the sex-age-specific BMI 85th percentile developed by Must, Dallal, & Dietz (1991) and define "obesity" using both the sex-age-specific BMI 85th percentile and triceps skin-fold thickness 90th percentile. For children under 10 years of age, they recommend using weight-for-height (Z-scores > 2) to define "overweight." (Note: a Z-score of 2 corresponds to the 98th percentile; a Z-score of 1.04 to the 85th percentile; and 1.65 to the 95th percentile.) The committee recommended not using the term "obesity" for children on an individual basis, but they stated that "on a population-wide basis, high weight-for-height can be considered as an adequate indicator of obesity." The committee did not provide a reference for "obesity." Currently it appears that the IOTF reference is replacing this WHO reference in international studies.

The International Obesity Task Force (IOTF) reference: As it is not clear at which BMI level adverse health risk factors increase in children, the group recommended cutoffs based on age specific values that project to the adult cutoffs of 25 kg/m^2 for overweight and 30 kg/m^2 for obesity. Using data from six different reference populations (Great Britain, Brazil, the Netherlands, Hong Kong, Singapore and the USA), Cole et al. (Cole et al., 2000) derived percentile curves that passed through the points of 25 kg/m^2 and 30 kg/m^2 at age 18 years. Their work was supported and acknowledged by IOTF. "These provide age and gender specific BMI cut offs to define overweight and obesity, corresponding to the adult cut off points for overweight and obesity. The tables developed by Cole et al. are useful for epidemiological research, in that children and adolescents can be categorized as non-overweight, overweight or obese using a single standard tool. The cutoff points were developed using several data sets,

therefore they represent an international reference that can be used to compare populations world-wide" (Lobstein et al., 2004, p. 14). The authors, however, acknowledge that the reference data set may not adequately represent non-Western populations.

CDC growth chart: Most recently, the US National Center for Health Statistics (NCHS) and the Centers for Disease Control and Prevention (CDC) have updated growth charts using data from five national health examinations from 1963-1994 and provided new BMI percentiles — the 2000 CDC Growth Charts (Kuczmarski et al., 2000). They recommended that BMI may be used for children and adolescents over age 2 to classify childhood obesity. The CDC recommends that those children with a BMI $\geq$ the 95th percentile be classified as overweight and those children with a BMI between the 85th and 95th percentiles be classified as "at risk of overweight". They did not recommend use of the term "obesity" for children. However, on the CDC current website, they use the term "overweight" and "obesity" for "at risk of overweight" and "overweight", respectively(CDC, 2009). To avoid an upward shift of the weight and BMI curves, when the NCHS developed these BMI cut points data from the most recent survey were excluded for children over the age of six.

Working Group on Obesity in China (WGOC) reference: Most references discussed above are based on western populations. They may not be appropriate for Chinese children. In order to develop a reference suitable for Chinese children, WGOC studied data from a national survey in 2000 on Student Constitution and Health with 216,620 subjects (Ji & WGOC, 2005). Body weight, height, pulse rate and blood pressure were measured, and the 75th, 80th, 85th, 90th, 95th and 97th percentiles of BMI were compared with the cut-off references of US-(NCHS, and IOTF references. Data from other national and local surveys on blood pressure and blood lipid of children were used to assess the risk of overweight and obesity at certain BMI percentiles

(P85/P90, P85/P95, and P90/P95). After further analysis, cut-offs were set at 85th and 95th of age- and gender- specific BMI values for overweight and obesity respectively. In 2003, WGOC officially proposed 'the BMI Classification Reference for Screening Overweight and Obesity in the Chinese School-age (7-18) Children and Adolescents'. Compared with the WGOC reference, prevalence of overweight and obesity among Chinese children was underestimated by IOTF and CDC references (Chen, 2008). However, children under 7 years old were excluded because of lack of data and evidence to assess health risks.

In summary, age- and gender- specific BMI is useful tool to assess children's weight status at population levels. The current BMI cut-offs used for the definition of obesity are based on either statistical data from reference populations or the association between morbidity and mortality and increasing body fat. In adults, BMI cut-offs recommended by WHO are evaluated on a base of the association with mortality (WHO, 2000a). However, it is difficult to assess the linkage of health risks to children's BMI, because there is a lack of longitudinal data on both childhood anthropometric measurements and health outcome in adulthood (WHO, 2000b). Most age- and gender- specific BMI cut-offs used for children are made through statistical procedures, which means that the cut points themselves are arbitrary and are not developed based on evidence of health risks.

Health consequences of childhood obesity

Adulthood obesity

Childhood obesity has far-reaching implications for adulthood health. The association between childhood obesity and increased morbidity and mortality in adulthood has been found (Must, Jacques, Dallel, Bajema, & Dietz, 1992; Dietz, 1998). This underlying pathway may be due to the persistence of childhood obesity into adulthood. Many studies show that childhood

obesity is an independent predictor of obesity in adulthood (Serdula et al., 1993; Guo, Roche, Chumlea, Gardner, & Siervogel, 1994; Clarke & Lauer, 1993). A study found that approximately 80% of children who were overweight at aged 10–15 years were obese adults at age 25 years (Whitaker, Pepe, Wright, Seidel, & Dietz, 1997). For this reason, obese adolescents and older children should be the heavily targeted group for intervention to reduce the risk of adulthood obesity.

Interestedly, a cohort study from a thousand families in UK found that though overweight teenagers were more likely to be obese adults, most fat adults were not overweight as children and those thin in childhood and adolescence were not protected from obesity as adults (Wright, Parker, Lamont, & Craft, 2001). Although this study show only a small proportion of adults were obese, as children, there is now common agreement that childhood obesity, particularly during the second decade of the life is a strong predictor of adulthood obesity and efforts should be directed at preventing childhood obesity(Livingstone, 2000).

Cardiovascular diseases and type 2 diabetes

Childhood obesity may increase the risks of cardiovascular diseases in later life. The most extensive longitudinal studies of persistence of obesity and its associated risk factors from childhood into later life have been done in the Bogalusa Heart Study (Bao, Srinivasan, & Berenson, 1996). Relations between obesity and cardiovascular risk factors all track significantly from childhood to adulthood including elevated systolic and diastolic blood pressure, abnormal total cholesterol, LDL cholesterol and HDL cholesterol. In addition, elevated blood pressure and dyslipidemia are likely to cluster among obese children and adolescents (Bao et al., 1996). Another well-known follow up study is the Harvard Growth Study (Must et al., 1992). They studied the relationship between overweight and morbidity and mortality in 508 adolescents 13

to 18 years old who participated in the study from 1922 to 1935. One of their findings is that the risk of morbidity from coronary heart disease and atherosclerosis was increased among men and women who had been overweight in adolescence.

Increased type 2 diabetes with the increased prevalence of obesity among children indicates that obesity during childhood may contribute to a higher risk of type 2 diabetes (Morrison, Friedman, Wang, & Glueck, 2008). Type 2 diabetes mellitus had been primarily a disease of adulthood; however, type 2 diabetes now occurs in adolescents typically with a BMI $\geq$ 30 kg/m^2, a level that would be considered obese even by adult standards. The prevalence of type 2 diabetes mellitus in US adolescents, according to NHANES III, is 4.1 in 1000 individuals, more than double the prevalence of type 1 diabetes mellitus (1.7 in 1000 individuals). Though the role of obesity in the etiology of childhood type 2 diabetes is still unclear, many studies have showed that obese children and adolescents are more likely to have abnormal metabolic changes (Vanhala, Vanhala, Kumpusalo, Halonen, & Takala, 1998). Approximately, 55% of the variance in insulin sensitivity in children can be explained by total adiposity, after adjusting for other confounders, such as age, gender, ethnicity and pubertal stage.

Other problems associated with obesity

Additional health problems are directly or indirectly related to overweight, including physiological ailments as well as psychosocial issues. Evidence shows that there is an association between obesity and increased risk of asthma and sleep disordered breathing in children (Silvestri et al., 1993; Romieu, Mannino, Redd, & McGeehin, 2004; Wickens et al., 2005). Studies have also showed that obesity is associated with early sexual maturation among adolescent girls and young females (Adair & Gordon-Larsen , 2001; Beunen et al., 1994;

Kaplowitz et al., 2001). However, it remains controversial whether obesity changes the timing of sexual maturation or the opposite way (Biro, Khoury, & Morrison, 2006).

Increased body circumference can affect self-esteem and the social functions of an individual. Strauss (2003) found that obese girls age 13 and 14 had significantly lower self-esteem than non-obese girls. One of the primary mediators of the psychopathological relations with obesity is compromised peer relationships. However, the causal path ways by which psychological disturbances exert influence on body weight are unclear, because the association is likely to be complex rather than simple (Friedman & Brownell, 1995). Confounders such as socioeconomic factors and parental factors should be taken into account when those relations between any psychological consequence and obesity are evaluated.

Risk factors of childhood obesity

Genetic factors

Observations in twins, siblings, nuclear families and extended pedigrees have shown that an individual's chances of being obese are increased when he or she has close relatives who are obese. Obesity persistence from childhood to adulthood is also linked to family obesity: data from the British 1958 birth cohort demonstrated that obese children of obese parents are more likely to be obese in adulthood, especially when both of the parents are obese (Lake et al., 1997).

The relative influence of parental and childhood weight status on the persistence of childhood overweight into adulthood appears to vary substantially with the age of the child. A large retrospective cohort study that explored medical record data on parents and children indicated that the influence of parental obesity on weight status in early adulthood was stronger from age 2 through age 10 years. By adolescence, the child's own weight status was a far

stronger determinant of obesity in early adulthood (Whitaker et al., 1997). Whitaker found that parental obesity was a more important predictor of offspring obesity in early childhood, but was less important in determining the fatness of children above 9 years of age.

Birth weight

A number of studies have shown that birth weight, a crude summary of growth in utero, is positively related to subsequent fatness (Parsons , Power , Logan , & Summerbell, 1999; Curhan et al., 1996), suggesting that the fetal environment plays a role in the development of obesity. Although limited data indicate the association between birth weight and later fatness to be independent of gestational age (Sorensen et al., 1997) and socio-economic status (Stettler, Zemel, Kumanyika, & Stallings, 2002), parental fatness (particularly maternal fatness) may be largely responsible for the relationship (Curhan et al., 1996). A study of 35 000 young people called for army service in Israel found that those with the very heaviest birth weights were at threefold risk of becoming severely overweight at age 17 years (Martorell, Stein, & Schroeder, 2001). The risk was particularly high among the fattest female babies.

Several studies report a J- or U-shaped relationship, with a higher prevalence of obesity seen for both the lowest and highest birth weights (Curhan et al., 1996; Fall et al., 1995), suggesting a more complex association between growth in utero and obesity. Just such a U-shaped relationship between birth weight and subsequent age-adjusted adult BMI was found in the US Nurses Health Study 1 (Curhan et al, 1996). Studies of famine or maternal smoking during pregnancy also suggest the picture is complicated, and that an adverse foetal environment may promote obesity independent of any effect on foetal growth (Power & Jefferis, 2002).

Diet in high energy density and physical inactivity

It is commonly agreed that diet and physical activity are two major factors contributing to weight gain in both adults and children. In children, feeding patterns also play a role in weight gain. Several recent large studies have examined whether breast-feeding might have a protective influence on childhood obesity. Most studies suggest a protective effect of breast-feeding on obesity (Gillman et al., 2001; Armstrong, Reilly, & Child Health Information Team, 2002) during childhood and adolescent among high risk groups (Young et al, 2002). A study in Bavaria found significantly greater proportions of those children who had been formula-fed as infants were overweight at the age of school entry (von Kries et al., 1999). However, the researchers acknowledge the potential role of confounding factors, including social class and general family dietary habits.

The relationships between beverage, food, snacks consumption and obesity in children is not clearly understand due to rapid change of eating habits and difficulties of obtaining correct dietary information among children (Livingstone, 2000). A study by Bowman et al. (2004). found that on those days when children consumed fast food products their diet was likely to be less healthful; their energy intake was higher and the fruit and vegetable intake lower. Data have shown the consumption of fast food by children has increased by 300% in two decades (St-Onge Keller, & Heymsfield, 2003). Soft drink makes a growing contribution to the diet of young people, even younger children (Prynne, 1999). A prospective study has reported that a positive association between sugar-sweetened drinks and obesity in 11-12 year olds over 19 month follow-up (Ludwig et al., 2001)

Similar to the diet assessment among children, it is difficult to monitor physical activity and to evaluation effects of daily physical activity on their weight gain. Direct evidence of

decreasing energy expenditure among children in recent years is lacking. Nevertheless, it is clear that reduced energy expenditure in transportation and increased television viewing is linked to physical inactivity and sedentary lifestyle both in adults and children. Studies have found that television viewing and playing video games for longer periods of time promotes obesity. Several studies in different populations have found that hours of television viewing were positively associated with increased levels of overweight and obesity among children (Wake et al., 2003; Hernandez et al., 1999; Hanley et al., 2000).

Social and environmental risk factors

In most industrialized countries children from the socio-economically deprived environments have a greater risk of obesity than those from more affluent groups (Parsons et al, 1999). Living conditions such as a deprived environment with a lack of facilities for outdoor physical activities and distance from shops where fruit, vegetables and low-energy density foods are affordable and readily available, may all contribute to the problem. It is possible that some of the effects of socioeconomic status (SES) are mediated through an individual's education levels. But data from UK demonstrated that both factors are independently related to adults' BMI, suggesting that circumstances in early life have an enduring and important effect (Hardy, Wadsworth, & Kuh, 2000). In countries with less westernized diets, the patterns of obesity related to SES of the family are more complex, with a tendency for urban children and children in rich families to be more at risk of overweight. In China, for example, children from advantaged backgrounds tend to be fatter than those from disadvantaged backgrounds (Wang, Ge, & Popkin, 2000)

The physical environment becomes 'obesogenic' in many parts of the world, especially in urban areas and industrialized world (Swinburn, Egger, & Raza, 1999). Many environmental

conditions encourage the consumption of greater food energy than is required, or encourage sedentary behavior or discourage physical activities. For instance, a decline in walking to school, and a rise in snack food consumption and the popularity of fast food all possibly contribute to the rise of childhood obesity. It is also important to consider, however, the micro-environment created in the home. For younger children in particular the family environment plays an important role in determining their risk of obesity, for example parental physical activity levels (Parsons et al., 1999), the family's eating behaviors (Whitaker et al., 1997) and television viewing habits (Lake et al., 1997).

Obesity Related Eating Behaviors among Children and Adolescents

To understand family influence on children's food intake, children's eating behaviors or patterns promoting obesity should be examined first. Low fruit and vegetable consumption and high intakes of high-in-fat food and sugar sweetened beverage are the most common diet patterns that are believed to promote obesity (Nielsen & Popkin, 2004; Troiano, Briefel, Carroll, & Bialostosky, 2000; Ludwig et al., 2001). Several studies also show that consumption of snacks and energy-dense foods is positively associated with overweight in children (Nicklas, Yang, Baranowski, Zakeri, & Berenson, 2003; St-Onge et al., 2003). A Canadian study showed that students in grades 7 and 11 who were overweight or at risk of overweight reported consuming fewer servings of fruit and vegetables than students with a healthy weight (St John et al., 2008).

Though health benefits of fruits and vegetables are documented, the consumption of them is not high among youth. 2005 Dietary Guidelines for Americans (DGA) recommend that adolescents consume 1.0 to 2.5 cups of fruit (2 to 5 servings) and 1.5 to 4 cups of vegetables (3 to 8 servings) each day, a total of 5 to 13 daily servings, depending on energy needs (United States Department of Health and Human Services and the Department of Agriculture, 2005).

Data from the 2007 Youth Risk Behavior Survey (YRBS) revealed that only 21.4% of high school students had eaten fruits and vegetables five or more servings per day in the previous 7 days (Eaton et al., 2008).

Although the positive relationship between dietary fat intake and body weight remains to be definitively established (Magarey, Daniels, Boulton, & Cockington, 2001), studies have shown that on days when children consumed energy-dense food such as fast food products, the energy levels of their diet were higher, the energy density per gram was higher and the fruit and vegetable consumption was lower, resulting in a diet less likely to be healthful compared with days on which health foods were consumed (Bowman et al., 2004). This type of diet may eventually affect children's energy regulation/balance and result in excessive weight gain. Studies have showed that children with a higher percentage of body fat or body mass index report a greater preference for fat, and children with higher weight status tend to regulate energy intake less precisely (Johnson & Birch, 1994). Longitudinal data usually provide insights to determining how dietary intake patterns may contribute to the development of childhood obesity. Several longitudinal studies (Eck, Klesges, Hanson, & Slawson, 1992; Klesges, Eck, & Shelton, 1995; Robertson et al, 1999) have indicated that higher levels of dietary fat intake are associated with greater increases in weight status among children.

Skipping meals or not eating meals with family are considered risk eating behaviors which promote obesity (Taveras et al., 2005; Sen, 2006; Fulkerson, Neumark-Sztainer, Hannan, & Story, 2008). Gillman et al. (Gillman et al., 2000) found a modest inverse association between age-adjusted BMI and family dinner frequency among youth aged 9–14 years in a cross-sectional study. Taveras et al. (2005) reanalyzed these data controlling for potential covariates, including SES, age, maturational stage, baseline height, race/ethnicity, girls' menstrual status, physical

activity, inactivity, and energy intake, and found that the odds of being overweight were significantly lower among youth who reported eating family dinner most or every day in a typical week during the past year.

However, the causal effect of less family meals on children's overweight is not clear. Though association was observed in the cross-section analysis, the longitudinal analysis in Taveras et al.'s study (2005) did not reveal the relationship between the likelihood of being overweight and frequency of family dinner. The authors suggested that the critical time period for family influences on children's eating patterns may be earlier in childhood; therefore, the cross-sectional results may be the product of a mechanism that occurred earlier in life. Further study, particularly well-designed longitudinal research, is needed to clarify the effect of family meals on childhood obesity.

Parental Influence on Children's Eating and Weight Status

As food providers

Breast feeding

As a food provider, the parent can influence children's food preference very early in life. (Cashdan, 1994; Hendy, 1999). Acceptance of food of infants can be influenced by breast feeding. The perception of flavors in breast milk is one of the human infants' earliest sensory experiences. Studies have shown that many flavors of the maternal diet appear in breast milk. Adult sensory panels can detect odors of garlic, alcohol, and vanilla in milk samples of lactating women who ingested those flavors prior to providing milk samples (Mennella & Beauchamp, 1991; Mennella, 1995). Evidence from in a randomized trial among forty-five mothers and their babies supports the hypothesis that experience with flavor in breast milk modifies infants'

acceptance and enjoyment of those foods. Research from animal experiments also shows that early experience with the flavors of the maternal diet can affect subsequent preference for and intake of solid foods. Because of repeated early experience with flavors in the mothers' milk, infants may learn to prefer their mother's diet. Thus, early dietary experience is shaped by infant feeding methods and dietary pattern of the mother, and it may provide the basis of food acceptance and preference in early life (Birch & Fisher, 1998).

Food availability at home

Food availability and accessibility at home is positively associated with children's consumption of the food that is frequently available and is ready-to-eat. "Availability concerns whether foods of interest are present in an environment (e.g., carrots in the refrigerator's vegetable bin or on the fast-food restaurant menu). Accessibility concerns whether these foods are available in a form, location, and time that facilitates their consumption" (Cullen et al., 2003, p. 616). Although research is lacking on food availability and eating behavior, several studies with young children have been show that the extent to which fruits and vegetables are present and readily available and accessible in the home correlates positively with the level of consumption among school-age children (Baranowski et al., 1997; Cullen et al., 2003). Cullen and colleagues examined the relationships among availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables among sixth graders and their parents (Cullen et al., 2003). Data showed that availability was the only significant predictor of intake for children reporting high preferences, whereas for children reporting low preferences, availability and accessibility were significantly related to consumption of fruits and vegetables. Those results also indicated that the availability of healthy foods is very important for children, especially with low preferences for those foods. Similarly, another study found that homes with greater availability

of fruits and vegetables had a stronger set of motivational factors such as parents and children's self-efficacy and their knowledge of fruits and vegetables, compared with homes with low fruits and vegetable availability (Kratt, Reynolds, & Shewchuk, 2000).

Likewise, availability of unhealthy food in the home such as fast food can promote unhealthy eating patterns. A study conducted among 902 middle school and high school adolescents, showed that the more frequent fast food purchases for family meals was associated with increased availability of less nutritious foods in the home, fewer vegetables, and higher salty snack intake among parents and, trends for higher fat and less frequent breakfast consumption in adolescents (Boutelle et al., 2007). Availability of fast food could be considered a marker for a less optimal food environment in the home. Fast food for family meals may displace the other healthier food in diet. Although the study did not find the association between the frequency of fast food purchase for family meals and adolescents' overweight, associations with several other unhealthy food factors in the home suggest that fast food availability at home could be a indicator of overall unhealthy eating practice and lifestyle that promote excessive energy intake.

When evaluating the impact of home environmental influences, it may be important to consider both child and parent perceptions. Food environment in the home can be perceived differently by parents and their children (Cullen et al., 2003; van Assema, Glanz, Martens, & Brug, 2007; Bere & Klepp, 2004). In a study with sixth- and seventh-grade Norwegian students and parents, parents perceived their children's fruit and vegetable availability to be better than what was reported by the children (Bere & Klepp, 2004). Similarly, van Assema and colleagues (2007) found that, on average, parents reported higher fruit availability/accessibility than their 12- to 14-year-old children; however, they found that the majority of parents and children shared

similar views on fruit accessibility. They also found that disagreement by more than 1 category across pairs of children and parents ranged from 9% to 30% with regard to fruit availability and accessibility.

With regards to the stronger predictor of consumption, findings from Robinson-O'Brien (Robinson, Neumark-Sztainer, Hannan, Burgess-Champoux, & Haines, 2009) indicate children's perceptions were more strongly associated with their intake than their parents' perceptions. Child-reported home food environment perceptions accounted for about 27% of the variance in children fruits and vegetable intake (Robinson et al., 2009).

It is important to identify the difference between children's perceptions and parents' perception of the foods available at home, because if parents perceive a higher level of home fruit and vegetable availability and accessibility than their children do, they may less likely to engage in behaviors to change the home environment and to facilitate children's fruit and vegetable intake. To identify the difference of perception could help parents understand the food environment and develop more effective strategies to promote healthy foods for children.

Family meals

Whether a family eats together can have important effects on children's food consumption patterns. A growing body of research demonstrates that children who eat meals with other family members consume more healthy foods and nutrients and less energy-dense food. Youth who eat meals with their family report more healthful dietary intake including higher intakes of fiber, fat, vitamins and fruits and vegetables as well as more frequent breakfast consumption (Gillman et al., 2000; Videon & Manning, 2003; Neumark-Sztainer et al., 2003).

Gillman and colleagues (2000) and Neumark-Sztainer and colleagues (2003) analyzed diets of boys and girls and both found an association of frequency of family dinner and healthful diets. The study by Gillman et al. (2000) consisted of 16,202 children of nurses in the Nurses Health Study (mostly white) ages 9 to 14 years and living across the United States. The cross-sectional analysis found frequency of family dinner associated with more healthful eating patterns. Boys and girls who ate dinner with their families every day had 0.8 more servings of fruits and vegetables, consumed less fried food and soda, and used multivitamins more than participants who reported having family dinner never or some days. Analysis of nutrients showed that with increasing frequency of family dinner, there were higher intakes of dietary fiber; calcium; iron; folate; vitamins B-6, B-12, C, and E; and lower glycemic load and intakes of trans-fat and saturated fat.

The study by Neumark-Sztainer and colleagues (2003) consisted of 4 746 Minneapolis–St Paul, MN, public school middle and high school students (ages 11 to 18 years) of diverse racial background and SES. Age was inversely associated with family dinner and SES was positively associated with family dinner. In addition, the investigators found strong positive associations with frequency of family dinner and a healthful nutrient pattern, including higher intakes of protein (percent of calories); calcium; iron; vitamins A, C, E, and B-6; folate; and fiber. Neumark-Sztainer and colleagues also noted that the frequency of family dinner was positively associated with intake of fruits, vegetables, grains, and calcium-rich foods and inversely associated with consumption of soft drinks.

Larson et al. (2007) did a 5-year longitudinal study showing that family meals during adolescence are associated with higher diet quality and healthful meal patterns during young adulthood. Family meal frequency during adolescence predicted higher intakes of fruit,

vegetables, dark-green and orange vegetables and lower intakes of soft drinks during young adulthood.

Since eating meals together is associated with more healthful food consumption, the frequency of having meals or dinners together with family may influence children's weight status. Taveras and colleagues (2005) analyzed the self-reported heights and weights of the 16,202 children (9 to 14 years old), along with their answers to "how often do you sit down with other members of your family to eat dinner or supper?" Cross-sectional results showed an inverse association between the frequency of family dinner and overweight with a 15% reduction in prevalence of being overweight among those who frequently ate as a family.

In the National Longitudinal Survey of Youth 1997, a representative sample of the US population ages 12 to 16 years completed a survey of height and weight and the number of days in a typical week that their family ate dinner together (Sen, 1997). Cross-sectionally and longitudinally (1997 to 2000), a higher frequency of family dinner was associated with lower odds of being overweight among non-Hispanic white adolescents. The association was not linear, with teens sitting down to dinner five to six times per week having 66% lower odds of being overweight compared with those who sat down every night of the week having 49% odds. No associations were found for Africa-Americans and Hispanics.

Despite the benefit of eating family meals together with parents, survey data indicated that the proportion of youth eating dinner with their families on a regular basis is not high. Studies in American children found that only about one third of adolescents ate dinner with their family every day (Neumark-Sztainer et al., 2003; Gillman et al., 2003). About 22% to 32% of adolescents reported eating dinner together with their family rarely or only a few days each week. Studies also found that the frequency of eating dinner with family decreased among older

children. Data from the national longitudinal study of adolescent health showed that about 74% of youth aged 12-14 years had in the previous week eaten 5 or more dinners with a parent. This declined to 61% for adolescents aged 15 to 16 years, and to 42% for adolescents aged 17 to 19 years.

Breakfast is the most commonly missed meal among American teens (Lin, Guthrie, & Blaylock, 1996). The 1989-91 continuing survey of food intakes by individual data shows that 24% adolescent girls and 20% boys skipped breakfast on the day of the survey. In another national survey, 40% of 8th and 10th grade students reported eating breakfast on 2 or fewer days the week before the survey (Dausch et al., 1995). The major reason reported by adolescents for not having family meals includes parent and teen schedules, teen desire for autonomy, dissatisfaction with family relations, and a dislike of food served at family meals (Neumark-Sztainer et al., 2003). Busy or conflicting schedule of parents and adolescents was the most frequently mentioned reason.

As role models

As mentioned above, eating family meals together can foster children's healthy eating habits. A study among American teens and their parents shows that both adolescents and parents perceived family meals as positive experiences. Family meals may be a useful mechanism for enhancing family togetherness and communication (Fulkerson, Neumark-Sztainer, Story, 2006). Therefore, the family meal can serve as an opportunity for parents to role-model their children's food preference, attitudes and eating patterns.

Children learn about food through the direct experience of eating and by observing the eating behavior of others, especially their parents. The parent, as the first teacher in children's food experience, can act as a stimulus for similar dietary behaviors in his or her child. Therefore,

parents' modeling can have important influence on children's behavior. However, few studies explore the influence of parents as role models on children's dietary behaviors. Several studies provide indirect evidence for the role of parental modeling. Lee and Reicks (2003) conducted a study to determine whether selected environmental and behavioral factors were associated with the calcium intake of low-income adolescent girls. They found that girls who saw their fathers consume milk had higher calcium intakes than did those girls who did not see their fathers drink milk.

Parental modeling has also been associated with greater fruit juice and vegetable intake among school-age children (Young, Fors, & Hayes, 2004). To examine whether student perceptions of parent behaviors explain variations in fruit and vegetable consumption, Young et al. conducted a survey among middle school students. They reported that perceived parent modeling, perceived parent support, self-efficacy, and perceived fruit and vegetable availability were significant predictors of fruit and vegetable consumption.

As caregivers

Parental child-feeding practices and children eating behavior

Parents' control, restriction and pressure to regulate certain food consumption of their children are feeding strategies commonly used by parents. Parents believe that their feeding practices can exert a major influence on children's eating behavior (Burroughs & Terry, 1992). Parents also believe that pressuring children to eat a 'healthy' food is an effective way to increase the children's liking for that food. However, some researchers have found that, rather than fostering food acceptance, pressuring and coercing children to eat particular foods may promote dislike of those foods. To examine the effects of common child-feeding practices on

children's food choice, researchers simulated them in the laboratory and found adverse effects of feeding practice (Fisher & Birch, 1999).

Fisher & Birch (1999) conducted an experimental study to evaluate maternal restriction of children's access to snack foods as a predictor of children's intake of those foods when they were made freely available. The data showed that for girls only (3-6 years old), child and maternal reports of restriction access predicted girls' snack food intake, with higher levels of restriction predicting higher levels of snack food intake. In this experimental study, the findings indicate that, contrary to parents' beliefs, restricting access to palatable foods is not an effective means of inducing a dislike or reducing intake of foods. At least for girls, restriction may actually promote the type of eating behavior that its use is intended to prevent: in the absence of parental restriction, girls may respond to the presence of these palatable foods with a desire to eat, even in the absence of hunger.

Restricting children's access to snacks or 'junk' foods seems a straightforward approach to teaching children moderation in their intake of snack foods high in sugar, fat and energy density but low in nutrients. However, research suggested that problematic eating styles in children may be fostered by parents' well-intended attempts to help children control their food intake. There are several other studies find that parental restriction of snack foods may be counterproductive; leading to uninhibited eating and weight gain, particularly for girls (Lee, Mitchell, Smiciklas-Wright, & Birch, 2001; Fisher & Birch, 2002; Francis & Birch, 2005). However, evidence from studies conducted in experimental settings during a short period of time may not reflect actual effects of parental feeding practice over time. Longitudinal studies are needed to examine the long-term effect of feeding practice on children's eating behavior.

Most studies of parents' child-feeding practices are conducted with young children including pre-schoolers and primary-school children (most are White girls). Few studies have been found to examine the effect of feeding practice on older children and adolescents. When children grow older and gain more autonomy and independence, parents' influence may diminish on their eating behavior. However, the role of parental attitudes and practices related to the dietary behaviors among adolescents remains unclear.

There is evidence on the important role of parents in adolescents' eating behaviors. Although parent modeling and eating meals as a family appear to positively influence dietary choices of adolescents (Feunekes et al., 1998; Neumark-Sztainer et al., 2003; Videon & Manning, 2003), adolescents (in 7th and 10th grades) themselves perceive parental influence as less important in their choice of food than factors such as hunger/craving, appeal of food and convenience (Neumark-Sztainer, Story, Perry, & Casey, 1999). In two studies among Belgian adolescents, researchers reported that adolescents 12-16 years old from more permissive or less controlling families had less healthy food choices (De Bourdeaudhuij, 1997, 1998). Further, adolescents in families with restrict rules of 'unhealthy foods' did report a lower consumption of such foods, although adolescents who reported greater encouragement to eat 'healthy food' did not report increased consumption of such foods. Such results underscore the complexity of the role of coercive parental-feeding practices whether they are restrictive or encouraging of intake.

Association between feeding practices and childhood obesity

Since parents' feeding attitudes and practices may influence children's eating behavior, which, in turn, may impact their energy intake, it is hypothesized that certain parents' feeding practices can lead to childhood obesity. There are studies showing associations of parental child-feeding strategies with obesity among young children (Birch et al., 2001; Faith et al., 2004;

Robinson et al., 2001; Spruijt-Metz D, Lindquist, Birch, Fisher, & Goran, 2002). Evidence from both cross-sectional studies and longitudinal studies provide useful information for understanding the pathway of links between child-feeding practices and childhood obesity.

Birch and her colleagues conducted confirmatory analysis of the Child Feeding Questionnaire (CFQ) among parents of children aged from 5-11 years. This questionnaire has 7 subscales which are designed to assess parents' beliefs, attitudes and practices regarding child feeding with a focus on obesity proneness in children. Those subscales include parents' perceived responsibility of feeding the child, perceived parent weight, perceived child weight, concerns about child weight, pressuring, restricting, and monitoring the child's eating. The findings from their study showed associations between the subscales of CFQ and children's weight: parents' perceived child weight, and concerns about child weight were positively related to the child's weight status, and pressure to eat was negatively related to child's weight status (statistically significant only in one of their three samples). The restriction score was marginally positively related to the child's weight status; monitoring was not related to the child's weight status.

Similar results have been found in several other cross-sectional studies. One study evaluating the relation between mothers' child-feeding practices and children's adiposity found that maternal concern about children's weight was positively correlated with children's total fat mass ($P < 0.001$), while pressure to eat was negatively associated with children's total fat mass ($P < 0.03$) (Spruijt-Metz et al., 2002). In their multiple regression models, parental concern for child's weight and pressure to eat, explained 15% of the variance in total fat mass after adjustment for total lean mass, sex, ethnicity, socioeconomic status, and energy intake. Another study conducted among Mexican-American fifth-grade children and their mothers showed that

mothers' pressure on their children to eat was inversely correlated with children's BMI: the greater eating pressure from the mother, the lower the children's BMI (Matheson, Robinson, Varady, & Killen, 2006).

Several longitudinal studies have also explored the potential pathways of the association of parental feeding practice and childhood obesity. Faith et al. tested the 2-year stability of parental feeding attitudes and styles and investigated whether they predict child BMI 2 years later among children aged 3 years at the baseline point (Faith et al., 2004). They classified children as high risk for obesity at study enrollment if their mothers had a pre-pregnancy weight of > 66th percentile of as low risk if their mothers' weight was < 33rd percentile. They found that parental monitoring of fat intake at age 5 predicts lower BMI at age 7, when BMI at age 3 was accounted for, but only among children with low genetic risk of overweight. This result may suggest that parental monitoring may help to regulate children's fat intake. Based on their findings, the authors suggested a gene-environment interaction and bidirectional influence between child and parent. "Among children predisposed to obesity, elevated child weight appears to elicit restrictive feeding practices, which in turn may produce additional weight gain. Parenting guidelines for overweight prevention may benefit from consideration of child characteristics such as vulnerability to obesity and current weight status" (Faith et al., 2004, p. e429).

Another longitudinal study examined older children (mean age of 11 years) for an average follow-up period of 2.7 years. The study found that parental concern for weight was a predictor of change in total fat mass with time in white children, but not in African-American children (Spruijt-Metz et al., 2006). In white children, the parental concern was associated with less increase of total body fat over time. The authors suggested that this concern might be linked

to as-yet-undefined behaviors that can help children to regulate weight gain, although a mother's concern for her child's weight represents an affective state and does not directly correspond to action or behavior. In addition, this study also showed that models of maternal child-feeding on child's body fat did not generalize across ethnicities.

Though the studies cited above show associations between child-feeding strategies and children's weight status, the direction of the relationships is inconclusive and the underlying mechanism is unclear. Other studies have not revealed any evidence with regard to the relationship between parental controlling feeding behaviors and childhood obesity (Baughcum et al., 2001; Robinson, Kiernan, Matheson, & Haydel, 2001; Spruijt-Metz, et al., 2006). In addition, most studies in this particular area were conducted among young white children. The magnitude of association may vary in different populations if there is any (Faith et al., 2003).

Feeding practices vs parenting styles

As discussed above, parent-child feeding practice, including control, restriction and pressure to eat, seems to impact children's eating behavior and their weight status. How parents use their controlling strategies may yield different effects. For instance, if parents regulate children's eating behavior with parental warmth and emotional support (e.g. role modeling and actively interacting with their children), negative attitudes from children may be reduced. That is involved with parenting style. Parenting style differs from feeding practice in that it describes parent-child interactions across a wide range of situations, whereas feeding practices are domain-specific (say, food related)(Darling & Steinberg, 1993).

In contrast to parenting practices, a parenting style is independent of the content of the practice. Darling & Steinberg (1993) have argued that the efficacy of specific parenting practice is moderated by the general parenting style. In the case of dietary behaviors, controlling child-

feeding may have different effects in children of parents with different parenting styles. Baumrind (1971) identified several parenting styles: authoritative (parents who are both firm and supportive/involved) authoritarian (in which parents are strict but less involve), indulgent (in which parents are involved but not strict), and neglectful (in which parents show relatively low levels of both strictness and involvement).

The literature on various parenting styles has provided consistent evidence that parental warmth, emotional support, appropriate granting of autonomy, and clear, bidirectional communication lead to positive behavioral outcomes in children and adolescents. A recent study explored the influence of general parenting styles on adolescent food choice patterns (Kremers et al., 2003). It showed that fruit consumption and fruit-specific cognitions were most favorable among adolescents who were being raised within an authoritative parenting style. The study also found that low levels of fruit consumption are associated with authoritarian parenting style, which seems to confirm findings on the adverse effect of strong parental control or strictness on child-feeding practices.

Findings from these studies provide insight into possible underlying mechanisms of parental control in child feeding practices. When parental control in child-feeding practices is exercised in a general atmosphere of active involvement and parental warmth, this may lead to positive effects, while the same parental practice may lead to adverse effects in an authoritarian atmosphere. However, some researchers have questioned the suitability of the ‘authoritative parenting’ concept for other cultures than the Western culture (Chao, 1994). The author argued that the concepts of authoritative and authoritarian are somewhat ethnocentric and do not capture the important features of Chinese child rearing. Future studies are needed to gain more insight into these issues for oriental population.

Children's Self-regulation of Energy Intake and Parental Control

Though environmental factors have strong influence on children's eating behaviors and energy intake, evidence shows that young children have the ability to regulate their own energy intake. Research has shown that infants are able to control their energy intake based on their physiologic needs, reflecting responsiveness to internal hunger and satiety cues. Fomon (1993) found that infants older than approximately 6 weeks adjusted their formula intake in response to differences in the energy density of the formula, consuming greater volumes of formula low in energy density than of formula high in energy density, so that total energy intake across conditions were similar. Preschool children also adjust the amount of food consumed in response to changes in the energy density of foods to maintain a relatively constant energy intake across changes in energy density (Birch & Deysher, 1985; Birch, McPhee, Sullivan, & Johnson, 1989). Birch et al. found from their studies that over 24-hour periods, children tended to maintain relatively consistent total daily energy intakes as a result of meal-to-meal adjustments in energy intake.

Most studies of young children's self-regulation of energy intake are conducted in the laboratory under controlled protocols. In order to test children's self-regulation of their energy consumption in every-day environment, Shea and colleagues (1992) examined 181 preschool children in a natural setting. They found that children who ate less at one meal compensated at another, which suggests that young children have ability to adjust their overall energy balance. The ability to closely regulate energy intake based on physiologic needs is an adaptive behavior in the prevention of overweight; unfortunately, however, with increasing age, children may lose this level of responsiveness because of interruption by certain familial and social factors such as parents' feeding methods and media influence (Birch & Davison, 2001).

Children's ability of regulating energy intake may be interrupted by feeding methods or feeding practices that parents select. Evidence shows that formula-fed infants consume more milk and gain weight more rapidly than breast-fed infant (Dewey, 1998). Fomon (1993) speculates the difference of growth between breast-fed infants and formula-fed infants may result from overfeeding as an outcome of heightened maternal control over the infant's intake. In formula feeding practice, the mother can see how much formula remains in the bottle and she may be inclined to take control of how much the infant eats, encouraging the infant to finish the bottle. This maternal control can override the infant's regulatory ability. Findings from Birch's laboratory studies (Birch & Deysher, 1985; Birch, McPhee, Shoba, Steinberg, & Krehbiel, 1987) provide some evidence for a parallel relationship between parental control and children's ability to regulate intake during early childhood. Birch and colleagues observed young children's response to the energy density of foods within meals, and found that if children were responsive to the energy density of the first course in a fixed amount, they ate less in the selected second course after high-energy than after the low-energy first course. Another research in the natural setting yielded the similar results of self-regulation among young children.

Though research methods (e.g. measurements of children's energy consumption) were questioned (Goldman, 1993), researchers believe that evidence was showed in such studies that children can regulate their intake based on feedback arising from the energy content of foods just consumed. Although many children continue to be sensitive to internal signals arising from the energy density of the diet in controlling their food intake, child-feeding practices that encourage or restrict children's consumption of foods may decrease the extent to which children use internal signals of hunger and satiety as basis for adjusting energy intake (Birch & Fisher, 1998).

As discussed in an earlier section, young children tend to select and consume more restricted or forbidden foods when maternal restriction is removed, even though they are not hungry.

Chinese Context

Overview of Chinese demographics and family structure

China has been the world's most populous country for centuries and today makes up one fifth of the world population (Riley, 2004). Based on the fifth national population census in 2000, the mainland of China has a population of 1.295 billion (National Bureau of Statistics of China, 2001). Children under 14 years old account for 23% of the total population (289.79 million). With the economic growth and urbanization, urban population has increased dramatically. In 2000, there were 455.94 million urban residents, accounting for 36 percent of the total population. Compared with the 1990 population census, the proportion of urban residents increased by almost 10 percent. From 1990 to 2000, the number of cities increased to 663, and the number of towns also soared. It is expected that urbanization in China will reach 60% by 2030, with an extra 200 million more people expected in the urban areas before 2010. This growth comes at a cost in health terms (National Bureau of Statistics of China, 2001).

To control the rapid population growth and reduce the burden on economy, the Chinese government introduced the family planning policy in 1979, which officially restricted the number of children married urban couple can have to one. It allows exceptions in several cases, including rural couples, ethnic minorities, and parents without any siblings themselves (Potts, 2006). The policy has profound influence on population, family structure, and health care issues. In China's modern cities, family structure is very similar to the American one, which is the called nuclear family: husband and wife living with their children. According to the 5th National Census of China, in 2002, the average family size in China was 3.39 persons, down 1.42 from

the number in 1973. The typical Chinese family today can be defined as “4-2-1”. “4” represents the parents and parents-in-law, “2” represents the husband and wife, and the “1” refers to the only child of the couple. The center of the family is on the “1”— the grandchild (Chinese Women’s Federation, 2006). Because most urban families now have only one child, parents and grandparents tend to spoil their child. This may reflect on feeding practice: parents may tend to over-feed their children because one of the old Chinese traditions is to show parents’ love and caring through food.

Nutrition transition and epidemiologic transition

China represents one of the most rapidly developing countries in the world. In the past decades, the annual growth rate of the gross domestic product (GDP) was more than 8%, the highest rate in recent world history (World Bank, 2001). China has achieved remarkable economic progress and high levels of education. Annual income per capita is now almost 20 times greater than 20 years ago (National Bureau of Statistics of China, 2001). Along with these economic shifts and many related social changes, Chinese lifestyle and diet has changed greatly.

At the beginning of the economic transformation in China, cereal intake increased but decreased thereafter (Du Lu, Zhai, & Popkin, 2002). There was also a long-term reduction of vegetable consumption that has now stabilized. Intake of animal foods increased slowly before 1979 and more quickly after the economic reforms occurred. The contribution of fat to the total dietary energy reached 28.4% in 1992, and in big cities like Beijing, Shanghai, and others, energy from fat has exceeded 30% of the total energy intake. Over a third of all Chinese adults and 60.1% of those in urban areas consumed over 30% of their energy from fat in 1997. Physical activities reduced with the improvement of working and living conditions. Chinese people are

less engaged in intense physical activities because of the access to labor saving machine, TV and internet and the change of transportation means.

Wang et al (2008) recently examined the eating behaviors of the Chinese people, focusing on snacking and cooking methods, and to identify the influences of socioeconomic factors on these eating behaviors during the nutrition transition. Results showed that the rapid shift in the food and nutrient profile of the Chinese population was accompanied by profound changes in meal and cooking patterns. Urban residents were more likely to eat snacks and consume excessive amounts of fried foods than rural residents. These findings indicate that eating behaviors were beginning to change rapidly toward less healthy options in China. SES plays a vital role in the early stages of the eating behavior transition in China. The study found that higher family income was associated with increased consumption of snacks and fried food which indicated increased consumption of edible oil and special foods (e.g. animal food). Family income was strongly associated with the frequency of purchasing these foods. Future health promotion programs targeting the higher-SES population will exert far-reaching effects on the improvement of health status in Chinese.

As a result of the change in lifestyle and diet, China is also undergoing a rapid epidemiologic transition, which is a shift from a disease pattern dominated by infectious and deficiency diseases to an epidemic of non-communicable chronic diseases including obesity (Chen, 1999). Chronic diseases now account for an estimated 80% of deaths and 70% of disability-adjusted life-years lost in China (Wang et al., 2005). The major causes of death in China now are cardiovascular disease, cancer, and chronic respiratory disease. Cardiovascular diseases alone account for 38% total mortality (Chen, 2008). The data from Chinese Ministry of

Health show the prevalence of hypertension, heart disease, diabetes among adults were 26.2, 14.3, and 5.6 per 1000 respectively in 2003 (Yang et al., 2008).

The Chinese health profile changes along with the increase in obesity. China was once considered to have one of the leanest populations (Keil & Kuulasmaa, 1989), but it is fast catching up with the West in terms of the prevalence of overweight and obesity (Ma et al., 2005). Data from the 2002 national nutrition and health survey showed that 22.8% of Chinese were overweight (BMI $\geq$24 kg/m^2) and another 7.1% were obese (BMI $\geq$28 kg/m^2) using the Chinese BMI reference (Chen, 2008).

Obesity among Chinese children

Recent data show the prevalence of overweight among Chinese school age children (7-18 years old) was about 10% in urban areas in 2000, compared to no more than 2% in 1985 (Ji & WGOC, 2008). A local reference developed by WGOC to define overweight and obesity was used (Ji & WGOC, 2005). Ji examined trends of prevalence of obesity among school-aged children (7-18 years old), using data from the Survey on Students' Constitution and Health (CNSSCH), which is conducted every five years since 1985. A steady increase in prevalence of obesity was observed between 1985 and 2000. This increase was more significant among boys. There are higher prevalence rates in more developed areas such as coastal regions and well developed big cities such as Shanghai and Beijing. For instance, in urban areas in Beijing the prevalence of obesity reached almost the same levels as in some developed countries (10– 15% both for boys and girls). The prevalence is relatively low in inland regions. For pre-school children, a national representative survey showed that the overall prevalence of overweight and obesity was 7.5% among Chinese children aged 3-6 years in 2000. The study found that girls were more likely to be overweight or obese than boys (Liu et al., 2007). A recent study

conducted in Beijing among Chinese children showed that the prevalence of overweight including obesity is 21.7% among school-aged children (7-18 years old) (Mi et al., 2006). Childhood obesity researchers in China have pointed out that though China is at an early stage of the childhood obesity epidemic, the prevalence is increasing rapidly and is catching up with the industrial countries. Urgent effort should be made in China to combat the growing obesity epidemic.

Change in eating patterns among Chinese

Direct assessment of children's eating behaviors among Chinese children is lacking in literature. Data on snack consumption and fried foods from national representative samples may provide some insights. Chinese Center of Disease Control and Prevention (CCDC) conducts the China Health and Nutrition Survey (CHNS), on a regular base, to examine how the social-economic transformations of Chinese communities affect the health, nutrition status of the population. Data collected in 1991 and 2004 shows that proportion of those who frequently ate snacks increased significantly over time in all population groups (Wang et al., 2008). For example, among children aged 2-18 year, the proportion of those eating snacks increased from 15.4% to 20.6% from 1991 to 2004. The proportion of calories consumed from fried foods increased significantly during that same period, while the proportion of calories consumed from home-prepared foods with traditional methods declined. For example, the proportion of energy from fried food among children 2-18 years old increased from 16.5% in 1991 to 21.3 in 2004.

Though the percentage of snacking among Chinese children was 20.4% (Wang et al., 2008), which was relatively low compared with US, the secular trend of increase indicates that shift in eating behavior is occurring. At the same time, cooking practices also undergo a significant shift from traditional health methods to high-in-fat methods in China (Zhai et al.,

2009). With increased availability of meat products and edible oil, fried food has become popular in China. The proportion of dietary energy derived from fat in the adult diet increased dramatically, from 19% in 1989 to 28% in 2004, and about half of dietary fat was derived from edible oil. Another study analyzing the data of CHNS collected in 1991 and 1997 (Liu et al., 2006) shows that snack consumption and consumption of food prepared outside the home have significant increased among children. Further exploration of the data reveals that fruits, grains and vegetables were most frequently consumed as snacks by Chinese children both in 1991 and 1997. The study also found that eating food prepared outside of the home is not significantly linked to more caloric intake. The positive association was found between increased snack consumption and foods prepared outside the home and the family income.

Political efforts to promote healthy diet and physical activity

During the 1990s, the increase in obesity and non-communicable diseases brought a rising awareness of the negative effects of the nutrition transition to Chinese researchers and scholars in public health, medicine and nutrition. The government made several changes in national policies and initiated national efforts to change these patterns emerging during the transition (Zhai et al., 2002).

A new nutritional guideline was launched in 1997, with the combined efforts from the Chinese Nutrition Society and the Institute of Nutrition and Food Hygiene at the Chinese Academy of Preventive Medicine (INFHCAPM) (Chinese Nutrition Society, 1997). Eight principles were developed to delineate a healthy diet, using the Pagoda as a symbol for the same set of healthy eating principles that guide the United States' dietary pyramid and many similar food-based efforts. These principles, focused on under- and over-nutrition and related food behaviors, are as follows.

1. Eat a variety of foods, with cereals as the staple.

2. Consume plenty of vegetables, fruits and tubers.

3. Consume milk, beans or dairy or bean products daily.

4. Consume appropriate amounts of fish, poultry, eggs and lean meat. Reduce fatty meat and animal fat in the diet.

5. Balance food intake with physical activity to maintain a healthy body weight.

6. Choose a light diet that is also low in salt.

7. Drink alcoholic beverages in limited amounts, if at all.

8. Avoid unsanitary and spoiled foods.

Several campaigns at local levels have been launched to initiate the dissemination of these guidelines. To date, activities have been focused at limited locations and on increased training of public health workers at Anti-epidemic Stations throughout the country. For instance, many face-to-face nutrition education sessions have been held in Beijing, Hubei, Shandong, Sichuan and other provinces of China with quite limited attendance to date (Zhai et al., 2002).

In the same year as new Chinese nutrition guidelines were published, the State Council of China issued the National Plan of Action for Nutrition (State Council of China, 1997). It was based on many years of discussion and the work of several joint activities of INFHCAPM, the State Council, the Ministry of Health and the Ministry of Agriculture. The general goals are: (1) to ensure an adequate food supply and implement appropriate intervention to alleviate hunger and food shortage; reduce the incidence of energy-protein malnutrition; and prevent, control and eliminate micronutrient deficiencies; and (2) to improve the general nutritional status of the people and prevent DR-NCDs through proper guidance on food consumption behavior,

improvement of dietary patterns and promotion of healthy lifestyles (Ge & McNutt, 2000). This plan stressed on multi-sectoral co-operation and set targets for agriculture and processed food production. It addressed adjustments to the agriculture structure (e.g. to increase poultry and fishery production; to increase vegetable, fruit and soybean production; and to develop soybean-processing techniques).

The government has also made effort to promote physical activity and sports with a 1995 edict (State Administration of Physical Culture and Sports, 1995). The government called upon all residents to exercise regularly to improve their physical status and to prevent DR-NCDs; various physical competitions are held at different levels. Increasing numbers of people are seen in China to participate in physical activities.

To increase physical activities among students, the Ministry of Education created a campaign to lighten students' burdens; schools are asked to reduce the teaching time and to increase the physical activity time. The Ministry of Education is also changing the examination system to decrease the study pressure on students. In the past, university entrance examinations had seven sections; now they have only three, plus one comprehensive test. However, parents of students still want them to do more homework and less physical activity. The effects of the government's efforts are still under observation, but it is felt they are ineffective to date (Zhai et al., 2002).

Child Feeding Questionnaire (CFQ)

Theoretical framework

The theoretical framework of CFQ is based on the concept of domain-specific parenting introduced by Costanzo and Woody (1985). They suggested parenting is tailored to the child, based not only on different characteristics among children but also parental concerns and

perceptions of the child's risk for developing a problem in a particular domain of development. In addition, Goodnow (1988) suggested a parent is more likely to constrain and control a child's behavior when the particular content area is high in importance and strongly valued by the parent, and when the parent distrusts the child's naturally occurring learning in the area, because the appropriate ideas or skills are not readily acquired or discoverable by the child's own experimentation.

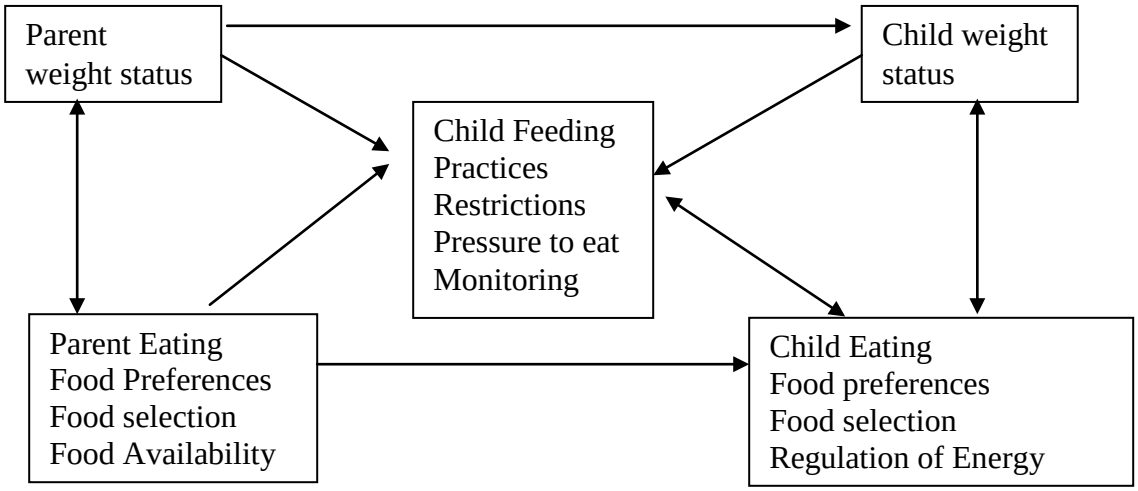
Costanzo and Woody (1985) assessed that high-involvement parenting may actually produce unintended and counterproductive effects in a child's optimal development in a specific context. In terms of obesity, parental control may increase the risk of obesity in their children. The possible mechanism, suggested in Costanzo and Woody's model, is as follows: Parents who detect signs of a tendency toward obesity in their children are likely to become highly concerned, because of the deviant status of obesity in the western culture and because of the adverse health consequences that parents can envision. This parental concern, they argue, tends to lead to restrictive, constraining strategies of parental intervention. Access to food may be restricted and monitored by a parent on a child's behalf. The high parental constrains may interfere with child's natural learning about self-regulation of eating.

Based on a literature review and laboratory studies, Birch & Davison (2001) extended the model in terms of obesity development and hypothesized familial factors that promote familial patterns of adiposity and childhood overweight. As Figure 2 shows, the model acknowledges direct genetic links between parent and child, but focuses on displaying a set of behavioral patterns shared within the family that promote childhood obesity. The model illustrates how parents' weight is linked to parents' own eating patterns and their child-feeding practices, which, in turn, influence children's eating behaviors and their weight status. Birch pointed out that this

model does not address the physical activity side of the energy balance equation (Birch & Davison 2001).

Figure 2

Behavioral Mediator of Family Resemblances in Eating and Weight Status (Birch & Davison, 2001)



Development of CFQ

Based on Costanzo & Woody's model, the first version of the Child Feeding Questionnaire (CFQ) developed by Johnson and Birch (Johnson & Birch, 1994) consisted of 24 forced-choice items adapted from Costanzo and Woody's (1985) parent interview. It measured parents' attitudes, beliefs, and tendency to use control in feeding and included items tapping parental concerns about child weight status, as well as items that assessed parental child-feeding practices in the child-feeding relationship. In a small sample of 77 families of preschool-aged children, they (Johnson & Birch, 1994) reported links between parental-control attitudes and practices and children's eating; parents who reported higher levels of control in child feeding had children who showed less adjustment of their intake in response to differences in the caloric density of foods.

Items in the questionnaire were revised and tested in a larger sample. Items regarding parents' perceived responsibility for child-feeding tasks were added to facilitate an understanding of factors that might elicit parents' use of control in child feeding. With regards to specifics of parental control in feeding, Birch's laboratory research revealed that parents tended to use two distinct types of control, pressuring children to eat and restricting their access to snack food. As a result, items about parental use of restriction, pressure to eat, and monitoring were added to the instrument.

Birch et al. (2001) confirmed an acceptable fit of a 7-factor model in several different samples aged from 5-11 years old including Caucasian and Hispanic. The fit statistics for the correlated factor model from confirmatory analysis was significant, which indicated acceptable fit. The highest correlations between factors were between restriction and pressure to eat scales and restriction and monitoring scales. Higher levels of restriction were associated with greater monitoring, and greater pressure to eat. In addition, the pressure to eat scale was significantly negatively associated with perceived child weight, indicating that parents who perceived their child as being thinner reported using higher levels of pressure to eat with the child.

Items loaded on 7 factors reflecting parental perceptions and concerns that may prompt use of controlling child feeding practice, and parental control attitudes and practices in feeding. The final version of the CFQ published by Birch and her colleagues consisted of 31 items addressing the 7 factors (see Appendix A): perceived responsibility of feeding the child, perceived parent weight, perceived child weight, concerns about child weight, pressuring, restricting, and monitoring the child's eating. Each factor in the CFQ assesses a different and distinct dimension in feeding practice. All items were measured using a 5-point Likert-type scale, with each point on the scale represented by a word anchor.

Since CFQ was published, there have been several studies which have used it among various ethnic groups to assess parental child feeding practices and attitudes. Using a reduced version of the CFQ (24 items), Anderson and colleagues tested the fit of Birch's model in a sample of 101 low-income African American parents and in a sample of 130 Hispanic pre-school children aged between 3 and 5 (Anderson, Hughes, Fisher, & Nicklas, 2005) . In their study, the perceived parent weight factor was not measured due to a clerical error discovered after data collection was completed, and three of six perceived child weight items were not used since they were not applicable due to age of children. They adapted the 7- factor model to one with 5 factors by dropping the perceived parent weight factor and the perceived child weight factor. Their results supported the hypothesized factor structure but the fitness of the model varied according to ethnic groups; the model's fit was better in the Hispanic than in the African-American sample.

A recent study investigated the validity of the CFQ among 260 parents of a multi-ethnic sample of 10–19-year-old adolescents (55% African American, 35% Caucasian, and 10% others) by adding one item on the monitoring of sugared beverages and by slightly modifying items to make it applicable to parents of adolescents (Kaur et al., 2006). They concluded that the psychometric properties of the modified CFQ were similar to those of the original CFQ used among parents of 2–11-year-old children. Factor-factor correlations were similar to those reported in Birch's study with monitoring, responsibility and concern and pressure to eat correlating negatively with perceived teen weight.

Geng et al. assessed validity and factor structure of the CFQ translated into Japanese among 920 parents of urban Japanese elementary school children aged 9-12 years. In their study, they used a translation-back-translation approach to convert the English questionnaire into

Japanese, attempting to retain its original meaning while making the necessary changes to adapt it to a Japanese setting. Their study revealed similar associations between certain factors and children's weight to those which had been observed in previous studies on the CFQ (Geng et al., 2009). The three behavioral factors (restriction, pressure to eat, and monitoring) were positively correlated with each other as well as with parents' perceived responsibility. Restriction was correlated with all factors, except for perceived parent weight. The pressure to eat factor was positively correlated with responsibility and monitoring, while it was negatively correlated with perceived child weight. Monitoring was positively correlated with concern about child weight, however, it was not correlated with perceived child weight.

Summary

With the increased obesity prevalence and subsequent health complications among children, there is a growing body of studies which focus on childhood obesity related issues. Evidence from different countries and regions has shown that the prevalence of overweight and obesity among children has increased dramatically both in developed and developing countries in the past decades. The increased prevalence of obesity parallels with increased adverse health consequences among children such as Type 2 diabetes, which indicates that obesity can cause dysfunctions of the body and impair the health and life quality of children. Childhood obesity is also associated with increased morbidity and mortality in adulthood. Therefore childhood obesity has profound influence on health over the life course.

Though studies show that obesity is linked to some genetic factors, the rapid increase of obesity at the population level globally is not attributed to change in genes but rather the change in social and physical environment. The' obesogenic' environment can promote unhealthy

lifestyles, which, in turn, impair the balance of energy intake and expenditure. High-in-fat diet and physical inactivity are strongly associated with obesity both in adults and children.

Children, especially, are vulnerable to this ‘obesogenic’ environment. Many factors can influence children’s consumption of healthy or unhealthy food. Parents, as food providers, caregivers and role models, play a critical role in shaping children eating behavior. Particularly, parent-child feeding practices, including perceived feeding responsibilities, weight concerns, control, restriction and pressure to eat, appear to influence children’s food preference and their weight status.

Chapter III Methods

Purpose of the Study

The purpose of this study was to examine the relationships between Chinese parents' child-feeding attitudes and practices and weight of their young adolescent. Particularly, the study assessed parental child-feeding attitudes and practices, including their concerns about their young adolescents' weight, and strategies regarding child feeding, and family food environment, which includes obesity-related foods available at home and family eating patterns. The study also examined whether these child-feeding practices and family food environment are associated with the young adolescent's actual weight status. The study focused on the parent who cooks meals for the family most of the time, because this parent is thought to have the greatest influence on children's food choice and the families' food environment.

Research Questions

In order to examine the relationships between the parental feeding practices and weight status of young Chinese adolescents, the following questions were seen as relevant:

1. What is the relationship between parents' perception of their children's weight status and children's actual weight status?
2. To what extent are parents concerned about their children's weight?
3. What is the relationship between parents' weight concern about overweight in their children and children's actual weight status?
4. To what extent do parents feel responsible for preparing their child's meals, and use specific feeding strategies to regulate young adolescents' food intake (e.g. restricting foods, pressure to eat and monitoring of high-calorie foods)?

5. What is the relationship between parents' child-feeding strategies and children's weight status?
6. To what extent do parents promote communication about healthy weight and eating with their children?
7. What is the relationship between parent-child communication and children's weight status?
8. What food environment do parents create at the home? Specifically:

   a. To what extent do parents limit availability of high-calorie foods (e.g. sweets, fried food, soft-drinks) and promote availability of fruits?

   b. To what extent do parents provide a positive eating environment (breakfast at home for child, dinner as a family, limited meals out and take-out foods)?
9. What is the relationship between family food environment and children's weight status?
10. Which feeding practices strongly predict children's weight status after taking SES factors and parents' BMI into account?

Setting of the Study

Beijing is the economic, political, and cultural center of China, and is also an international communication hub. It is the second largest city in China after Shanghai and is one of the most well-developed cities. Its economy continues to boom and plays a leading role with rich natural and human resources and political benefits from the central government.

Beijing has a population of 17 million living in urban, suburban and rural areas (Beijing Bureau of Statistics, 2006). Those over 16 years of age account for 89% of the total population.

Seniors of 65 years or older account for 11%, while children aged 14 years or younger account for 10% of the population. There are 14 million residents in urban areas, which accounts for 84.9% of the population in Beijing. As an economic and cultural center, Beijing attracts people from all over the country. There is a considerable floating population including college students, construction workers, international people and some of those working in manufacturing sectors (Yang, 2007).

Beijing includes 16 districts and 2 counties. Eight districts are in the urban areas. The urban four districts surrounding the Forbidden City are called 'old city areas', where most of those who have lived in Beijing for several generations make their homes. The other four urban districts on the outside circle of the 'old city area' are economic, business and technological zones, called 'new city areas', where immigrants from all over the country live. They are considered newcomers who have settled in the city in recent decades.

The educational system in Beijing, as elsewhere in China, consists of six years of universal primary education and six years of secondary education. Children attend primary school at seven years of age with the exception of Beijing and Shanghai and some other major cities, where children are allowed to begin school at six and a half years of age. Students attend school five days a week for a nine-and-a-half-month school year consisting of two semesters, spring and fall. The early years of primary education emphasize reading, writing, and arithmetic, with history, geography, and science added in the later years (Beijing Municipal Education Commission, 2007).

Research Design

A cross-sectional design was used in this study to assess parents' child-feeding attitudes and practices and their relationship with children's weight status. Cross-sectional studies,

specifically surveys, are a common research method to gather information on important health related aspects and social issues. Surveys are useful ways to assess knowledge, attitudes, and practices within a defined population (Isaac & Michael, 1995). Surveys enable researchers to collect descriptive information about various characteristics and describe the associations between health exposures and outcomes. Cross-sectional studies can be thought of as providing a "snapshot" of the frequency and characteristics of a health issue in a population at a particular point in time. Though they cannot identify cause-and-effect relationships, they provide insights to the problems and evidence for developing effective interventions and making health decisions (Creswell, 1994; Sarvela & McDermott, 1993). Therefore, the cross-sectional research design was appropriate for the purpose of this study.

A self-administered survey was conducted among parents of students in 7th to 8th grades in selected public schools in Beijing. Parents were approached and recruited through their children. The instrument was based on a published questionnaire with new items added by the researcher based on literature reviews.

Sample Selection

The targeted population in this study was parents of young Chinese adolescents from 7th grade to 8th grade who live in Beijing urban areas. In particular, the research focused on the parent who prepares the most family meals and is more responsible for feeding the child. The ultimate goal of the study is to provide instructive information for combating the increase of obesity in Chinese children. Adolescence is a critical time for development of obesity as well as behavior change. Though young adolescents are in a transition of gaining more autonomy, they eat mainly at home and are under great influence from their parents. Parents of young Chinese adolescents have particular relevance to the purpose of this study.

In order to get a sample that would better represent socioeconomic and demographic variations, purposive sampling was used to select families for this study. There are eight districts in the urban areas. To balance demographic variations in this study, one district (Xuanwu District) from the well-established 'old city' areas and one district (Chaoyang District) housing more newer immigrants to Beijing were selected for this study. Because of the development and reconstruction of the Beijing city, there is no distinct line to draw between 'old city' areas and 'new city areas'. Many residents who lived in 'old city' areas for generations are relocated in 'new city' areas in the past decade. Communities in all urban areas are actually mixed with diverse socioeconomic backgrounds.

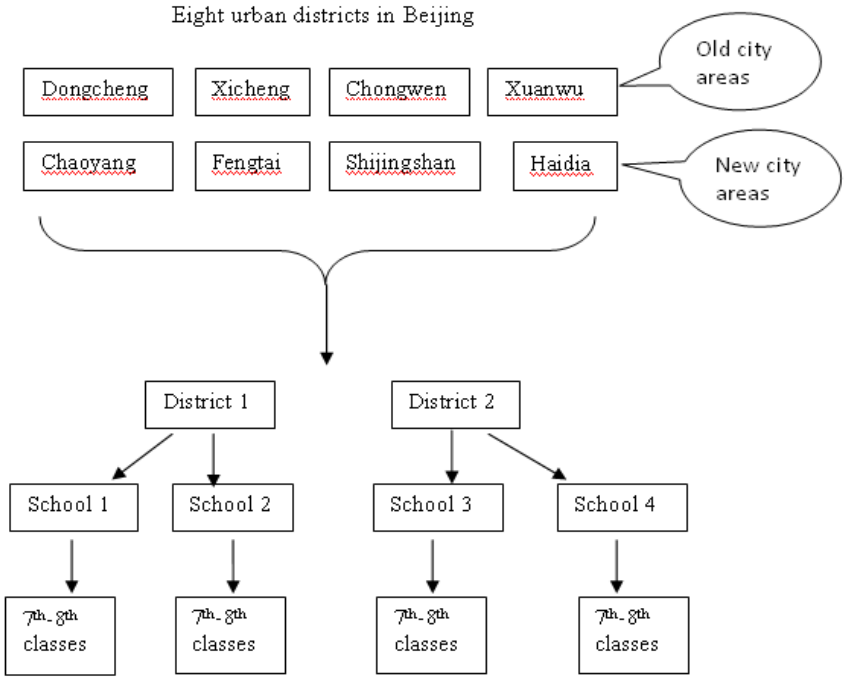
The sample size used in this study was based on the need of data analysis. Multiple regression analysis was conducted to test relationships and identify predictors of children's weight status. Six independent variables and five adjusted variables were involved in the regress analysis. In general, 25-30 subjects for each variable in the regression model would be sufficient. Thus, the minimum number of subjects that was sufficient for the multiple regression analysis in this study would be (25 subjects*11 variables=275). Based on the previous survey experience, 70% as the minimum response rate was expected. Taking the response rate into account, 393 (275 subjects/70%) subjects would be sufficient for the data analysis.

A convenience sampling strategy was used to select public middle schools. Based on the recommendation of easy cooperation and availability of students' most recent check-up data, schools were selected from school lists provided by district CDCs in Beijing. Two middle schools were selected from each selected urban district. Total four middle schools were selected from two urban districts plus one middle school in Xuanwu District for the pilot study.

Each grade in these public middle schools has several class cohorts (groups of students who take all their classes together), which are organized in numbers. When students are enrolled in school, they are randomly assigned to these class cohorts. The class size ranges from 25 to 40 students. To be able to meet the estimate sample size and get sufficient participants, the researcher planned to recruit 120-150 participants from each selected school. School nurses were identified as the key person who helped organize the survey. During a visit to these selected schools, the researcher and the school nurses worked together, and decided to pick the first 2 or 3 class cohorts in each grade (7th and 8th grades) from the lists of the class cohorts. Students in selected classes were recruited and their parents were approached through them. For example, seven class cohorts were in 7th grade in a selected school, which were numbered from 1 to 7. The class size was 25 students. Class 1, 2, and 3 were chosen for recruitment of participants. The same procedure was applied to 8th grade in this school. The sampling procedure is summarized in Figure 1.

Figure 1

Sampling Procedure



Instrumentation

This study particularly focused on parental influence on their child's weight. Based on a literature review, several aspects were identified through which parents may exert impact on children's eating behavior and weight status. As discussed in previous sections, high parental concerns about their child's weight can lead to controlling feeding strategies which, as some research has suggested, may interfere with the child's self-regulation strategies. Therefore, such practices may increase risk of overweight in children. Food environment at home created by parents, which also can be seen as reflections of parents' child-feeding strategies, have strong influence on children's eating and weight status. The food environment at home should be assessed along with parents' child-feeding attitudes and behaviors. In addition, parental control of their children's eating with appropriate discussion about eating and weight issues can yield positive influence on children's energy intake and their weight status. The instrument for this study was structured based on these aspects related to parents' child-feeding practices.

Certainly, there are many other factors that need to be assessed to get a clear picture of how parental feeding practices affect their child's weight. There are many ways in which family may influence a child's weight and eating behavior, such as the parents' own food preferences and eating behaviors, and how food is prepared and served as well as physical activity and actual energy intake. However, these factors were not the focus of this study and were not assessed.

The instrument used for this study was developed based on a published instrument and literature reviews. Seven subscales (29 items), assessing attitudes toward feeding their children and strategies of feeding, were primarily adopted from Birch et al.'s CFQ (Birch et al., 2001) and previous studies. They included perceived responsibility, perceived parent weight, perceived child weight, parental concern about child weight, restriction, pressure to eat, monitoring. Two

items (one was restriction of snacks and the other was monitoring of snacks) developed by the researcher were added to subscales of restriction and monitoring, respectively. Three additional subscales (12 items) were developed and added to the instrument, assessing communication about eating and weight issues, and family food environment. They were communication, food availability at home and family eating patterns. Most items in the instrument were measured using a 5-point Likert-type scale.

Items in each subscale and response options are listed in Table 1. Minor changes were made to those adopted items to make them more suitable for the present study. Modification of item 7's wording was made to make it suitable for parents of young adolescents. The original item reads, "*When your child is at home, how often are you responsible for feeding her?"* The item has been changed to, *"When your child is at home, how often are you responsible for preparing his/her meals?"* The response options of items 20 to 33 have been changed from "*disagree, slightly disagree, neutral, slightly agree, agree"* to *"strongly disagree, disagree, neutral, agree, strongly agree."* The word of 'plate' in item 30 was replaced by the word of 'bowl' to make it suitable to Chinese eating traditions. 'Fried foods' was used instead of 'high-fat foods' in items because 'high-fat food' sounds more like an academic term to Chinese parents and 'fried food' is better for them to understand and categorize their food.

Table 1

Items and Response Options in Subscales

Subscales	Items
Perceived responsibility	7. When your child is at home, how often are you responsible for preparing his/her meals? 8. How often are you responsible for deciding what your child's portion sizes are? 9. How often are you responsible for deciding if your child has eaten the right kind of foods? RO: 1=never, 2=seldom, 3=half of the time, 4=most of the time, 5=always
Perceived parent weight	10. Your weight during your adolescence 11. Your weight during your 20s 12. Your weight now RO: 1=markedly underweight, 2=underweight, 3=normal, 4=overweight, 5=markedly overweight
Perceived child weight	13. Your child during the first year of life 14. Your child as a pre-schooler 15. Your child from 3rd to 5th grade 16. Your child currently is RO: 1=markedly underweight, 2=underweight, 3=normal, 4=overweight, 5=markedly overweight
Concern	17. How concerned are you about your child eating too much when you are not around him/her? 18. How concerned are you about your child having to diet to maintain a desirable weight? 19. How concerned are you about your child becoming over weight? RO: 1=unconcerned, 2=a little concerned, 3=concerned, 4=fairly concerned, 5=very concerned
Restriction	20. I have to be sure that my child does not eat too many sweets (candy, ice-cream, cake or pastries). 21. I have to be sure that my child does not eat too many fried (fried meat, fried vegetables, etc.) foods. 22. I have to be sure that my child does not eat too much of his/her favorite foods. 23. I have to be sure that my child does not eat too much of snacks (potato chips, puffed foods, etc.). 24. I have to be sure that my child does not drink too much soft drinks (such as soda and sweetened beverage). 25. I intentionally keep some foods out of my child's reach. 26. I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behaviors. 27. I offer my child his/her favorite foods in exchange for good behaviors. 28. If I did not guide or regulate my child's eating, he/she would eat too many junk foods. 29. If I did not guide or regulate my child's eating, he/she would eat too much of his/her favorite food. RO: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5= strongly agree
Pressure to eat	30. My child should always eat all of the food in him/her bowl. 31. I have to be especially careful to make sure my child eats enough. 32. If my child says ``I'm not hungry'', I try to get him/her to eat anyway. 33. If I did not guide or regulate my child's eating, he/she would eat much less than he/she should. RO: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Table 1

Items and Response Options in Subscales (continued)

Subscales	Items
Monitoring	39. How much do you keep track of the sweets that your child eats?
	40. How much do you keep track of the snack food that your child eats?
	41. How much do you keep track of fried (fried meat, fried vegetables, etc.) foods that your child eats?
	42. How much do you keep track of soft drinks that your child drinks?
	RO: 1= never 2=rarely 3=sometimes 4=mostly 5=always
Communication	34. I often talk with my child about why he/she should or should not eat certain food.
	35. I feel confident talking about healthy eating with my child.
	36. I feel confident talking about weight related topics with my child.
	37. I think that it is important to discuss healthy eating.
	38. I think it is important to discuss weight related topics with my child.
	RO: 1=strongly disagree, 2=disagree, 3= neutral, 4= agree, 5=strongly agree
Food availability at home	43. Fruits are available at home
	44. Sweets (including ice-cream, candy, cookies, cake, etc) are available at home
	45. Fried foods (fried meat, fried vegetable, etc) are available at home
	46. Sugar-sweetened beverages are available at home
	RO: 0 1 2 3 4 5 6 7 (days/per week)
Family eating patterns	47. How often does your child eat breakfast at home?
	48. How often does your family eat dinner together at home?
	49. How often does your family eat out at restaurant?
	50. How often do you purchase take-out food (or food prepared outside of home) for family meals?
	RO: 0 1 2 3 4 5 6 7 (days/per week)

Feeding responsibility: Three items assess perception of parents' responsibility: for feeding their child (item 7), determining the teen's portion sizes (item 8), and ensuring consumption of the ''right kind of food'' (item 9).

Perceived parent weight: Three items ask parents to classify their weight: during their adolescence (item 10), in their 20's (item 11), and currently (item 12). Due to poor loadings in confirmatory analysis in several previous studies (Birch et al., 2001; Kaur et al., 2006), one item in Birch's original instrument assessing perceived parental weight at 5-10 years was dropped from this study.

Perceived child weight: These items assess parental perception of their teenager's weight across the following age categories: first year of life (item 13), preschool (item 14), 3rd to 5th grade (item 15), and current grades (item 16). In one another confirmatory analysis among adolescents, parents' perception of the teen's weight in early childhood (2 items) had poor factor loading, and these items were dropped for this study. Early childhood items regarding both parents and children's weight may be less accurate with the increased length of time.

Concern about child weight: Three items assess parents' concerns about their teenager's weight: eating too much when the parent was not around (item 17), needing to diet to maintain a desirable weight (item 18), and becoming overweight (item 19).

Restriction: Nine items tap into parental behaviors intended to curb and regulate intake of ''energy-dense'' foods and use of food as a reward: four items on restricting intake of unhealthy foods (items 20-23), one item on keeping food out of reach (item 25), two items on using food as a reward (items 26, 27) and two items on guiding intake (items 28, 29). Two additional items were added to this subscale to specifically assess parents' restrictions on snack foods (item 23)and soft drinks (items 24, adopted from Kaur et al.'s study) (2006).

Pressure to eat: This domain consists of four items related to parental practices of encouraging food intake: believing that the child should always eat all of the food in him/her bowl (item 30), making sure the child eats enough (item 31), getting the child eat more (32), and worrying the child eat much less if the parent did not guide him/her eating (item 33).

Monitoring: Four items assess the extent to which parents oversee their child's intake of sweets (item 39), snack foods (item 40), fried food (item 41), and soft drinks (item 42).

Communication: Five items in this domain assess parents' attitudes toward and confidence in communicating with their children about healthy eating and weight (items 34-38). One item assesses if parents talk to their child about healthy food (item 34). Two items assess parents' confidence in talking about healthy eating and weight (items 35, 36). Two items assess parents' attitudes toward communication (items 37, 38).

Food availability at home: Four items assess food or drinks at the home that may promote or reduce the risk of obesity development (items 43-46). These items focus on fruits, sweets, fried food and soft or sugar-sweetened beverages. Items 44-46 were coded in reverse to indicate a positive family food environment.

Family eating patterns: Four items in this domain aim to assess family eating patterns including how often the child eats breakfast at home, how often the family eats dinner at home or at a restaurant, and how often the parent purchases food prepared outside the home for family meals (items 47-50). Item 49 and item 50 were reversely coded because these two practices promote unhealthy eating behaviors.

Additional sixteen items were added to collect demographic and background information (see Table 2).

Table 2

Demographics/Background Items

items
1. Who is answering the questionnaire
2. Who in the family cooks meals for the family most the time
3. Your child's birthday
4. Gender of your child
5. Your child's current weight
6. Your child's current height
51. Child's mother's age
52. Child's father's age
53. Child's mother's weight
54. Child's mother's height
55. Child's father's weight
56. Child's fathers' height
57. Average monthly family income (including both parents' income)
58. Child's mother's highest education level
59. Child's father's highest education level
60. Is he/she your biological child?

Translation-back-translation

A translation-back-translation procedure was used to ensure the accuracy of Chinese version. Two separate translations (Appendix C & D) of the original English version into Chinese were undertaken by the researcher and a Chinese graduate student who had a degree in English and who was familiar with health surveys. Adaptations were made to fit the culture of eating in China while maintaining the accuracy of each translated item. Subsequently, the two translations were compared and some minor adjustments were agreed upon. Thereafter, the Chinese version of the instrument was translated back into English by another Chinese graduate student who was majoring in mass communication and was a skilled translator into English. This English version (Appendix E) was compared with the original instrument. The translations were then discussed among all the translators, all inconsistencies were resolved by mutual agreement,

and the appropriate wording in Chinese was decided upon for the final Chinese version (Appendix F).

Several changes have made based on the instrument based on comments from the dissertation committee and translators. Chinese people use bowls more than plates to serve and eat meals at home. The word of “plate” was changed into “bowl” in item 30. In Chinese cuisine, fried foods are common. The word of “fried food” is more familiar than ‘high fat food’ to parents, and it is easier for them to categorize the foods. “High-fat food” in Chinese sounds more like an academic term. A Chinese word, corresponding to “object”, expresses the same meaning of “disagree”, but it is more suitable in wording in Chinese context. Based on discussion with the translators, the Chinese word of “object” was used in the response options to indicate the attitude of “disagree”. This change is seen in the back-translation version of the survey from Chinese to English. The words for frequencies in Chinese were also carefully selected to make response options in Chinese more accurate.

Basic instruction and information about the study was explained in a cover letter for participants (see Appendix G). The letter specified that the parent who cooks family meals most of the time be the person to answer the survey. Parental consent to use children’s height and weight information from their school annual check-up was also requested. Voluntary and anonymous participation was also emphasized in the cover letter.

Human Subjects

Prior to data collection, approval from Southern Illinois University Carbondale’s Human Subjects Committee was obtained by the researcher. The procedure of the study in China and both English and Chinese versions of the survey were submitted to the committee for review. As requested, a letter from the third party (a Chinese Graduate assistant who helped translate the

instrument) was provided to indicate the Chinese version of the survey had the same information as the English one. Minor changes were also made on the research protocol. The application was resubmitted and was approved by the human subject review committee (see Appendix H).

Pilot Study

The primary purposes of the pilot study were to test the data collection procedure and test internal consistency of the instrument. A public middle school in Beijing was selected to conduct the pilot study among parents of 7th and 8th grade students. The school was selected because of its similarity to schools identified for the full study. The district CDC also indicated that the school nurse in this school was experienced and was able to facilitate administrations of the pilot survey at two points in time.

The survey procedure was similar to the one described in the following section for the full study. The cover letter to parents was the same as the one used in the full data collection, except that parents were asked to participate in two survey administrations. Also, parents were asked to supply child name, in order to link data from the two administrations. Children's names were deleted from the database after records were linked. The data collected in the pilot study was only used for reliability tests, and was not included in the full scale data analysis. Cronbach's alpha tests were used to test internal consistency of the instrument and the test retest reliability was examined, using Pearson's correlation and pair-wise t-test procedure in SPSS.

Several changes were made based on the pilot study. During the first administration of the pilot survey, the researcher suspected that some surveys were answered by students themselves, not their parents. Subsequently, parents' signatures at the end of the survey were required. In order to give parents additional time to complete the survey, students were asked to turn in the survey in two days instead of one day.

Data Collection

A public health official from the Department of School Health in Beijing CDC helped contact the selected schools (one school for a pilot study and four schools for full data collection) and obtain permission to conduct the survey. The CDC identified school nurses as the gatekeeper for assessing students. In addition, school nurses are asked periodically to help local CDCs to conduct school evaluations and investigations, so they are familiar with the data collection process. The researcher met each school nurses to give them questionnaires and explain instructions for this project. The nurses were also given a brief instruction outline (see Appendix I).

Following clear instructions provided by the researcher, the school nurses talked to students about the survey and distributed the survey in selected classes. Students were asked to take the survey, a cover letter (Appendix G), and an empty envelop home to the parent who prepares the most of family meals. The voluntary participation was stressed and parental consent for using the school annual check-up weight and height data was requested in the cover letter. If the parent agreed to participate in the study, students were asked to bring the survey in the envelop (sealed by the parent) back in two days. On the third day after surveys were delivered, the school nurses collected questionnaires and contacted the researcher about the progress. The researcher visited the schools again to collect questionnaires. The students' school annual check-up data were saved in the database on the school computers, to which school nurses had access. The research requested the data of weight and height of those surveyed classes alone with students' names on the second visit. After all the survey data was entered into the database and linked to the check-up data, the checkup data of those who did not respond to the survey were deleted from the database. Students' names were also deleted after all records were matched.

Data Analysis

All data was coded and entered into EpiData 3.0. Statistical analyses were conducted using SPSS software, version 17 (SPSS, Inc., Chicago, IL). The mean scores were calculated for each subscale. Higher scores indicated greater parental concern, about the child's weight, greater parental control over the child eating, and a more positive food environment at home. Some items in subscales of food availability and family eating patterns were reverse-coded, so that higher scores consistently reflected more positive family food environment. An alpha level of .05 was used for all statistical tests.

This survey targeted at the parent who is primarily responsible for family meals and feeding the child. The total response to the survey was 548. The final data analysis only included those who cooked the family meals most of the time. In addition, relationships between parents child-feeding practices and children's actual weight status cannot be assess without children's weight and height from their school check-up data. The records without children's check-up data were also excluded from the data analysis. The exclusion of records was made as follows: Sixty five records without children's check-up data were excluded; additional 128 records of those who did not cook the family meals most of the time were excluded. The data set used for the final data analysis included total 355 records.

Internal reliability of subscales was determined with an analysis of Cronbach's alpha coefficients in subscales. Pearson correlations and pair-wise *t*-tests were used to examine the test-retest reliability of the instrument using data from the pilot study. Correlation analysis was used to test if the two administrations were strongly associated with each other, while the pair-wised *t*-tests were used to test if there was significant difference in subscale means between the

two administrations. The results from these analysis would indicated the stability of the instrument.

The prevalence of underweight, overweight and obesity in both parents and children were reported as part of results. The BMI cutoffs for Chinese adults were used to classify overweight and obesity for parents: 'overweight' is defined as BMI $\geq$ 24 kg/m^2 , and 'obesity' BMI $\geq$ 28 kg/m^2 (Chen, 2008), while the underweight cut off of BMI for adults was 18.5 kg/m^2 based on the recommendation from WHO (WHO, 2000b). Age- and sex- specific BMI cut-offs developed by IOTF (Cole et al., 2000) to classify childhood overweight and obesity were used for the adolescents in this study (see Appendix J for detailed classification), while BMI percentiles below 5th were used as the underweight criterion (WHO, 1995). The normal weight group included those between the underweight and the overweight as classified by recommended criteria for adults and children.

Children's BMI z-scores were used to indicate their weight status in correlation and regression analysis. Children's BMI z-scores were computed by using EpiInfo 3.5.1, in which a procedure can compute the child BMI z-scores and percentiles based on CDC 2000 growth reference. EpiInfo is a statistical package for public health research developed by CDC (CDC, 2008). The program can calculate nutritional indicators, such as BMI z scores and percentiles in children, based on CDC 2000 growth reference.

Table 3 shows the summary of the data analysis methods with research questions. A descriptive analysis was used to report the baseline data. Response rates, means and standard deviations were calculated for individual items in the survey. *t*-tests were conducted to examine differences in child feeding attitudes and practices by children's genders.

The relationships between subscales on child-feeding practices and children' weight status were examined by using Pearson correlation analysis. Multiple regression analyses were used to identify which child-feeding practices were the strongest predictors of children's weight (BMI z-scores) and how much variance they accounted for. The dependent variable was children's BMI z-scores, and the independent variables were parents' child-feeding practices including their controlling feeding strategies, parent-child communication, and family food environment. Since SES factors and parents' BMI have been reported to be strongly associated with children's BMI in literature, parents' education levels, family income, and parents BMI were included in the regression model as adjustment factors. Dummy coding methods were used for the categorical variable (parents' education levels). All concerned variables were entered into the regression model at one time.

Table 3

Data Analysis Summary

Research Questions	Item	Analysis Methods
1. What is the relationship between parents' perception of their children's weight status and children's actual weight status?	13-16, child's check-up data	Frequencies/Percentage/ Pearson's correlation
2. To what extent are parents concerned about their children's weight?	17-19	Mean scores/ Standard Deviation/Frequencies/ Percentage
3. What is the relationship between parents' concern about overweight and children's actual weight status?	17-19, child's check-up data	Pearson's correlation
4. To what extent do parents feel responsible to preparing their child meals, and use feeding strategies to regulate young adolescents' food intake (e.g. restricting foods, pressure to eat, and monitoring of high-calorie foods)?	7-9, 20-33, 39-42	Mean scores/ Standard Deviation/ Frequencies/ Percentage
5. What is the relationship between parents' feeding strategies and children's weight status?	20-33, 39-42, child's check-up data	Pearson's correlation
6. To what extent do parent promote communication with their children about healthy eating and weight?	34-38	Mean scores/ Standard Deviation/Frequencies/ Percentage
7. What is the relationship between parent-child communication and children's weight status?	34-48, child's check-up data	Pearson's correlation
8. What food environment do parents create at the home? Specifically:		
a. To what extent do they limit the availability of high-calorie foods (e.g sweets, fried food, soft-drinks) and promote availability of fruits?	43-46	Mean scores/ Standard Deviation/Frequencies/ Percentage
b. To what extent do they provide a positive eating environment (breakfast at home for child, dinner as a family, limited meals out and pick-up foods.	47-50	Mean scores/ Standard Deviation/Frequencies/ Percentage
9. What is the relationship between family food environment and children's weight status?	43-50, child's check-up data	Pearson's correlation
10. Which feeding practices strongly predict the child weight status after taking SES factors and parents BMI into account?	20-50, 53-59, child's check-up data	Multiple regression DV-- Children's BMI z-scores IV -- Feeding practices (including restriction, pressure, monitoring, food availability at home, family eating patterns, and parent-child communication) Adjusted variables: Parents BMI, parent education levels, family monthly income

Note: DV=dependent variables, IV=independent variables.

Summary

A cross-sectional design was used in this study to assess parents' attitudes and practices about feeding their child. The instrument used in this study was based on a published instrument and literature reviews. The self-administrated survey was conducted among parents of Chinese adolescents in 7th and 8th grade in Beijing urban areas. Support was secured from Beijing CDC to collect information through schools. Descriptive statistics and inferential tests were conducted to assess parents' child-feeding practices and examine relationships between those practices and children's weight status.

Chapter IV Results

Pilot Study

General information

A pilot study was conducted before the full data collection to test the reliability of the instrument and to identify unpredicted factors which could affect the data collection process. One hundred and forty students were asked to take the survey home to their parents. One hundred and thirty six answered the questionnaires (97%) in the first administration, and134 responded to the second administration (96%). One hundred and thirty three out of 140 to both pilot test administrations (95%) with a time interval of two weeks. Demographic information of pilot test respondents is presented in Table A in Appendix K.

Internal consistency

Cronbach alpha scores of the various subscales are presented in Table 4. In general, the Cronbach alpha coefficient should be greater than 0.6 to ensure the internal reliability of a scale, and over 0.70 is considered good (DeVellis, 1991). By this measure, most subscales showed moderate or strong internal consistency. However, the subscales of pressure to eat and eating patterns showed weaker internal consistency. There was no significant improvement in the Cronbach alpha coefficient if individual items were deleted from the subscales of pressure to eat and eating patterns. Internal consistency analysis was also conducted on the final data set (355 records) of the full scale study. The results in internal consistency from the full data showed similar patterns to the pilot study (see Appendix L).

Table 4

Internal Consistency of Subscales for Both Pilot Test Administrations (N=133)

Subscales	Number of Items	Cronbach alpha	
		First Administration	Second Administration
Perceived responsibility	3	0.60	0.70
Perceived parent weight	3	0.65	0.64
Perceived child's weight	4	0.75	0.68
Concern	3	0.88	0.94
Restriction	10	0.70	0.83
Pressure to eat	4	0.49	0.55
Communication	5	0.81	0.82
Monitoring	4	0.91	0.90
Food availability	4	0.60	0.60
Eating patterns	4	0.38	0.49

Test-retest reliability

Examination of the first question in the survey ("*Who is answering the questionnaire?"*) identified 23 records (17.3% of all 133 records) in which the respondents to the two administrations were not the same. These records were excluded from the test-retest correlation analysis. Correlations of subscales between the two administrations are presented in Table 5. For test-retest reliability, a correlation of 0.7 or more is generally adequate for research purposes (Goldstein, 2000). In general, a correlation coefficient from 0 to 0.4 is considered weak; correlation coefficients between 0.4-0.7 are considered moderate; and correlation coefficients above 0.7 are considered strong. In this study, perceived child weight had a strong correlation between the two administrations (r=0.86, p<0.001), indicating that the parents' perception of their children's weight was consistent and was not significantly influenced by the time and conditions under which the surveys were conducted. Eating patterns and concern also had a strong correlation between two administrations (both r=0.74, p<0.001). The other subscales showed weak or moderate correlations between the two administrations (a range of r from 0.30-

0.56, $p<0.001$). Paired t tests of subscale means were also conducted between the two administrations, and no significant differences were found (see Table B in Appendix K).

Table 5

Correlations between Two Pilot Test Administrations (N=110[a])

Subscales	***r***	***p***
Perceived responsibility	0.68	<0.001
Perceived parent weight	0.62	<0.001
Perceived child weight	0.86	<0.001
Concern	0.77	<0.001
Restriction	0.46	<0.001
Pressure to eat	0.30	<0.001
Communication	0.48	<0.001
Monitoring	0.61	<0.001
Food availability	0.55	<0.001
Eating patterns	0.72	<0.001

[a] Twenty three records were identified and exclude, in which the respondents to the two pilot test administrations were not the same.

Background Information

In total, 598 students in the 7th and 8th grades were given surveys and 548 parents responded (response rate 92%). However, the recent check-up data of children's weight and height were available for only 483 children. Children without children without checkup data were excluded from the data analysis. There were several causes of missing data: students did not attend the annual checkup; students transferred from other schools since check-up data were collected; missing checkup sheets; and data entry errors. In general, there were no significant differences in demographic characteristics between those respondents with child's weight and height from a recent annual checkup, and those without such information (see Table A in Appendix M). Children's ages was an exception: Children without checkup data were slightly older (t=-2.24, p=0.03).

Only if the person who answered the survey was the one who cooked the family meals most of the time was the survey included in the final data analysis (355 records). Instructions included with the survey clearly indicated that the parent who cooked family meals most of the time should be the one to answer the survey, but 128 respondents did not cook the family meal and were excluded from the database. A comparison of demographic characteristics of these 128 excluded records with 355 records revealed no significant demographic differences (See Table B in Appendix M). Subscale meanscores were also compared (see Table C in Appendix M). Except for perceived responsibility and communication, which were higher in the included surveys, there were no significant differences. The results from all 483 records are also reported in Appendix N.

Demographics of participants

Parents' demographic information is presented in Table 6. The parents' average age was 41.6 years (*SD*=2.75). Most parents (76.7%) had a high school or higher education, and 38% had a post- secondary education. The average family income was 5380 Chinese Yuan (802 USD) (SD=4332.25) and the median was 4000 Chinese Yuan (590 USD). In general, mothers cooked family meals 76% of the time, fathers, 19%, while grandparents accounted for only 5%.

The prevalence of overweight and obesity in parents is shown in Table 7. Based on parent-reported their own weight and height, the prevalence of overweight and obesity in fathers was 41.2% and 15.7%, respectively; the prevalence of overweight and obesity in mothers was 26.2% and 8.6, respectively. There were significantly higher rates of overweight and obesity among fathers than mothers (overweight $\chi^2(1, N=673)=17.3$, $p<0.001$; obesity χ^2 $(1, N=673)=8.0$, $p<0.05$).

Table 6

Demographic Information of Parents (N=355)

	Mean age (SD)	Education levels *n* (%)			
		Elementary school or less	Middle school	High school	College or higher
Parent					
Father	42.8 (4.25)	8(2.3)	59(16.8)	142(40.5)	142(40.5)
Mother	40.4 (3.49)	14(4.0)	82(23.4)	130(37.0)	125(35.6)
Total	41.6 (2.75)	22(3.1)	141(20.1)	272(38.7)	267(38.0)

Family monthly income: Average 5 380 Yuan (802USD) SD=4332.25
Median 4 000 Yuan (590 USD)

Who cooks the family meals: Mothers 76.2%
Fathers 18.8%
Grandparents 5%

Table 7

BMI Classifications in Parents Based on Parents' Self-report Weight and Height Data

	Underweight	Normal	Overweight[a]	Obesity[b]
Parent				
Father	6(4.5)	139(39.2)	139(41.2)	53(15.7)
Mother	15(1.8)	204(57.5)	88(26.2)	29(8.6)
Total	21(3.1)	343 (51.0)	227(33.7)	82(12.2)

[a] Prevalence of overweight among fathers is higher than that mothers (χ^2(1, N=673)=17.3, p<0.001).
[b] Prevalence of obesity among fathers is higher than that among mothers (obesity χ^2 (1, N=673)=8.0, p<0.05).

The prevalence of overweight and obesity in children were calculated based on BMI scores derived from children's check-up data (Table 8). The prevalence of overweight and obesity in boys was 22.6% and 13.4%, respectively; and the prevalence of overweight and obesity in girls was 16.0% and 4.1%, respectively. Boys had a significantly higher prevalence of obesity over girls (χ^2 (1, N=355)=9.34, p<0.05).

Table 8

Demographic Information and BMI Classifications in Children Based on Check-up Data (N=355)

	n (%)	Mean Age (*SD*)	Underweight	Normal	Overweight	Obesity[a]
Children						
Boy	186 (52.4)	13.6 (0.78)	9(4.8)	110 (59.2)	42(22.6)	25(13.4)
Girl	169 (47.6)	13.5 (0.65)	12(7.1)	123 (72.8)	27(16.0)	7(4.1)
Total	355	13.6 (0.72)	21(5.9)	233 (65.6)	69(19.4)	32(9.0)

[a] Prevalence of obesity among boys is higher than that among girls (χ^2 (1, N=355)=9.34, p<0.05).

Results by Research Questions

1. **What is the relationship between parents' perception of their children's weight status and children's actual weight status?**

Parents were asked to rate their child's weight status at four ages, and response results are presented in Table 9. About the child's current weight status, 26% respondents thought their child was overweight or markedly overweight (item 16). The actual proportion of overweight and obese children was 28% based on their annual check-up data. Overall, parents' perception of children's weight had a moderate correlation with children's BMI z-scores (r=0.55, p<0.001).

Table 9

Perceived Child Weight at Four Ages (N=355)

	Response *n* (%)							
	1	**2**	**3**	**4**	**5**	**NR**	**M**	***SD***
Response option:1=markedly underweight, 2=underweight, 3=normal, 4=overweight, 5=markedly overweight								
13. Your child during the first year of life	30(8.5)	77(21.7)	133(37.5)	98(27.6)	16(4.5)	1(0.3)	2.98	1.01
14. Your child as a pre-schooler	25(7.0)	117(33.0)	156(43.9)	52(14.6)	5(1.4)	0	2.70	0.85
15. Your child from 3rd to 5th grade	18(5.1)	95(26.8)	156(43.9)	79(22.3)	7(2.0)	0	2.89	0.87
16. Your child currently is	8(2.3)	84(23.7)	170(47.9)	77(21.7)	16(4.5)	0	3.03	0.85
					Subscale summary		**2.90**	**0.63**

Note: NR=No response.

Table 10 presents the correspondence between parents' perceptions and children's actual weight status. To simplify the representation, 'underweight' and 'markedly underweight' were combined, as were 'overweight' and 'markedly overweight' combined into 'overweight/obesity'. Parents' perceptions of their children as 'overweight or obese' were close to the actual prevalence. However, parents' perception of their children as 'underweight' was markedly inflated. The underweight prevalence rated by parents was 26%, while the actual underweight rate in children was 5.9% using children's check-up data and WHO recommended criteria of 'underweight' for adolescents.

Table 10

Perceived Child Weight and Child Actual Weight Status (N=355)

	Underweight	Normal	Overweight/obesity
Perceived child current weight[a]	92 (26.0)	170 (47.9)	93 (26.2)
Child weight category based on checkup data	21(5.9)	233 (65.6)	101 (28.4)

[a] Results based on responses to item 16; responses of 'underweight' and 'markedly underweight' were combined into 'Underweight', and responses of 'overweight' and 'markedly overweight' were combined into 'Overweight/obesity'.

2. To what extent are parents concerned about their children's weight?

Table 11 shows responses to parental concern about child's eating and weight. Thirty seven percent respondents indicated that they were concerned, fairly concerned or very concerned about their child eating too much when the parent wasn't there (item 17). Considerable proportion of respondents indicated they were concerned, fairly concerned or very concerned about their child having to diet to maintain a desirable weight (44%), or becoming overweight (43%) (item 19).

Table 11

Parental Concern Regarding Overweight (N=355)

Items	Response *n* (%) 1	2	3	4	5	NR	*M*	*SD*
Response option:1=unconcerned, 2=a little concerned, 3=concerned, 4=fairly concerned, 5=very concerned								
17. How concerned are you about your child eating too much when you are not around him/her?	144 (40.6)	77 (21.7)	88 (24.8)	28 (7.9)	16 (4.5)	2 (0.6)	2.14	1.17
18. How concerned are you about your child having to diet to maintain a desirable weight?	115 (32.4)	79 (22.3)	70 (19.7)	43 (12.1)	43 (12.1)	5 (1.4)	2.49	1.38
19. How concerned are you about your child becoming overweight?	119 (33.5)	74 (20.8)	66 (18.6)	42 (11.8)	44 (12.4)	10 (2.8)	2.47	1.40
Subscale summary							**2.36**	**1.17**

Notes: NR=No response.

3. **What is the relationship between parents' weight concern about overweight in their children and children's actual weight status?**

Results from Pearson correlation showed that parents' concern had a moderate and positive association with children' BMI z-scores (r=0.63, p<0.001) (see Table 14). Further data exploration also found a positive correlation between parents' concern and perceived child weight (r=0.42, p<0.001).

4. **To what extent do parents feel responsible for preparing their child's meals, and use specific feeding strategies to regulate young adolescents food intake (e.g. restricting foods, pressure to eat and monitoring of high-calorie foods)?**

Eighty five percent of the respondents indicated that they were responsible for preparing their child's meals most of time or always (item 7) (see Table 12). Seventy four percent of the respondents indicated that they were responsible most of the time or always for making decisions regarding the right foods for their child (item 9). However, only about 35% of the respondents indicated that they determined their child's portion size most of the time or always (item 8).

Table 12
Response of Perceived Responsibility (N=355)

Items	Response *n* (%) 1	2	3	4	5	NR	M	SD
Response option:1=never,2=seldom,3=half of the time, 4=most of the time, 5=always								
7. When your child is at home, how often are you responsible for preparing his/her meals?	3 (0.8)	11 (3.1)	36 (10.1)	150 (42.3)	152 (42.8)	3 (0.8)	4.24	0.82
8. How often are you responsible for deciding what your child's portion sizes are?	64 (18.0)	110 (31.0)	55 (15.5)	89 (25.1)	36 (10.1)	1 (0.3)	2.78	1.28
9. How often are you responsible for deciding if your child has eaten the right kind of foods?	5 (1.4)	36 (10.1)	50 (14.1)	165 (46.5)	98 (27.6)	1 (0.3)	3.89	0.97
					Subscale summary		**3.63**	**0.72**

Note: NR=no response

Table 13 shows the response to questions regarding parents' child feeding strategies. Respondents indicated that they did regulate their children's eating habits using restrictions, pressure, and monitoring. Seventy eight percent of respondents agreed (or strongly agreed) that they intentionally hid some foods from their child (item 25). Sixty six percent agreed that they did not let their child eat too many fried foods including fried meat and vegetables (item 21). And about 65% agreed that they would not let their child drink too much soft drink (item 24). More than half of respondents agreed that they tried to restrict their child from eating too many sweets (51%) (items 20). Not many respondents used foods as rewards in exchange for their teen's good behavior; only 16% respondents used sweets (item 26) and 32% used child's favorite foods (item 27) to encourage their child's good behaviors.

As shown in Table 13, 72% of respondents thought that their child should always eat all of the food in his/her bowl (item 30), and 60% of respondents agreed that they had to be especially careful to make sure their child ate enough (item 31). However, no more than 20% of parents tried to get their child to eat even if he/she said 'I'm not hungry' (19%) (item 32). And 22% of parents thought their child would eat much less than he/she should if they did not regulate their child's eating (item 33).

Table 13
Response to Feeding Strategies (N=355)

Items	Response *n* (%) 1	2	3	4	5	NR	*M*	*SD*
Restriction *Response option: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree*								
20. I have to be sure that my child does not eat too many sweets.	4 (1.1)	21 (5.9)	147 (41.4)	137 (38.6)	44 (12.4)	2 (0.6)	3.56	0.83
21. I have to be sure that my child does not eat too many fried foods (fried meat, fried vegetables, etc.).	4 (1.1)	18 (5.1)	97 (27.3)	171 (48.2)	65 (18.3)	0	3.77	0.84
22. I have to be sure that my child does not eat too much of his/her favorite foods.	4 (1.1)	37 (10.4)	165 (46.5)	122 (34.4)	23 (6.5)	4 (1.1)	3.35	0.80
23. I have to be sure that my child does not eat too much of snacks.	5 (1.4)	26 (7.3)	108 (30.4)	158 (44.5)	57 (16.1)	1 (0.3)	3.67	0.88
24. I have to be sure that my child does not drink too much soft drinks.	7 (2.0)	27 (7.6)	92 (25.9)	133 (37.5)	96 (27)	0	3.8	0.99
25. I intentionally keep some foods out of my child's reach.	5 (1.4)	15 (4.2)	55 (15.5)	187 (52.7)	92 (25.9)	1 (0.3)	3.98	0.85
26. I offer sweets to my child as a reward for good behaviors.	29 (8.2)	144 (40.6)	118 (33.2)	51 (14.4)	7 (2.0)	6 (1.7)	2.61	0.91
27. I offer my child his/her favorite foods in exchange for good behaviors.	9 (2.5)	71 (20.0)	158 (44.5)	100 (28.2)	15 (4.2)	2 (0.6)	3.12	0.86
28. If I did not guide or regulate my child's eating, he/she would eat too many junk foods.	23 (6.5)	89 (25.1)	93 (26.2)	125 (35.2)	23 (6.5)	2 (0.6)	3.1	1.06
29. If I did not guide or regulate my child's eating, he/she would eat too much of his/her favorite foods.	8 (2.3)	50 (14.1)	122 (34.4)	152 (42.8)	22 (6.2)	1 (0.3)	3.37	0.88
					Subscale summary		**3.43**	**0.50**
Pressure to eat *Response option:1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree*								
30. My child should always eat all of the food in his/her bowl.	1 (0.3)	29 (8.2)	71 (20)	184 (51.8)	70 (19.7)	0	3.83	0.85
31. I have to be especially careful to make sure my child eats enough.	1 (0.3)	27 (7.6)	109 (30.7)	169 (47.6)	45 (12.7)	4 (1.1)	3.66	0.81
32. If my child says ``I'm not hungry'', I try to get him/her to eat anyway.	39 (11.0)	145 (40.8)	103 (29)	55 (15.5)	12 (3.4)	1 (0.3)	2.59	0.99
33. If I did not guide or regulate my child's eating, he/she would eat much less than he/she should.	19 (5.4)	124 (34.9)	132 (37.2)	70 (19.7)	9 (2.5)	1 (0.3)	2.79	0.91
					Subscale summary		**3.22**	**0.58**
Monitoring *Response option: 1=never, 2=seldom, 3=half of the time, 4=most of the time, 5=always*								
39. How much do you keep track of the sweets that your child eats?	41 (11.5)	64 (18.0)	133 (37.5)	80 (22.5)	37 (10.4)	0	3.02	1.14
40. How much do you keep track of the snack food (potato chips, Doritos, cheese puffs) that your child eats?	33 (9.3)	66 (18.6)	132 (37.2)	90 (25.4)	34 (9.6)	0	3.07	1.09
41. How much do you keep track of fried foods (fried meat, fried vegetables, etc.) that your child eats?	32 (9.0)	65 (18.3)	112 (31.5)	104 (29.3)	42 (11.8)	0	3.17	1.13
42. How much do you keep track of soft drinks that your child drinks?	25 (7.0)	55 (15.5)	108 (30.4)	118 (33.2)	49 (13.8)	0	3.31	1.11
					Subscale summary		**3.14**	**0.97**

Note: NR=no response

Respondents indicated that they did keep track of their child's intake of energy-dense foods to some extent. The percentages of those who indicated they paid attention most of the

time or always on their child's intake of soft drinks (item 42), fried foods (item 41), snacks (item 40) and sweets (item 39) were 47%, 41%, 35% and 32% respectively.

5. **What is the relationship between parents' feeding strategies and children's weight status?**

Table 14 shows the results from a correlation analysis of mean scores on the various subscales and children's BMI z-scores. Children's BMI z-scores had a significant positive correlation with restriction (r=0.15, p<0.001) and monitoring (r=0.13, p<0.001), and a negative correlation with pressure to eat (r=-0.16, p<0.001).

Table 14

Pearson Correlation of Subscales and Children's BMI z-scores (N=355)

Subscales	*r*	*p*
Responsibility	-0.04	0.43
Perceived parent weight	0.12	0.02
Perceived child's weight	0.55	<0.001
Concern about overweight	0.63	<0.001
Restriction	0.15	<0.001
Pressure to eat	-0.16	<0.001
Communication	0.07	0.21
Monitoring	0.13	0.02
Food availability	0.09	0.11
Eating patterns	-0.09	0.10

6. **To what extent do parents promote communication with their children about healthy eating and weight?**

Table 15 shows the response to communication items. Eighty four percent of respondents agreed that it is important to talk about health eating (item 37), and 67% felt confident to talk about it (item 35). About weight related topics, 67% of respondents thought it is important to discuss it with their child (item 38) and only 56% felt confident to talk about it (item 36). A

majority of the respondents (67%) indicated that they often talk with their child about why he/she should or should not eat certain foods (item 34).

Table 15

Communication about Weight and Healthy Eating (N=355)

	Response *n* (%)							
Items	**1**	**2**	**3**	**4**	**5**	**NR**	**M**	**SD**
Response option: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree, NR=no response								
34. I often talk with my child about why he/she should or should not eat certain food.	4 (1.1)	15 (4.2)	98 (27.6)	185 (52.1)	52 (14.6)	1 (0.3)	3.75	0.80
35. I feel confident talking about healthy eating with my child.	2 (0.6)	5 (1.4)	107 (30.1)	189 (53.2)	48 (13.5)	4 (1.1)	3.79	0.71
36. I feel confident talking about weight related topics with my child.	2 (0.6)	15 (4.2)	139 (39.2)	171 (48.2)	28 (7.9)	0	3.59	0.72
37. I think that it is important to discuss healthy eating.	0	3 (0.8)	54 (15.2)	213 (60)	85 (23.9)	0	4.07	0.65
38. I think it is important to discuss weight related topics with my child.	1 (0.3)	6 (1.7)	111 (31.3)	188 (53)	48 (13.5)	1 (0.3)	3.78	0.70
			Subscale	summary			**3.80**	**0.50**

7. **What is the relationship between parent-child communication and children's weight status?**

Pearson correlation analysis was conducted to examine the relationship between the communication subscale meanscore and children's BMI z-scores. No significant correlation was found between communication and children's actual weight status (r=0.07, p=0.21).

8. **What food environment do parents create at the home? Specifically:**

a. Availability of fruits and high-calorie foods (e.g. sweets, fried food, soft-drinks) at home.

Table 16 shows responses to frequencies of certain foods and drinks available at home and eating patterns. Seventy eight percent of respondents indicated that they had fruits available at home 5 days or more per week (item 43). Sweets were more available at home as compared with fried foods and soft drinks. Thirty one percent of respondents indicated that sweets were

available at home 5 days or more per week (item 44), followed by soft drinks (22%) (item 46). Only about 7% of families had fried foods available at home 5 days or more per week (item 45).

Table 16

Response of Food Availability by Days A Week (N=355)

	Response *n* (%)										
Items	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**NR**	***M***	***SD***
43. Fruits at home	1 (0.3)	1 (0.3)	22 (6.2)	27 (7.6)	24 (6.8)	36 (10.1)	37 (10.4)	203 (57.2)	4 (1.1)	5.83	1.67
44. Sweets at home	22 (6.2)	49 (13.8)	71 (20)	61 (17.2)	35 (9.9)	31 (8.7)	16 (4.5)	62 (17.5)	8 (2.3)	3.46	2.21
45. Fried food at home	97 (27.3)	106 (29.9)	71 (20.0)	40 (11.3)	9 (2.5)	11 (3.1)	4 (1.1)	11 (3.1)	6 (1.7)	1.60	1.66
46. Soft drinks	61 (17.2)	82 (23.1)	56 (15.8)	46 (13)	30 (8.5)	19 (5.4)	13 (3.7)	45 (12.7)	3 (0.8)	2.67	2.29
						Subscale summary				**4.77**	**1.24**

Note: NR=No response. Item 44, 45, and 46 were reversed coded to calculate the subscale mean.

b. Family eating patterns (breakfast at home for child, dinner as a family, eating out and take-out foods)

Results in Table 17 show that about 70% of parents indicated that their child ate breakfast at home 5 days or more per week (item 47). Most parents (86%) indicated that their families ate dinner together 5 days or more per week (item 48). Families ate dinner at home about 6 days per week on average. Fifteen percent of families ate out 3 days or more per week (item 49). Twelve percent of families purchased take-out food for family meals 3 days or more per week (item 50).

Table 17

Eating Patterns by Days A Week (N=355)

Items	Response *n* (%)										
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**NR**	***M***	***SD***
47. Breakfast at home	31 (8.7)	20 (5.6)	22 (6.2)	17 (4.8)	17 (4.8)	23 (6.5)	29 (8.2)	194 (54.6)	2 (0.6)	5.18	2.48
48. Dinner together at home	5 (1.4)	7 (2.0)	3 (0.8)	20 (5.6)	13 (3.7)	26 (7.3)	35 (9.9)	244 (68.7)	2 (0.6)	6.16	1.60
49. Eat out at restaurant	95 (26.8)	136 (38.3)	67 (18.9)	25 (7.0)	7 (2.0)	8 (2.3)	5 (1.4)	8 (2.3)	4 (1.1)	1.42	1.52
50. Purchasing take-out food for family meals	153 (43.1)	106 (29.9)	51 (14.4)	17 (4.8)	11 (3.1)	2 (0.6)	3 (0.8)	10 (2.8)	2 (0.6)	1.14	1.54
									Subscale summary	**5.69**	**1.18**

Note: NR=No response. Item 49, and 50 were reversed coded to calculate the subscale mean.

9. What is the relationship between family food environment and children's weight status?

Pearson correlation analysis was conducted separately on mean scores for food availability at home and eating patterns with children's BMI z-scores (see Table 14). No evident relationships were found between the family food environment and children's BMI z-scores. There was a positive but non-significant correlation of food availability (r=0.09, p=0.11) and negative non-significant correlation of eating pattern (r=-0.09, p=0.10) to children's BMI z-scores.

10. Which feeding practices strongly predict the child weight status after taking SES factors and parents' BMI into account?

The regression analysis was conducted with children's BMI z-scores as the dependent variable, which indicates the children's weight status in the model (see Table 18). The independent variables included such factors as parents' child-feeding strategies along with the food environment at home. SES and parental factors were adjusted in the model. The independent variables and adjusted variables explained 22% of the variance of children's BMI z-scores. All the child-feeding practice variables accounted for 10% of the variance of children's

BMI z-scores; among these variables, restriction, pressure to eat and eating patterns made significant contributions to the regression model while the contribution of each factor was small. Higher restriction, but lower pressure to eat from the parent and negative eating patterns in the family were associated with higher BMI z-scores in children.

Table 18

Regression Analysis of Children's BMI z-scores and the Feeding Practices (N=355)

	Beta	***B***	R^2	***t***	***p***
Dependent variable: Children's BMI z-scores					
Independent variables:					
Restriction	0.15	0.36	0.02	2.48	0.01
Pressure to eat	-0.19	-0.38	0.04	-3.40	<0.001
Monitoring	0.01	0.01	<0.01	0.12	0.90
Communication	0.02	0.04	<0.01	0.29	0.77
Food availability	0.08	0.08	0.01	1.36	0.18
Eating patterns	-0.13	-0.13	0.02	-2.22	0.03
Adjusted variables:					
Family income	0.03	<0.01	<0.01	0.45	0.65
Father's education (dummy coded)					
Elementary school vs College or above	-0.04	-0.33	<0.01	-0.72	0.47
Middle school vs College or above	0.04	0.11	<0.01	0.49	0.62
High school vs College or above	0.08	0.19	<0.01	1.17	0.24
Mother's education (dummy coded)					
Elementary school vs College or above	-0.07	-0.42	<0.01	-1.09	0.28
Middle school vs College or above	-0.05	-0.13	<0.01	-0.62	0.54
High school vs College or above	-0.04	-0.10	<0.01	-0.56	0.58
Father's BMI	0.18	0.05	0.04	3.27	<0.001
Mother's BMI	0.31	0.11	0.10	5.77	<0.001
Model Summary	Sum of squares		R^2	$F_{(15, 283)}$	*p*
	Regression	86.39	0.22	5.41	<0.001
	Residual	301.13			

Further Data Exploration

Parents' child-feeding attitudes and practices to children's weight status

Associations between some parents' child-feeding attitudes and practices with children BMI z-scores were found in previous Pearson correlation analysis. ANOVA tests were conducted to further explore the relationships by using certain child feeding attitudes and practices as the dependent variables and the children's actual weight classifications as the independent variable (Table 19). Parents' concern, restriction, pressure to eat and monitoring scores were significantly different according to children's different weight status. Post hoc analysis (Tukey test) was conducted to identify the difference between specific groups of weight status (Table 20). Parents' concern about children's eating and being overweight increased from underweight groups to obese groups. Parents with underweight children used more eating pressure than those with overweight children, while parents with obese children kept less track of their eating.

Table 19

One-way ANOVA of Subscale Meanscores between Underweight, Normal, Overweight and Obese Groups in Children (N=355)

	M (*SD*)					
Subscales	underweight	normal	overweight	obese	$F(3, 351)$	p
Perceived parent weight	2.83(0.49)	2.93(0.58)	2.98(0.69)	3.26(0.62)	3.12	0.03
Perceived child's weight	2.36(0.55)	2.76(0.59)	3.29(0.54)	3.40(0.47)	30.06	<0.001
Concern	1.41(0.47)	1.97(0.98)	3.26(0.96)	3.86(0.82)	70.27	<0.001
Restriction	3.55(0.47)	3.38(0.49)	3.51(0.47)	3.60(0.61)	3.07	0.03
Pressure to eat	3.50(0.46)	3.24(0.59)	3.04(0.48)	3.24(0.71)	4.01	0.01
Monitoring	3.25(0.93)	3.07(0.95)	3.17(1.08)	3.58(0.82)	2.77	0.04

Table 20

Significant Pairs in Post Hoc Analysis (Tukey test) (N=355)

Subscales	Significant pairs	Mean difference	*p*
Perceived parent weight	Normal vs Obesity	-0.33	0.02
Perceived child weight	Underweight vs Normal	-0.41	0.01
	Underweight vs Overweight	-0.93	<0.001
	Underweight vs Obesity	-1.04	<0.001
	Normal vs Overweight	-0.53	<0.001
	Normal vs Obesity	-0.63	<0.001
Concern	Underweight vs Normal	-0.56	0.04
	Underweight vs Overweight	-1.85	<0.001
	Underweight vs Obesity	-2.45	<0.001
	Normal vs Overweight	-1.29	<0.001
	Normal vs Obesity	-1.89	<0.001
	Overweight vs Obesity	-0.60	0.01
Pressure to eat	Underweight vs Overweight	0.46	0.01
Monitoring	Normal vs Obesity	-0.51	0.03

Correlation between subscales

Parents' perception of their child's weight may affect their feeding attitudes and practices, which, in turn, may affect the child's weight status. Further data exploration was conducted to examine the relation between parents' perception and feeding attitudes and practices. The correlations between subscales are reported in Table 21. Perceived child weight had a positive association with concern and restriction (concern: r=0.42, restriction: r=0.14, both p<0.001). Perceived child weight had only a weak correlation with perceived parent weight and the correlation was not statistically significant (r=0.10, p=0.06). As seen in the previous section, children's actual weight status (measured by BMI z-scores) had a weak but significant correlation (r=0.12, p=0.02) with perceived parent weight (measured by mean score of the subscale). Parents' concern had a positive correlation with restriction (r=0.20, p<0.001) and monitoring (r=0.19, p<0.001).

Table 21

Correlations between Subscales (N=355)

Subscales		Perceived responsibility	Perceived parent weight	Perceived child weight	Concern	Restriction	Pressure to eat	Communication	Monitoring	Food availability	Eating patterns
Perceived responsibility	*r*	1.00									
Perceived parent weight	*r*	0.02	1.00								
	p	0.72									
Perceived child weight	*r*	-0.01	0.10	1.00							
	p	0.79	0.06								
Concern	*r*	0.03	0.13*	0.42**	1.00						
	p	0.57	0.02	0.00							
Restriction	*r*	0.20**	0.03	0.14**	0.20**	1.00					
	p	0.00	0.64	0.01	0.00						
Pressure to eat	*r*	0.12*	0.00	-0.08	-0.07	0.24**	1.00				
	p	0.03	0.97	0.14	0.18	0.00					
Communication	*r*	0.23**	0.01	0.10	0.08	0.42**	0.25**	1.00			
	p	0.00	0.90	0.05	0.13	0.00	0.00				
Monitoring	*r*	0.31**	0.03	0.09	0.19**	0.43**	0.17**	0.43**	1.00		
	p	0.00	0.57	0.08	0.00	0.00	0.01	0.00			
Food availability	*r*	0.05	-0.01	0.08	0.03	0.00	-0.09	0.12*	0.20**	1.00	
	p	0.39	0.86	0.16	0.57	0.96	0.11	0.02	0.00		
Eating patterns	*r*	0.14**	0.02	-0.05	-0.06	-0.01	-0.04	0.03	0.07	0.36**	1.00
	p	0.01	0.76	0.38	0.24	0.92	0.41	0.62	0.17	0.00	

*. Correlation is significant at the 0.05 level.

**. Correlation is significant at the 0.01 level.

Summary

Parents of young Chinese adolescents in Beijing showed concern about their children's weight though the prevalence of overweight was high among both children and parents in this study. Parents tended to perceive their child's weight as being less than his/her actual weight. However, Chinese parents did use controlling feeding strategies including restriction, pressure to eat and monitoring. They believed that healthy eating and having a healthy weight is important for the child. The overall food environment at home was generally positive, though unhealthy elements were observed in many families, such as not eating breakfast at home, and having soft drinks available at home most of the time.

Parents' concern and restrictive feeding practices were significantly associated with children's BMI z- scores. Higher concern, more restriction and monitoring, and less pressure were related to higher BMI z- scores. After parents' BMI and SES factors were adjusted in the regression model, among parents' child-feeding practices, only restriction, pressure to eat, and family eating patterns maintained significant relationships with children's BMI z-scores.

Chapter V Discussion and Recommendation

Overview

This chapter presents the interpretation of results and discussion of findings from this study. It also presents conclusions based on the results found in this study. Further, recommendations are offered for future research and public health education practices.

Purpose of the Study

The purpose of this study was to examine the relationships between Chinese parents' child-feeding attitudes and practices and weight of their young adolescent. Particularly, the study assessed parental child-feeding attitudes and practices, including their concerns about their young adolescents' weight, and strategies regarding child feeding, and family food environment, which includes obesity-related foods available at home and family eating patterns. The study also examined whether these child-feeding practices and family food environment are associated with the young adolescent's actual weight status. The study focused on the parent who cooks meals for the family most of the time, because this parent is thought to have the greatest influence on children's food choice and the families' food environment.

Summary of the Study

Though there is a dramatic increase of prevalence of obesity among Chinese children in past two decades, this is the first study which focuses on the influence of child-feeding practices on childhood obesity among Chinese children.

The study surveyed 548 parents of students in 7th and 8th grades in two Beijing urban districts. The final sample of 355 included only those who cooked family meals most of the time

and had their child's annual physical check-up data available. In this study, the prevalence of overweight and obesity in children was 19.4% and 9.0%, respectively, based on their check-up data. Boys had significant higher prevalence of obesity than girls.

Parents whose children were overweight or obese by objective standards were quite accurate in their perceptions: 26.2% perceived their children as overweight, compared to 28.4 % (combined prevalence of overweight and obesity) who actually were. However, a significant proportion of parents whose children were normal weight by objective standards perceived their children as underweight: compared with 5.9% of objectively underweight children, 26% of parents reported their children as underweight.

Parents showed some concern about overweight in their children. Over 40% of parents indicated that they were concerned about the child becoming overweight or having to diet, and 37% were concerned about their child eating too much away from parents' observation. There was a significant positive correlation between parents' concerns about overweight and children's BMI z-scores.

Parents used various child-feeding strategies to regulate their child eating. More than 50% of parents indicated that they restricted their children from eating too much fried food, sweets and drinking too much soft drink. And few used food as rewards in exchange for their teen's good behavior. Pressure to eat also was high in terms of making sure that children emptied their bowl and ate enough, but not in terms of pushing kids past the point of feeling full. Parents' monitoring behaviors were not very high, with soft drinks, fried foods, snacks and sweets being monitored at 47%, 41%, 35% and 32%, respectively. Parents' restriction and monitoring were positively associated with children's BMI z-scores, while pressure to eat was inversely related with children's BMI z-scores. After parents' BMI and SES factors adjusted,

parents' restriction and pressure had significant contribution to the variance in children BMI z-scores among parent' child-feeding practices. However, the contribution only accounted for a small portion.

Over 65% of parents agreed that communication about healthy eating (84%) and weight issues (67%) was important, and did so 'often'; the majority of them felt confident in doing so (66% being confident in discussing healthy eating with their children, and 56% in weight related topics). The communication subscale was not significantly correlated with child's weight status in terms of BMI z-scores.

The food environment at home assessed in this study was generally positive with regards to food availability and family eating patterns. Most family (78%) had fruits available at home 5 days or more per week. The least available food was fried food. Only about 7% of families had fried food available 5 days or more per week. Most family (86%) ate dinner together at home 5 days or more per week. And no more than 5% of families purchased take-out food for family meals 5 days or more per week. However, results also showed that many families had unhealthy elements in their food environment. For example, 22% of families had soft drinks at home 5 days or more a week; and about one third of children had breakfast at home no more than 5 days a week. Pearson correlation analysis did not show significant association of food availability and eating patterns to children's BMI z-scores. After adjusting for parents' BMI and SES factors, family eating patterns showed a significant inverse association with children BMI z-scores.

Conclusions

1. The prevalence of overweight and obesity was high in young Chinese adolescents in this study, compared to the national data. The prevalence of overweight in boys was

significantly higher than in girls. The shift to a western lifestyle in Beijing metropolitan areas may contribute to the high prevalence of overweight among Chinese children.

2. Parents may have more concern about being underweight than being overweight in their children. Parents' overestimation of being underweight in their children indicates that Chinese parents may be more likely to be concerned with underweight issues. Many parents misclassified their normal-weight children as being underweight. This misperception may lead to problematic child-feeding practices.

3. It is common for parents of the young Chinese adolescents to use controlling child feeding strategies. Though the concern of being overweight in their child was not high, parents did use restrictive feeding strategies to regulate their child eating, such as hiding certain food, and tracking what or how much their child ate.

4. Parents' child-feeding attitudes and practices may have important influence on children's weight status among Chinese adolescents. Associations were observed between parents' attitudes and practices and children's BMI z-scores, though the causal direction between cannot be determined.

5. Potential risk factors promoting unhealthy eating in Chinese adolescents hide in a positive family food environment. Though the overall family food environment reported by parents was generally positive, sizable portion s of families had sweets and soft/sugar-sweetened beverages at home most of the time; and many teens didn't consistently eat breakfast at home.

6. The instrument may be useful, with modification, to assess Chinese parents' attitudes and practices regarding child feeding. Most subscales showed adequate internal consistency

and test retest reliability. However, several subscales did not meet the recommended criteria of reliability. Modification may be needed to make better use of the instrument.

Discussion

The instrument

This study used an instrument with adopted items from the CFQ which was originally developed by Birch and her colleagues to assess parent's attitudes and strategies about child feeding (Birch et al., 2001). Twenty one items were adopted from CFQ with minor modification. Three new domains assessing parent-child communication about healthy eating and weight issues, and family food environment were developed and added into the instrument.

Items in most subscale showed adequate internal consistency (from 0.60-0.91) except for pressure to eat and family eating patterns. In Birch et al.'s study of CFQ with parents of young children aged from 5 to 9 years, the Cronbach alpha values of subscale items ranged from 0.70 (pressure to eat) to 0.92 (monitoring of child eating) (Birch et al., 2001). Kaur et al. tested the instrument among parents of adolescents (aged 10-19 years) and reported alpha values from 0.60 (responsibility) to 0.88 (monitoring) (Kaur et al., 2006).

Though the subscale of pressure to eat showed fair internal consistency in previous studies (Birch et al., 2001; Kaur et al., 2006; Geng et al., 2009), there are several reasons that may cause the low Cronbach alpha values of this subscale. In this study, a translation-back-translation process was used to convert the English questionnaire into the Chinese version in order to retain the original meaning. The translated version may describe the concept in a different way from the English version. It is notable that a lower Cronbach alpha of the subscale of pressure to eat was also found in the Japanese study of CFQ (Geng et al., 2009).

The subscale of eating patterns was developed by the researcher to assess family eating habits. The low internal consistency of this subscale may be due to individual items measuring distinctive aspects in the domain of family eating habits. For example, the construct of eating breakfast at home may not prove to be as closely related with the construct of eating at restaurants as the researcher believed. Further research would be helpful to evaluate the internal consistency of these subscales.

Results from test re-test showed that most subscales had adequate correlations between two administrations. According to recommendations (Groth-Marnet, 2003), test retest correlation 0.7 or more is adequate for research purposes. However, there is no agreement about minimally acceptable correlation coefficients for the test-retest reliability. The higher correlation coefficient is, the better the retest reliability is. Subscales of restriction, pressure to eat, communication and food availability showed low test-retest reliability (*r* from 0.30-0.55). During the first administration of the survey in the pilot study, the researcher suspected that some questionnaires were completed by students instead of their parents. For the second administration, instructions of completing the survey were reinforced and parents' signatures were required to indicate that the survey was completed by a parent. For this reason, the person who responded to two administrations may not be the same, which may cause the response patterns were not very consistent. Interestingly, examination of response to the question asking who asked the questionnaire indentified 23 records in which the respondents to the two administrations were not the same. The elimination of the record from the analysis improved the test retest reliability of some subscales (Results from all 133 records are reported in Table C in Appendix K). However, the elimination may not rule out all records in which the respondents were not the same in two administrations, if some students dishonestly responded to the surveys.

Another reason of weak or moderate correlations in several subscales may be due to the retest effect. The first administration may raise respondents' awareness of their feeding attitudes and behaviors. The increased awareness may cause them to respond differently to the survey in the second administration (e.g. more desirable response). Test-retest reliability of the Chinese CFQ cannot be compared to other researchers' results, because no study examined the test retest reliability of Birch et al.' original CFQ. Based on the results in this study, further examination of the reliability of the instrument is recommended.

Prevalence of obesity

The average SES of the sample in this study was the typical in Beijing urban areas compared to previous reports in this region. Most parents (76.7%) had a high school or higher education, and 38% had college or higher-level education, and the average monthly family income was 5380 Chinese Yuan (802 USD) in this study. Data from a representative sample of the Beijing population (six years old or above) showed the proportion of those with a college education was about 32% in 2005 (Beijing Bureau of Statistics, 2006), the average monthly income per family was 5621 Yuan (829 USD) in 2008 (National Bureau of Statistics of China, 2009b). Parents' education levels and average family income in this sample were close to reported data. However, the standard deviation of family monthly income in this sample was large, which may indicate diverse SES backgrounds in this sample.

The prevalence of overweight and obesity among parents and children in this study were higher than reported national data. The prevalence of overweight and obesity among parents (aged from 36-59) were 33.7% and 12.2%, respectively, and the prevalence of overweight and obesity among their children were 19.4% and 9.0%, respectively. The prevalence of overweight was 22.8% and obesity 7.1% in 2002 among Chinese aged 18-69 years (Chen, 2008), and the

prevalence of overweight and obesity in children (7-17 years old) were 4.4% and 0.9%, respectively (Li et al., 2008). Compared with the national data, both adults and children had a higher prevalence of overweight in our sample. However, the national data was collected almost 10 years ago. With the accelerating speed of the obesity epidemic, the prevalence of obesity found in this study may be typical in metropolitan areas. The latest data for children (6-18 years old) in Beijing is from 2004 with a prevalence of overweight 18.9% and a prevalence of obesity 5.5% in urban areas (Shan et al., 2010). The prevalence of childhood obesity in Beijing, especially in urban areas, has been reported to be higher than other major cities in China,.

Urban areas had higher prevalence of overweight and obesity in China. Urbanization has been suggested as an important obesity risk factor for developing countries undergoing economic transition (Popkin, 2001). Urban residents have easier access to energy-dense foods, and are more likely to adopt sedentary lifestyles. Beijing, as a big metropolis in China, is impacted by the transition greatly. Financial success is marked by greater access to energy-dense foods and labor-saving devices that have an impact on energy balance. This energy-dense diet and sedentary lifestyle eventually cause a higher prevalence of overweight in cities in China during the transition.

It is noteworthy that the prevalence of obesity was significantly higher among males than females both in parents and children in this study. The similar trend has been found in other studies in Chinese (Ji, 2008; Wang, Monteiro, & Popkin, 2002). The gender differences in obesity is not consistent across different populations; some studies in different populations reported higher overweight rates among girls (Salazar-Martinez et al., 2006; Bénéfice, Garnier, Simondon, & Malina, 2001), which may also indicate cultural variation of eating behaviors, feeding practices and body images. The pronounced gender difference in obesity among Chinese

population may be related to the socio-cultural preference for sons over daughters in China (Wang et al., 2002). In most Chinese families, daughters are expected to marry and move out of the family, whereas sons are seen as the main labor force to continue with the family line, and take over the family business. As a result, sons may be more likely to be overindulged (or overfed) by parents. In addition, girls might be more concerned with their physical appearance, and desire a slim body than boys.

Child-feeding attitudes and practices

Parents' perception of being overweight in their child was relatively accurate. The estimation of prevalence of overweight was closed to the prevalence of overweight (including obesity) based on children's check-up data, while the estimation of being underweight in the child was significant higher than the rate of underweight based on children's check-up data. Many studies have examined parents' perception of children's overweight and results show that parents are poor at identifying overweight in their children (Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000; Carnell, Edwards, Croker, Boniface, & Wardle, 2005; Maynard, Galuska, Blanck, & Serdula, 2003). Parents have more accurate perception of older children than younger children (Maynard et al., 2003). One study in adolescents in US reported that adolescent weight status was accurately assessed by the majority of mothers (60.4%), underestimated by about one-third of mothers (35.3%), and overestimated by 5% of mothers (Boutelle, Fulkerson, Neumark-Sztainer, & Story, 2004).

The parents' perception of children's weight status is important and relevant to behavior change. Accurate estimation of children's weight status can facilitate parents and children to make a healthy change in their diet and lifestyle. On the other hand, misperception of children's weight status may lead to problematic child feeding practices. This study showed parents

misjudged their normal weight children as being underweight, which may lead to more pressure to eat on their child. If the parent perceives a normal-weight child as being underweight and excessively encourages him/her to eat more, this may lead to excessive weight gain over time. High pressure to eat on a child may also cause problematic eating behaviors on the child's part (Birch & Fisher, 1998).

The further data exploration showed perceived child weight had a moderate and positive association with parents' concerns of being overweight in the child, and a weak and positive association with restriction. These results were expected and it is reasonable to see that the heavier the parent though the child was, the more concern the parent would have about their children being overweight. Perceived child weight had a moderate correlation with child actual weight status. However, there was no significant relationship found, between perceived child weight and pressure to eat.

Compared with the original study by Birch et al. among 5- to 9-year-old American children (Birch et al., 2001), this study showed less restriction and higher pressure to eat. The reported mean score of restriction in Birch's study was 4.0, while it was 3.4 in this study; the mean score of pressure (3.2) to eat was similar to that in the Japanese study (Geng et al., 2009), which was higher than that in Birch's study (2.5). If child weight status plays a role in influencing parents' child-feeding strategies, that Japanese and Chinese children are thinner than the sample of western population may partly explain the higher pressure to eat in these Asian samples.

Parents' perception of their child weight may also explain the higher pressure to eat in this study. Many parents classified their normal-weight children as being underweight. This perception of parents may cause more concern about being underweight in their child instead of

being overweight. Thus, parents with such concern may be more likely to encourage their normal-weight child eat more than they should. This practice will increase the risk of excessive weight gain in their children.

The lower restriction score and higher pressure score observed in this study may also indicate the cultural/ethnic variation in feeding attitudes and practices. Birch's study also found that responses to the pressure to eat and restriction items across different ethnic groups were not identical (Birch & Fisher, 2000). In Chinese culture, food has special meanings: sharing food in a family means harmony, intimacy and love, especially between parents and children (Wong, 2010). Chinese parents tend to show their love by giving their child abundant and delicious food (Jiang et al., 2005). Thus, parents may be less likely to restrict food from their child and more likely to encourage them to eat.

As reported in other studies among older children, the item 'food as reward' did not load strongly on the restriction factor (Kaur et al., 2006; Geng et al., 2009). In this study of young Chinese adolescents, when parents were asked if they offer sweets to their child as a reward for good behaviors, no more than 20% parents agreed with this practice. It is likely that food does not have the same incentive value for adolescents as it does for younger children, or perhaps parents use rewards other than food for their adolescent.

There was no evidence that any aspects of parental feeding style, as measured by this instrument, differed significantly between boys and girls. The similar results were also reported among young children aged 3-5 years in UK (Montgomery, Jackson, Kelly, & Reilly, 2006). Spruijt-Metz et al. found that specific child-feeding practices are equally related to total fat mass in both girls and boys (Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002). However, in Birch's studies, girls were consistently found to be subject to a greater degree of parental control

over feeding than boys (Johnson & Birch, 1994; Birch &Fisher, 1998). Conversely, Kaur et al. reported that parents of American boys (aged 10-19 years) scored higher on restriction (Kaur et al., 2006); however, no explanations were given for this finding. Many of the previous studies have only looked at mother-daughter pairs or have only assessed the role of child's gender as a moderator between parents' child-feeding practices and children's weight status, or body fat measures. To date, studies haven't show clear patterns across different populations. It is not clear whether the absence of marked gender differences in the present study is related possible cultural difference in parental feeding styles

Parent-child communication about health eating and weight was a new structure added to child-feed practice assessment in this study. Positive attitudes and practices in communication about healthy eating were relatively high. The majority of parents indicated that they thought it is important to talk about healthy eating and weight related issues, and did so 'often'. And over half of them were confident in discussing such topics with their children. The high communication score may be due to the well-educated respondents/parents; about 77% of them had a high school or higher education, and 38% had a college or higher education. However, it appears that parents had less confidence in weight related topics than in healthy eating. This may suggest that health education should address healthy weight and body image along with healthy eating and nutrition education.

Though several studies found that warm communication with and explanation of health eating to the child can facilitate healthy eating behaviors and reduce the risk of childhood overweight, this study did not found any relationships between communication and children's BMI z-scores. Items in this domain assessed general attitudes and practice in communication about healthy eating and weight issues. The questions didn't focus on specific food or eating

behaviors that are related to obesity. Therefore, the communication scores may not be necessarily related to either higher or lower BMI z-scores.

Food environment was also assessed as one of these domains in child-feeding practices. This structure was also added by the researcher based on literature reviews, and included two factors: home food availability and family eating patterns. The detailed discussion can be found in the later section.

Parental control over children's eating

The study found the some parental feeding strategies were related to children's actual weight status. Restriction and monitoring had a weak and positive association with children' BMI z-scores, while pressure to eat was inversely associated with children's BMI z-scores. Heavier children received more restriction and monitoring of their eating and less pressure of eating from their parents. These findings were similar to results from some cross-sectional studies (Birch et al, 2001; Kaur et al., 2006; Geng et al., 2009). Some researchers argue that parental restrictive feeding practices may increase the risk of overweight in children. However, other studies have not revealed any significant evidence with regard to the relationship between parental controlling feeding behavior and children's actual weight status (Baughcum et al., 2001; Robinson et al., 2001; Spruijt-Metz et al., 2006). The direction of associations found in this study is unclear. In terms of parental feeding behaviors, parents' perception of their children's weight might be more relevant to their restrictive feeding strategies than children's actual weight status.

Several longitudinal studies have attempted to examine the influence of parents' child-feeding practices on children's eating and weight status. A study in 192 non-Hispanic white girls showed that maternal restriction of palatable food at 5 years old predicted girls' eating in the absence of hunger at age 7 years (Fisher & Birch, 2002). Girls' behaviors were observed in a

laboratory. Another study examined the direction of association of feeding practices and children's weight status in a similar but smaller sample (57 white families) (Faith et al., 2004). Results show that from age 5 to age 7 in girls, parental restriction predicted higher BMI z-scores and pressure to eat predicted reduced BMI z-scores among high-risk children, while monitoring predicted reduced child BMI z-scores in low-risk children. The authors suggested that different findings in low-risk and high risk children may indicated a gene-environment interaction. Interestingly, the study found that the prospective effect of monitoring was attenuated with adjustment for the child's BMI z-score at age 3 years, suggesting that parental monitoring of child fat intake may be also responsive to child weight status. However, a study conducted by Spruijt-Metz and colleagues did not reveal any prospective influence of child-feeding practices on children' total body fat mass among 121 white and African-American boys and girls with an average follow-up period of 2.7 years. Findings from these studies were informative. However, whether parents' behaviors have a long-term influence on children's weight status remains uncertain.

The use of parental control in child feeding has been hypothesized to have adverse effects on the child's subsequent eating and weight status by impending the child's opportunities for the development of self-control in eating (Costanzo & Woody, 1985; Birch & Fisher, 1998). Some researchers on restrictive feeding believe that focusing children's attention on external cues, such as food portion size, rewards, and cleaning the plate, may undermine their ability to respond to internal cues that signal hunger and satiety. Restricting access to highly palatable snack foods has also been shown to increase children's preference and requests for such foods (Birch & Fisher, 1998). Thus, parental feeding strategies may play a role in the development of childhood overweight because excessive control in child feeding has been associated with poorer eating

self-regulation, which, in turn, increase children's energy intake in some way (e.g. taking more 'forbidden' food than they should).

Unfortunately, we were not able to assess children's actual energy intake in this current study. The actual energy intake of children related to parental restriction of eating may help understand the pathway of influence of the feeding practice on children's weight status. To date, no studies have done to assess energy intake among adolescents and its relationship to feeding practices. Such studies could be more relevant, because adolescents have more chances to choose their food freely and eat more often outside of their home. What they eat and the energy intake away from their parents can be a reflection of parents feeding practices.

Parental control or regulation of children's energy intake may not always have adverse effects as observed in many studies. Several studies show that parents control helps children regulate their energy intake and have healthier diet. Brown and Ogden (2004) reported that greater parental control was associated with higher intakes of healthy snack foods. Wardle et al. (2002) suggested that 'lack of control of food intake [rather than higher control] might contribute to the emergence of differences in weight' (p.453). Though the research methods and instruments used in those studies are different, those results indicate that parental control can work in a positive way.

It is plausible to say that parents' child-feeding practices are more likely to be a response to children's weight status. Parents may control their child's eating and restrict them from certain food to decrease the child's energy intake when they see the child becoming overweight, while parents may push the child eat more to increase his/her weight if they perceive the child is too skinny.

Due to the cross-sectional design, this study cannot determine the causal relationships between parents' child feeding practices and their child's weight status. However, researchers in this field agree that child feeding is a dynamic process and relationships to children's weight were bidirectional. Parents can have strong influence on children's energy intake and weight status by controlling, modeling and creating a unique family food environment. Children also can shape parents' child-feeding practices in various ways. To understand the association of parental control over their child's eating and child weight status, the actual energy intake of the child should also be assessed using longitudinal research, because the outcome of the excessive weight gain in a child may manifest over time.

Family food environment

The home food environment can be conceptualized as the reflection of parents' child-feeding practices. Parents may bring home what they want their child to eat and set up eating environment to encourage certain eating behaviors in their child.

The results show the family food environment aspects assessed in this study was generally positive. Majority of families had fruit at home 5 day or more a week. Among three 'unhealthy' foods assessed in this study (including sweets, soft drinks and fried food), fried food was the least available at home. Most children ate breakfast at home (70%) and dinner with the family (86%) 5 days or more a week.

It is difficult to evaluate if the food environment at home in this sample was typical or had changed over time in urban areas in China, because of a lack of data in family food environment in Chinese. Few studies assess the food availability and eating patterns within Chinese families. Data on diet and eating behavior at a population level reveals some changes in diet structure and eating behaviors over time. A study in a representative Chinese sample showed

that the proportion of calories consumed from fried foods (21.3%) in 2004 increased significantly in children (2-18 years old) compared with 16.5% in 1991 (Wang et al., 2008). Snaking behavior also increased significantly between 1991 and 2004 (prevalence of snacking 15.4% in 1991, 20.6% in 2004). Though findings from this analysis cannot demonstrate the direct change within a Chinese family, increase in snaking and food preparation may indicate that the food environment is undergoing a change.

Evidence from national nutrition surveys shows that change of eating behaviors and food environment is happening at a population lever in China. There are some alarming trends in the intake of energy from fat, increased consumption of saturated fat and cholesterol and decreased consumption of fruits and vegetables (Zhai et al., 2007; Du, Lu, Zhai, & Popkin, 2002; Popkin & Du, 2003). The changes are more pronounced in urban areas in many major cities. The relatively positive food environment in this sample may have undergone changes and become less healthy than it used to be; or the food environment at home may be affected by the change of the macro environment as the trend of the transition. The longitudinal evaluation of the family food environment should be conducted to capture the change over time and intervention is urgently needed at this point to avoid irreversible change in food environment both at macro and micro levels.

Food environments that parents create at home sometimes have extraordinary impact on children eating and weight. Our study found that overall family eating patterns was inversely associated with children's BMI z-scores after parents BMIs and SES factors adjusted, while no significant relationship was found between food availability at home and children's BMI z-scores. Other studies also found moderate inverse association between frequencies of family meals and children's weight status among adolescents (Gillman et al., 2000; Sen, 2006). Sen et

al. (2006) found family dinner frequency was inversely associated with being overweight among white adolescents in both cross-sectional and longitudinal analyses; however, findings were not significant for Black and Hispanic youth. However, a longitudinal analysis did not find significant evidence that eating family dinners were associated with children's weight status (Taveras et al., 2005).

Though the overall food environment was relatively healthy in this sample, many families had potentially unhealthy elements at home in regards to availability of certain foods and eating behaviors. Considerable proportion of respondents (30%) indicated that their children ate breakfast at home less than 5 days a week. Breakfast has been regarded as the most important meal of the day, in part because of its nutritional benefits (Siega-Riz, Popkin, & Carson, 1998; Song et al., 2006). Skipping breakfast can reduce the intake of many nutrients. It may also lead to greater levels of hunger later in the day, producing overeating, or may lead to greater consumption of foods high in energy density, which may increase risk of obesity (Wyatt et al., 2002; Nicklas, Reger, Myers, & O'Neil, 2000). In addition, many families had soft drinks available at home most of the time and ate out at restaurants 3 or more days a week. These practices may create opportunities for children to consume more energy-dense foods and decrease the intake of nutrient-dense foods.

Evaluation of the family food environment in this study was a rough assessment. It may not directly represent what the child actually ate, or precisely capture relationships of the elaborated food environment and children's weight status in Chinese families. More refined evaluation of family food environment and longitudinal research are needed as well as evaluation of child's energy intake and physical activity.

Limitations

Several limitations should be considered in this study when interpreting results. First, findings were based on the cross-sectional design; the direction of causality cannot be firmly established. Associations observed in this study cannot determine whether certain parents' child-feeding practices caused different weight status of their children, or their practices were just a response to outcomes of children's weight gain. In addition, the non-significant association from this 'snap-shot' may not be overlooked, because influence from particular aspects may manifest through time. Longitudinal research is desired to get a clearer picture. Other important factors such as physical activities and their actual energy intake within and outside of the home also should be carefully studied. Second, adolescents, on whom the study focused, are in a rapid physical and emotional transition, which makes it more complicate to assess their weight status and their parents' attitudes and practices in regards to feeding them. The growth pattern during this period of time may outweigh the negative effects from family food environment and family eating patterns. In addition, compared with very young children, increased autonomy of young adolescents may diminish the influence form their parents and the home environment.

Recommendations for Further Research

1. Further evaluation and refinement of the instrument is needed for its use in Chinese. The instrument used in this study included items developed by previous studies and items developed by the researcher. Some concept in structures of the instrument may need more specific description in order to capture targeted behaviors more accurately. In addition, the final version used in data collection was translated into Chinese from the English version. Though the translation-back-translation was conducted to ensure the validity of the content, certain items may need to be described more carefully in Chinese. Several

subscales with low internal consistency need further study. In addition, a confirmatory factor analysis may be helpful, because such analysis could help identify particular items which are not necessary in certain subscales.

2. Culture related issues regarding feeding need further research. In this study, less restriction and more pressure to eat were found. This finding may indicate that there is culture variation in feeding practices. Different child feeding styles were also found in different ethnic groups in a western population (Birch et al., 2001). However, there are few studies examining the cultural issues in child feeding practices. Cultural beliefs and different social norms can affection parents' child feeding practices as well as parents' perceptions and concern regarding child weight. Such studies could help develop culture appropriate education and intervention.

3. What adolescents eat within and outside of the home should be assessed. In terms of feeding and eating, the actual intake of food should provide more precise understanding of the influence of child-feeding practices if there is any. What children eat at home can be a reflection of their parents' influence. What children eat outside of the home is also important because it can reflect parents' child-feeding strategies in many ways. Assessment of children's actual food intake will help understand the pathway of the influence of feeding practices on children's weight status. In Chinese population, such research is very limited because of a lack of tools or instrument to assess children's energy intake. Developing such instruments is in demand.

4. Autonomy issues should be examined carefully among Chinese adolescents. Young adolescents in a transition of being responsible for their own eating. Though most parents felt that they were responsible for what their child ate in this study, most of them did not

decide how much their child ate. The finding indicates that young adolescents have certain autonomy to decide what they eat and how much they eat. To what extent of their autonomy and how do children practice their autonomy in eating could be instructive both for parents and health educators to develop effective strategies to regulate children's eating at this age.

5. Longitudinal studies are needed to better assess influence from parents and clarify the causality of those associations of feeding and weight status among Chinese. Given the cross sectional design in this study, it was unable to draw conclusions about influence of parents feeding practices on children's weight status among young Chinese adolescents. A longitudinal cohort study would be more meaningful to direct evaluation and education regarding eating and feeding.

Recommendations for Public Health Education

1. Parents' concern and their perception about children's weight should be addressed in health education programs. Parents show fair concern about being underweight and being overweight in their child. The misperception and inappropriate concern may lead to problematic child feeding practices. In a health education program, parents should be taught about what a healthy weight is and a right body image for their teens. Correct use of growth charts or any valid charts helping monitoring child weight status should be encouraged. In addition, health education professionals should make such materials easy to use and interpret in terms of children's weight status.

2. Intervention for overweight issues should be gender specific. Though there was no significant difference in parent feeding practices between boys and girls, the significant

higher prevalence of obesity in males than in females was found. The result may indicate needs for gender specific intervention. Social norms or cultural preference for an acceptable body image may be different for males or females in this population. Health educators should investigate the gender difference and develop gender-specific health promotion programs.

3. Health education programs should help parents use appropriate control to regulate their child's eating. Though the cause-effect relationships cannot be established between parents' controlling feeding strategies and children weight status in this population, parents' regulation on children's eating is important. Health educators should teach parents to use various strategies to help their child eat healthy, such as having unhealthy foods unavailable at home instead of hiding these foods, and acting as role models to eating right instead of pushing their child eat certain food. In addition, education programs should emphasize the child's internal cue for eating. Parents may decide what their child eat and let the child decide how much to eat. Health education programs also should teach skills that parents can use to train their teens to select right types of foods and the right portion.

4. Parents need knowledge and skill to be able to confidently communicate with their child about healthy eating and weight issues. Though most parents realized that it is important to talk about healthy weight and eating, they lacked of confidence in talking about these topics. To increase parents' confidence and encourage them to communicate with their teens, health educators should not only teach parents nutrition knowledge but also provide resources where parents can find valid and reliable health information to be self-educated. Adolescents lack a sense of urgency regarding their future health-making

nutrition of low concern (Lessard et al., 2010). Health educators also should teach parents skills in handling an effective conversion or discussion about nutrition and weight related issues.

5. Health education programs should get both parents and children involved. There is no doubt that feeding and eating is a dynamic process. Interaction between parents and children should be taken into account when health promotion programs are developed to facilitate healthy eating in children. Studies have showed family based intervention programs with both parents and children involved are more likely to be successful in behavior change and weight management.

6. Health educators in China should also be aware of the frustration of being surrounded by chain fast food restaurants, and strive to advocate policy makers to help make a change at macro levels. During the data collection, a school nurse expressed her frustration and said 'we know it (fast food) is not good for children, but, it is a business, what we can do about it (the fast food business)'. Though little influence of fast food or fried food on obesity development in Chinese children were found, the popularity of western fast food chain restaurants and their spreading speed has created public health concerns. The potential health risk from fast foods and fried food, especially western fast foods, should be underlined. Health educators should promote health traditional Chinese food through mass media, and lobby policy makers to make regulations on the spread of fast food restaurants in Chinese communities.

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Appendix A

Child Feeding Questionnaire factors, items, and response options (Birch et al., 2001)

Factor	Question	Response options
Percieved responsibility	When your child is at home, how often are you responsible for feeding her? How often are you responsible for deciding what your child's portion sizes are? How often are you responsible for deciding if your child has eaten the right kind of foods?	1 = never; 2 = seldom; 3 = half of the time; 4 = most of the time; 5 = always
Perceived parent weight	Your Childhood (5 to 10 years old) Your adolescence Your 20s At present	1 = markedly underweight; 2 = underweight; 3 = normal; 4 = overweight; 5 = markedly overweight
Perceived child weight	Your child during the first year of life Your child as a toddler Your child as a pre-schooler Your child kindergarten through 2nd grade Your from child 3rd through 5th grade Your child from 6th through 8th grade	1 = markedly underweight; 2 = underweight; 3 = normal; 4 = overweight; 5 = markedly overweight
Concern about child weight	How concerned are you about your child eating too much when you are not around her? How concerned are you about your child having to diet to maintain a desirable weight? How concerned are you about your child becoming over weight?	1= unconcerned; 2 = a little concerned; 3 = concerned; 4 = fairly concerned; 5 = very concerned
Restriction	I have to be sure that my child does not eat too many sweets (candy, ice cream, cake or pastries) I have to be sure that my child does not eat too many high-fat foods I have to be sure that my child does not eat too much of her favorite foods I intentionally keep some foods out of my child's reach I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behavior I offer my child her favorite foods in exchange for good behavior If I did not guide or regulate my child's eating, she would eat too many junk foods If I did not guide or regulate my child's eating, she would eat too much of her favorite foods	1= disagree; 2= slightly disagree; 3= neutral; 4 = slightly agree 5 = agree
Pressure to eat	My child should always eat all of the food on her plate I have to be especially careful to make sure my child eats enough If my child says ``I'm not hungry'', I try to get her to eat anyway If I did not guide or regulate my child's eating, she would eat much less than she should	1 = disagree; 2 = slightly disagree; 3 = neutral; 4 = slightly agree 5 = agree
Monitoring	How much do you keep track of the sweets (candy, ice cream cake, pies, pastries) that your child eats? How much do you keep track of the snack food (potato chips, Doritos, cheese puffs) that your child eats? How much do you keep track of the high-fat foods that your child eats?	1 = never; 2 = rarely; 3 = sometimes; 4 = mostly; 5 = always

Appendix B

Child-feeding Practice Questionnaire

Cover

ID No. □□□□

Grade _____

Today's Date _____

Note: This questionnaire is only used for research purpose. Personal information will be kept confidential. Please put the questionnaire in the envelope when finishing and let the student turn it in at school. If you have any question, place contact Xiaoyi Shan or Ruoxiang Cao. Thank you for your cooperation.

- ***Please let the parent who prepares the family meals most of the time answer the survey.***
- ***If you have more than one child who ages from 12-14, please select the younger one as the subject for this questionnaire.***
- ***Please make the best guess on child's and parents' weight and height.***

1. I am the child's _____ who is answering the questionnaire.
   1. Mother 2. Father 3. Grandparents 4. Others

2. Who in the family cooks meals for the family most of the time?
   1. Mother 2. Father 3. Grandparents 4. Others

3. Your child's birthday _____year_____month_____day

4. Gender of your child: 1. Male 2. Female

5. Your child's current weight _____._____kg
6. Your child's current height _____cm

(***Note: please choose only one- the best answer to each question and circle the number of the option)***

7. When your child is at home, how often are you responsible for preparing his/her meals?
   1. never 2.seldom 3.half of the time 4.most of the time 5.always

8. How often are you responsible for deciding what your child's portion sizes are
   1. never 2.seldom 3.half of the time 4.most of the time 5.always

9. How often are you responsible for deciding if your child has eaten the right kind of foods?
   1.never 2.seldom 3.half of the time 4.most of the time 5.always

How do you describe your weight during different periods of time as the following questions ask (Question 10-12)

10. Your weight during your adolescence
    1.markedly underweight 2.underweight 3.normal 4.overweight 5.markedly overweight

11. Your weight during your 20s
    1.markedly underweight 2.underweight 3.normal 4.overweight 5.markedly overweight

12. Your current weight
    1.markedly underweight 2.underweight 3.normal 4.overweight 5.markedly overweight

How do you describe your child's weight during different periods of time as the following questions ask (Question 13-16)

13. Your child's weight during the first year of life
    1.markedly underweight 2.underweight 3.normal 4.overweight 5.markedly overweight

14. Your child's weight as a pre-schooler
    1.markedly underweight 2.underweight 3.normal 4.overweight 5.markedly overweight

15. Your child's weight from 3rd to 5th grade
    1.markedly underweight 2.underweight 3.normal 4.overweight 5.markedly overweight

16. Your child's current weight

1.markedly underweight 2.underweight 3.normal 4.overweight 5.markedly overweight
17. How concerned are you about your child eating too much when you are not around him/her? 1.unconcerned 2.a little concerned 3.concerned 4.fairly concerned 5.very concerned
18. How concerned are you about your child having to diet to maintain a desirable weight? 1.unconcerned 2.a little concerned 3.concerned 4.fairly concerned 5.very concerned
19. How concerned are you about your child becoming overweight? 1.unconcerned 2.a little concerned 3.concerned 4.fairly concerned 5.very concerned
Do you agree or disagree with the following statements (Question 20-33)?
20. I have to be sure that my child does not eat too many sweets (candy, ice-cream, cake or pastries) 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
21. I have to be sure that my child does not eat too many fried foods (fried meat, fried vegetables, etc.). 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
22. I have to be sure that my child does not eat too much of his/her favorite foods. 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
23. I have to be sure that my child does not eat too much of snacks (potato chips, puffed foods, etc.) 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
24. I have to be sure that my child does not drink too many soft drinks (such as soda and sweetened beverage). 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
25. I intentionally keep some foods out of my child's reach. 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
26. I offer sweets (candy, ice cream, cake, cookies, etc) to my child as a reward for good behaviors. 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
27. I offer my child his/her favorite foods in exchange for good behaviors. 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
28. If I did not guide or regulate my child's eating, he/she would eat too many “ junk” foods 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
29. If I did not guide or regulate my child's eating, he/she would eat too much of his/her favorite foods 1. strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
30. My child should always eat all of the food in his/her bowl. 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
31. I have to be especially careful to make sure my child eats enough 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
32. If my child says ``I'm not hungry'', I try to get him/her to eat anyway 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree

33. If I did not guide or regulate my child's eating, he/she would eat much less than he/she should 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
34. I often talk with my child about why he/she should or should not eat certain food. 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
35. I feel confident talking about healthy eating with my child. 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
36. I feel confident talking about weight related topics with my child. 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
37. I think that it is important to discuss healthy eating. 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
38. I think it is important to discuss weight related topics with my child. 1.strongly disagree 2. disagree 3.neutral 4. agree 5. strongly agree
39. How much do you keep track of the sweets (candy, ice cream, cake, cookies, etc) that your child eats? 1. never 2.rarely 3.sometimes 4.mostly 5.always
40. How much do you keep track of the snack food (potato chips, puffed foods, etc) that your child eats? 1. never 2.rarely 3.sometimes 4.mostly 5.always
41. How much do you keep track of high-fat (fried) foods that your child eats? 1. never 2.rarely 3.sometimes 4.mostly 5.always
42. How much do you keep track of soft drinks that your child drinks? 1. never 2.rarely 3.sometimes 4.mostly 5.always
Please indicate how many days the following foods/drinks are available at home every week (Question 43-46). The number 0-7 represent the number of days, please make the best guest and select only one number that best represent your answer. Question 47-50 follow the same pattern.
43. Fruits at home 0 1 2 3 4 5 6 7 (days/per week)
44. Sweets (including ice-cream, candy, cookies, cake, etc) at home. 0 1 2 3 4 5 6 7 (days/per week)
45. Fried food (fried meat, fried vegetable, etc) at home. 0 1 2 3 4 5 6 7 (days/per week)
46. Sugar-sweetened beverages are available at home 0 1 2 3 4 5 6 7 (days/per week)

47. How often does your child eat breakfast at home? 0 1 2 3 4 5 6 7 (days/per week)
48. How often does your family eat dinner together at home? 0 1 2 3 4 5 6 7 (days/per week)
49. How often does your family eat out at restaurants? 0 1 2 3 4 5 6 7 (days/per week)
50. How often do you purchase take-out food (or food prepared outside of home) for family meals? 0 1 2 3 4 5 6 7 (days/per week)
51. Child's mother's age_____
52. Child's father's age_____
53. Child's mother's weight _____cm 54. Child's mother's height _____.__kg
55. Child's father's weight _____cm 56. Child's father's height _____.__kg
57. Average **monthly** family income (including both parents' income) _____Yuan (F*or example, if the father and the mother both earn 2000 Yuan a mother, the monthly family income is 4000 Yuan; if only one parent works or it is a single-parent family, the monthly family income is the monthly income of the parent.)*
58. Child's mother's highest education level 1. Elementary school or less 2. Middle school 3. High school 4. College and/or Graduate school
59. Child's father's highest education level 1. Elementary school or less 2. Middle school 3. High school 4. College and/or Graduate school
60. Is he/she your biological child 0. No 1. Yes
Thank you for your time and cooperation!

Subscales

Subscales	Items
Perceived responsibility	7. When your child is at home, how often are you responsible for preparing his/her meals? 8. How often are you responsible for deciding what your child's portion sizes are? 9. How often are you responsible for deciding if your child has eaten the right kind of foods? RO: 1=never, 2=seldom, 3=half of the time, 4=most of the time, 5=always
Perceived parent weight	10. Your weight during your adolescence 11. Your weight during your 20s 12. Your weight now RO: 1=markedly underweight, 2=underweight, 3=normal, 4=overweight, 5=markedly overweight
Perceived child weight	13. Your child during the first year of life 14. Your child as a pre-schooler 15. Your child from 3rd to 5th grade 16. Your child currently is RO: 1=markedly underweight, 2=underweight, 3=normal, 4=overweight, 5=markedly overweight
Concern	17. How concerned are you about your child eating too much when you are not around him/her? 18. How concerned are you about your child having to diet to maintain a desirable weight? 19. How concerned are you about your child becoming over weight? RO: 1=unconcerned, 2=a little concerned, 3=concerned, 4=fairly concerned, 5=very concerned
Restriction	20. I have to be sure that my child does not eat too many sweets (candy, ice-cream, cake or pastries). 21. I have to be sure that my child does not eat too many fried (fried meat, fried vegetables, etc.) foods. 22. I have to be sure that my child does not eat too much of his/her favorite foods. 23. I have to be sure that my child does not eat too much of snacks (potato chips, puffed foods, etc.). 24. I have to be sure that my child does not drink too much soft drinks (such as soda and sweetened beverage). 25. I intentionally keep some foods out of my child's reach. 26. I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behaviors. 27. I offer my child his/her favorite foods in exchange for good behaviors. 28. If I did not guide or regulate my child's eating, he/she would eat too many junk foods. 29. If I did not guide or regulate my child's eating, he/she would eat too much of his/her favorite food. RO: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5= strongly agree
Pressure to eat	30. My child should always eat all of the food in him/her bowl. 31. I have to be especially careful to make sure my child eats enough. 32. If my child says ``I'm not hungry'', I try to get him/her to eat anyway. 33. If I did not guide or regulate my child's eating, he/she would eat much less than he/she should. RO: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Subscales (continued)

Subscales	Items
Monitoring	39. How much do you keep track of the sweets that your child eats? 40. How much do you keep track of the snack food that your child eats? 41. How much do you keep track of fried (fried meat, fried vegetables, etc.) foods that your child eats? 42. How much do you keep track of soft drinks that your child drinks? RO: 1= never 2=rarely 3=sometimes 4=mostly 5=always
Communication	34. I often talk with my child about why he/she should or should not eat certain food. 35. I feel confident talking about healthy eating with my child. 36. I feel confident talking about weight related topics with my child. 37. I think that it is important to discuss healthy eating. 38. I think it is important to discuss weight related topics with my child. RO: 1=strongly disagree, 2=disagree, 3= neutral, 4= agree, 5=strongly agree
Food availability at home	43. Fruits are available at home 44. Sweets (including ice-cream, candy, cookies, cake, etc) are available at home 45. Fried foods (fried meat, fried vegetable, etc) are available at home 46. Sugar-sweetened beverages are available at home RO: 0 1 2 3 4 5 6 7 (days/per week)
Family eating patterns	47. How often does your child eat breakfast at home? 48. How often does your family eat dinner together at home? 49. How often does your family eat out at restaurant? 50. How often do you purchase take-out food (or food prepared outside of home) for family meals? RO: 0 1 2 3 4 5 6 7 (days/per week)

Appendix C

Translated Survey Items in Chinese by Xiaoyi Shan

请在家做饭最经常的那位家长来回答以下问题。
如果您有一个以上的孩子年龄在 12 岁到 15 岁之间，请选择年龄较小的孩子最为对象，来回答以下问题。
对于多项选择题，请在您认为的最佳答案序列号上画圈儿。

1. 我是孩子的_____ 在回答这个问卷。
   1.母亲　　2. 父亲　　3. 外公、外婆/爷爷、奶奶　　4. 其他人
2. 请问在家里，谁主要负责全家的饮食？
   1.母亲　　2. 父亲　　3. 外公、外婆/爷爷、奶奶　　4. 其他人
3. 孩子的生日 _____年_____月_____日
4. 孩子性别 1。 男　2. 女
5. 孩子现在的体重
6. 孩子现在的身高
7. 孩子母亲年龄_____
8. 孩子父亲年龄_____
9. 孩子母亲身高_____厘米
10. 孩子母亲体重 _____.__公斤
11. 孩子父亲身高_____厘米
12. 孩子父亲体重 _____.__公斤
13. 家庭平均月收入（包括父母双方收入）_____ 元

（说明：以下问题都为选择题，请选择一个最符合您实际情况的答案，在答案的序号上画圈。）

14. 孩子母亲文化程度
    1.小学或者小学以下　2. 初中　3. 高中　4. 大学及大学以上文化程度
15. 孩子父亲文化程度
    1.小学或者小学以下　2. 初中　3. 高中　4. 大学及大学以上文化程度

16. 当您的孩子在家吃饭时，多少时候是您负责给他/她准备饭菜？
    1. 从不　2.很少　3.有一半时间　4.大多数时候　5.总是
17. 有多少时候您负责决定他/她吃多少？
    1. 从不　2.很少　3.有一半时间　4.大多数时候　5.总是
18. 有多少时候你负责决定他/她吃得是不是健康食品？
    a. 从不　2.很少　3.有一半时间　4.大多数时候　5.总是

请您回忆一下您不同时期的体重状况，选出一项对您体重状况描述最相符的一项 （问题 19-21）

19. 在您青春期的时候
    a. 非常瘦　2. 有点瘦　3.不胖不瘦　4. 有点胖　5. 非常胖
20. 在您二十多岁的时候
    1. 非常瘦　2. 有点瘦　3.不胖不瘦　4. 有点胖　5. 非常胖
21. 您现在的体型是
    a. 非常瘦　2. 有点瘦　3.不胖不瘦　4. 有点胖　5. 非常胖

请您回忆一下不同时期您孩子的体重状况，选出一项对孩子体重状况描述最相符的一项 (问题 22-25）

22. 孩子一岁左右的时候是
    1. 非常瘦　2. 有点瘦　3.不胖不瘦　4. 有点胖　5. 非常胖
23. 孩子在上小学前是
    1. 非常瘦　2. 有点瘦　3.不胖不瘦　4. 有点胖　5. 非常胖

24. 孩子在上三年级到五年级的时候是
a. 非常瘦 2. 有点瘦 3.不胖不瘦 4. 有点胖 5. 非常胖
25. 孩子现在是
1. 非常瘦 2. 有点瘦 3.不胖不瘦 4. 有点胖 5. 非常胖

26. 当您不在他/她身边的时候，您是否担心您孩子吃得太多？
1. 从不 2. 很少 3. 有时候 4. 常常 5. 总是
27. 您是否担心您的孩子为了保持理想的体重而节制饮食?
1. 从不 2. 很少 3. 有时候 4. 常常 5. 总是
28. 您是否担心您的孩子被诊断为肥胖?
1. 从不 2. 很少 3. 有时候 4. 常常 5. 总是

请问您同意以下观点吗 (问题29-42)？

29. 我必须保证我的孩子不会吃太多甜食（像糖、饼干、蛋糕，冰激凌，巧克力等）
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
30. 我必须保证我的孩子不会吃太多的油炸食品
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
31. 我必须保证我的孩子不会吃太多他/她特别喜欢吃的食品
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
32. 我必须保证我的孩子不吃他多零食（像薯片、膨化食品等）。
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
33. 我必须保证我的孩子不会喝太多碳酸饮料或者含糖饮料（象可乐、汽水、果味甜饮料，等）。
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
34. 我有意不让我的孩子接触某些我认为不健康的食品。
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
35. 如果他/她表现良好或者学习成绩进步，我会给他/她甜食作为鼓励(象糖、蛋糕、冰激凌等)。
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
36. 我会给我的孩子他/她最喜欢的食品，以鼓励他/她表现好或者学习进步。
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
37. 如果我不管着他/她，他/她会吃很多垃圾食。
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
38. 如果我不管着他/她，他/她会吃很多他/她最喜欢的食品
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意

压力

39. 我认为我的孩子应该总是吃完他/她碗里所有的饭
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
40. 我必须努力确保我的孩子吃饱了
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
41. 即使他/她说：“我不饿”, 我也会尽量让他多吃一些
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意
42. 如果我不看着他/她, 他/她会吃得比较少
a. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意

监督

43. 您监督他/她吃多少甜食吗？
1. 从不 2.很少 3.有时候 4. 经常 5. 总是
44. 您监督他/她吃零食的情况吗？
1. 从不 2.很少 3.有时候 4. 经常 5. 总是
45. 您监督他/她吃油炸食品的情况吗？
1. 从不 2.很少 3.有时候 4. 经常 5. 总是
46. 您监督他/她喝多少碳酸饮料、汽水和其果味甜汁饮料吗？
1. 从不 2.很少 3.有时候 4. 经常 5. 总是

家里食品可及性

47. 家里水果

0 1 2 3 4 5 6 7 （天/每周）

48. 家里油炸食品

0 1 2 3 4 5 6 7 （天/每周）

49. 平均每个礼拜， 甜食 (包括饼干、蛋糕、雪糕和冰激凌、以及糖和巧克力等) 在家里

0 1 2 3 4 5 6 7 （天/每周）

50. 家里碳酸饮料（包括可乐、汽水和加糖果味饮料等）

0 1 2 3 4 5 6 7 （天/每周）

家庭饮食习惯

51. 孩子在家吃早餐频率

0 1 2 3 4 5 6 7 （天/每周）

52. 家人一起在家吃晚餐的频率

0 1 2 3 4 5 6 7 （天/每周）

53. 家人一起在外面餐馆就餐的频率

0 1 2 3 4 5 6 7 （天/每周）

54. 买快餐或者外卖食品作为家庭就餐的频率

0 1 2 3 4 5 6 7 （天/每周）

交流

55. 我常和我的孩子讲他/她应该吃什么或者不应该吃什么.

1. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意

56. 和我的孩子讨论有关健康饮食的话题，我感觉比较自信。

1. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意

57. 和我的孩子讨论体重相关的话题，我感觉比较自信。

1. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意

58. 我觉得和孩子讨论健康饮食很重要

1. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意

59. 我觉得和孩子讨论体重相关的问题很重要。

1. 非常不同意 2. 不同意 3.持中立态度 4. 同意 5. 非常同意

60. 他/她是您的亲生子？

0. 不是 1. 是

Appendix D

Translated Survey Items in Chinese by Pu Jian

请让负责膳食的父母回答问卷。
如果在您的家庭 12-15 岁的小孩超过 1 个，请选择年幼的作为调查目标。

1. 回答问卷的是小孩的————
1. 母亲 2. 父亲 3.祖父母 4 其他人
2. 在家里负责准备膳食的是---------
   1.母亲 2.父亲 3.祖父母 4 其他人
3. 小孩的生日是——年 ——月——日
4. 小孩的性别 1。男 2。女
5. 小孩目前的体重——公斤
6. 小孩目前的身高——厘米
7. 小孩母亲的年龄——
8. 小孩父亲的年龄——
9. 小孩母亲的身高——厘米
10. 小孩母亲的体重——公斤
11. 小孩父亲的身高——厘米
12. 小孩父亲的体重——公斤
13. 家庭平均月收入为（包括父母双方的收入）_____ 元

14. 小孩母亲的最高学历 1．初中或低于初中 2。初中 3。高中 4 。大学或研究生以上
15. 小孩父亲的最高学历 1．初中或低于初中 2。初中 3。高中 4 。大学或研究生以上

（以下为问题为选择题，请选择最合适的答案作为选项）

16. 你为小孩准备膳食的频率是
    1．从不 2。很少 3。半数时间 4。多数时间 5。经常
17. 你决定小孩的用餐量的频率是
    1．从不 2。很少 3。半数时间 4。多数时间 5。经常
18. 你负责小孩饮食健康的频率为
    1．从不 2。很少 3。半数时间 4。多数时间 5。经常

以下问题是关于您在不同时期的体重

19.您在青春期的体重
    1． 明显低于标准 2。低于标准 3。正常 4。超重 5。明显超重
20. 您在 20-30 岁之间的体重
    1． 明显低于标准 2。低于标准 3。正常 4。超重 5。明显超重
21. 您目前的体重
    1． 明显低于标准 2。低于标准 3。正常 4。超重 5。明显超重

以下问题是关于您的小孩在不同时期的体重

22.小孩在 0-1 岁期间的体重
    1． 明显低于标准 2。低于标准 3。正常 4。超重 5。明显超重
23. 小孩在 3-5 岁期间的体重
    1． 明显低于标准 2。低于标准 3。正常 4。超重 5。明显超重
24. 小孩在 3-5 年级期间的体重
    1． 明显低于标准 2。低于标准 3。正常 4。超重 5。明显超重
25. 小孩目前的体重

1. 明显低于标准 2。低于标准 3。正常 4。超重 5。明显超重
26. 如果你不在场时，小孩饮食过量，你对此的关心程度是
1.不关心 2。有点关心 3。关心 3。相当关心 4。非常关心
27. 如果您的小孩必须靠节食来维持一定体重，你对此的关心程度是
1.不关心 2。有点关心 3。关心 3。相当关心 4。非常关心
28. 如果你的小孩体重在超重，你对此的关心程度是
1.不关心 2。有点关心 3。关心 3。相当关心 4。非常关心
对以下表述，你同意还是不同意？
29. 我尽量不让小孩吃太多甜食 （包括糖果，冰淇淋，蛋糕或者点心等）
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
30. 我尽量不让小孩吃太多高脂（油炸）食物
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
31. 我尽量不让小孩吃太多他/她喜欢的食物
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
32. 我尽量不让小孩吃太多零食（包括薯片，膨化食品等）
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
33. 我尽量不让小孩喝太多软饮料（包括汽水，甜饮料）
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
34.我有意识地不让小孩吃某些食物
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
35.我让小孩吃甜食（包括糖果，冰淇淋，蛋糕或者点心等）作为对他/她的奖励
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
36.我让小孩吃他/她喜欢的食物作为对他/她的鼓励
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
37.如果我不管小孩的饮食，他/她会吃太多垃圾食品
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
38. 如果我不管小孩的饮食，他/她会吃太多他/她爱吃的食物
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
39. 小孩要尽量把碗里的食物吃光
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
40. 我要保证小孩吃饱
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
41.尽管小孩说他/她不饿，我也要强迫他/她吃
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
42. 如果我不管小孩的饮食，他/她会吃得太少
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
43. 我经常给小孩解释什么该吃或者不该吃
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
44. 我对和小孩讨论饮食健康有信心
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
45. 我对和小孩讨论和体重有关的话题有信心
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
46. 我认为讨论饮食健康很重要
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
47. 我认为讨论和体重有关的话题很重要
1.强烈反对 2。反对 3。一般 4。同意 5。非常同意
48. 你留意小孩吃甜食（包括糖果，冰淇淋，蛋糕或者点心等）的频率是
1. 从不 2。很少 3。有时 4。多数时间 5。经常
49. 你留意小孩吃零食（（包括薯片，膨化食品等）的频率是
1. 从不 2。很少 3。有时 4。多数时间 5。经常
50. 你留意小孩吃高脂（油炸）食物的频率是
1. 从不 2。很少 3。有时 4。多数时间 5。经常

51. 你留意小孩喝软饮料的频率是

1．从不 2。很少 3。有时 4。多数时间 5。经常

以下问题是关于家里每周备有的食物/饮料的频率

52. 家里备有水果

0 1 2 3 4 5 6 7 （天/每周）

53. 家里备有甜食（包括冰淇淋，糖果，饼干，蛋糕等等）

0 1 2 3 4 5 6 7 （天/每周）

54. 家里备有油炸食物 （包括炸蔬菜，炸肉等）

0 1 2 3 4 5 6 7 （天/每周）

55. 家里备有甜饮料

0 1 2 3 4 5 6 7 （天/每周）

56.小孩在家吃早点的频率

0 1 2 3 4 5 6 7 （天/每周）

57.一家人在一起在家吃饭的频率

0 1 2 3 4 5 6 7 （天/每周）

58.一家人在饭馆吃饭的频率

0 1 2 3 4 5 6 7 （天/每周）

59. 购买外卖食品回家吃的频率

1 2 3 4 5 6 7 （天/每周）

60. 他//她是您的亲生子？

0. 不是 1. 是

Appendix E

Translated Survey Items from the Chinese version back in English by Haoyue Zhang

The parent who usually cooks at home, please answer the following questions. If you have more than one child at from 12 to 15, please choose the younger one as the referred subject.

1. I'm the child's _____ when filling this sheet.
   1.Mother 2. Father 3. Grandparent 4. Other
2. Who is mainly in charge of the family's diet?
   1.Mother 2. Father 3. Grandparent 4. Other
3. Birthday of the child is _____ (dd/mm/yyyy)
4. Gender of the child 1. male 2. female
5. Weight of the child _____
6. Height of the child _____
7. Age of the child's mother _____
8. Age of the child's father _____
9. Height of the child's mother _____ cm
10. Weight of the child's mother _____kg
11. Height of the child's father _____cm
12. Weight of the child's father _____kg
13. Educational level of the child's mother
    1. grade school or below 2. Junior high 3. senior high 4. college or above
14. Educational level of the child's father
    1. grade school or below 2. Junior high 3. senior high 4. college or above
15. Average monthly income of the family (including both parents)_____Yuan

（note: the following questions are all multiple choices. Please choose ONE most suitable for your situation and circle the answer.）

16. When your child eats at home, how often do you prepare the meal for him/her?
    1. never 2. seldom 3. half of the time 4. most of the time 5. always
17. How often do you decide the amount (s)he should eat?
    1. never 2. seldom 3. half of the time 4. most of the time 5. always
18. How often do you decide if (s)he eats healthy or not?
    1. never 2. seldom 3. half of the time 4. most of the time 5. always

(Please recall your weight in different stages, and choose the one most applicable to the description of your weight. Questions 14-16)

19. You were _____ in your adolescence.
    a. skinny 2. slim 3. moderate 4. chubby 5. obese
20. You were _____ at your 20s.
    a. skinny 2. slim 3. moderate 4. chubby 5. obese
21. Your body type now is _____.
    a. skinny 2. slim 3. moderate 4. chubby 5. obese

The parent's perception of the child's weight

(Please recall your child's weight in different stages, and choose the one most applicable to the description of the child's weight. Questions 17-20)

22. Your child was _____ at one year old.
    a. skinny 2. slim 3. moderate 4. chubby 5. obese
23. Your child was _____ before the grade school.
    a. skinny 2. slim 3. moderate 4. chubby 5. obese
24. Your child was _____ in the third to the fifth grade.
    a. skinny 2. slim 3. moderate 4. chubby 5. obese
25. Your child is _____ now.
    a. skinny 2. slim 3. moderate 4. chubby 5. obese

26. When you are not with the child, do you worry that (s)he might eat too much?
    1. never 2. seldom 3. sometimes 4. most of the time 5. always
27. Are you worried that your child might be on diet to keep the ideal weight?
    1. never 2. seldom 3. sometimes 4. most of the time 5. always
28. Are you worried that your child might be overweight or obese?
    1. never 2. seldom 3. sometimes 4. most of the time 5. always

Do you agree with the following opinions?

29. I must be assured that my child doesn't eat too much dessert (such as candy, cookies, cake, ice cream, chocolate, etc）.
    a. strongly object 2. object 3. neutral 4. agree 5. strongly agree
30. I must be assured that my child doesn't eat too much fried food (such as fried meat, fried vegetables, etc.).
    a. strongly object 2. object 3. neutral 4. agree 5. strongly agree
31. I must be assured that my child doesn't eat too much his/her favorites.
    a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

32. I must be assured that my child doesn't eat too much snacks (such as potato chips, pop snacks）。

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

33. I must be assured that my child doesn't drink too much carbonated drinks or sugary beverages (such as coke, soda, fruit beverages, etc.）.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

34. I keep my child away from certain unhealthy food on purpose.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

35. If my child behaves, I will award him/her dissert (such as candy, cake, ice cream, etc)。

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

36. I will award my child his/her favorite food for his/her good behavior.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

37. If I let my child go, (s)he will eat a lot of trash food.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

38. If I let my child go, (s)he will eat a lot of his/her favorite food.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

39. I believe my child should always finish all the food in his/her bowl.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

40. I must try to make sure that my child is full.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

41. Even if (s)he claims no hungry, I will still force him/her to eat.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

42. If I let my child go, (s)he will eat very little.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

43. I often explain to my child what (s)he should eat or not.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

44. I feel confident in discussing health related topics with my child.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

45. I feel confident in discussing weight related topics with my child.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

46. I think it's important to discuss healthy diet with my child.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

47. I think it's important to discuss weight related topics with my child.

a. strongly object 2. object 3. neutral 4. agree 5. strongly agree

48. Do you supervise how much dissert (s)he eats?

1. never 2. seldom 3. sometimes 4. most of the time 5. always

49. Do you supervise how much snacks (including potato chips, pop snacks) (s)he takes?

1. never 2. seldom 3. sometimes 4. most of the time 5. always

50. Do you supervise how much fried food (s)he takes?

1. never 2. seldom 3. sometimes 4. most of the time 5. always

51. Do you supervise how much carbonated drinks and fruity sweet beverages (s)he drinks?

1. never 2. seldom 3. sometimes 4. most of the time 5. always

Following questions are about how often certain food/drinks are available at home.

52. Fruit at home

1. never 2. seldom 3. half of the time 4. most of the time 5. always

53. Fried food at home (such as fried meat, fried vegetables, etc.)

1. never 2. seldom 3. half of the time 4. most of the time 5. always

54. In every week, dissert at home (including cookies, cake, ice cream, candy and chocolate, etc)

1. never 2. seldom 3. half of the time 4. most of the time 5. always

55. Carbonated drinks at home (including soda, sweet beverages, etc.)

1. never 2. seldom 3. half of the time 4. most of the time 5. always

56. How often does your child have breakfast at home?

1. never 2. seldom 3. half of the time 4. most of the time 5. always

57. How often does the whole family eat together at home?

1. never 2. seldom 3. half of the time 4. most of the time 5. always

58. How often does the whole family eat out together?

1. never 2. seldom 3. half of the time 4. most of the time 5. always

59. How often do you or someone else buy fast food to take home?

1. never 2. seldom 3. half of the time 4. most of the time 5. always

60. Is he/she your biological child?

0. No 1. Yes

Appendix F

Final Chinese Version

喂养行为调查问卷

序号 □□□□

班级 _____

日期 _____

说明: 此问卷只用于调查研究。有关的个人信息和数据只有相关研究人员可以浏览并用做研究分析所用。请将完成的问卷放入信封并密封，由学生带回学校。如果您有任何问题，请联系单晓益或曹若湘。谢谢合作.

- 请通常在家做饭那位家长来回答以下问题。
- 如果您有一个以上的孩子年龄在 12 岁到 14 岁之间，请选择年龄较小的孩子最为对象，来回答以下问题
- 如遇选择题，请在**唯一**的**最佳答案**序列好上画圈。

1. 我是孩子的_____。
   1.母亲　2. 父亲　3. 外公、外婆/爷爷、奶奶　4. 其他人

2. 请问在家里，谁主要负责全家的饮食？
   1.母亲　2. 父亲　3. 外公、外婆/爷爷、奶奶　4. 其他人

3. 孩子的生日 _____年_____月_____日

4. 孩子性别　1. 男　2. 女

5. 孩子现在的体重_____ .____（公斤/千克）
6. 孩子现在的身高_____(公分/厘米)

（说明：以下问题都为选择题，请选择一个最符合您实际情况的答案，在答案的序号上画圈。）

7. 当您的孩子在家吃饭时，多少时候是您负责给他/她准备饭菜？
   1. 从不　2.很少　3.有一半时间　4.大多数时候　5.总是

8. 有多少时候您负责决定他/她吃多少？
   1.从不　2.很少　3.有一半时间　4.大多数时候　5.总是

9. 有多少时候您负责决定他/她吃得是不是健康？
   1.从不　2.很少　3.有一半时间　4.大多数时候　5.总是

请您回忆一下您不同时期的体重状况，选出一项对您体重状况描述最相符的一项 （问题 19-21）

10. 在您青春期的时候， 您是
    1.非常瘦　2.有点瘦　3.不胖不瘦　4.有点胖　5.非常胖

11. 在您二十多岁的时候， 您是
    1.非常瘦　2.有点瘦　3.不胖不瘦　4.有点胖　5.非常胖

12. 您现在的体型是
    1.非常瘦　2.有点瘦　3.不胖不瘦　4.有点胖　5.非常胖

请您回忆一下不同时期您孩子的体重状况，选出一项对孩子体重状况描述最相符的一项（问题 22-25）

13. 孩子一岁左右的时候是
    1.非常瘦　2.有点瘦　3.不胖不瘦　4.有点胖　5.非常胖

14. 孩子在上小学前是
    1. 非常瘦　2.有点瘦　3.不胖不瘦　4. 有点胖　5. 非常胖

15. 孩子在上三年级到五年级的时候是
    1. 非常瘦　2.有点瘦　3.不胖不瘦　4. 有点胖　5. 非常胖

16. 孩子现在是
    1. 非常瘦　2.有点瘦　3.不胖不瘦　4. 有点胖　5. 非常胖

17. 当您不在他/她身边的时候，您是否担心您孩子吃得太多？
    1. 从不　2. 很少　3. 有时候　4. 常常　5. 总是

18. 您是否担心您的孩子超重或者太胖?

1. 从不　2. 很少　3. 有时候　4. 常常　5. 总是
19. 您是否担心您的孩子超重或者太胖? 1. 从不　2. 很少　3. 有时候　4. 常常　5. 总是
请问您同意以下观点吗 （问题 29-47）？
20. 我必须保证我的孩子不会吃太多甜食（像糖、饼干、蛋糕，冰激凌，巧克力等） 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
21. 我必须保证我的孩子不会吃太多的油炸食品。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
22. 我必须保证我的孩子不会吃太多他/她特别喜欢吃的食品。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
23. 我必须保证我的孩子不吃他多零食（像薯片、膨化食品等）。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
24. 我必须保证我的孩子不会喝太多碳酸饮料或者含糖饮料（象可乐、汽水、果味甜饮料，等）。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
25. 我有意识的不让我的孩子接触某些我认为不健康的食品. 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
26. 如果他/她表现良好，我会给他/她甜食作为奖励(象糖、蛋糕、冰激凌等)。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
27. 我会给我的孩子他/她最喜欢的食品，以奖励他/她表现好。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
28. 如果我不管着他/她，他/她会吃很多垃圾食 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
29. 如果我不管着他/她，他/她会吃很多他/她最喜欢的食品。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
30. 我认为我的孩子应该总是吃完他/她碗里所有的饭菜。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
31. 我必须努力确保我的孩子吃饱了。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
32. 即使他/她说不饿，我也会强迫他/她吃。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
33. 如果我不管着他/她，他/她会吃得很少。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5. 非常同意
34. 我常和我的孩子解释他/她应该吃什么或者不该吃什么。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5.非常同意
35. 和我的孩子讨论有关健康饮食的话题，我感觉比较自信。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5.非常同意
36. 和我的孩子讨论体重相关的话题，我感觉比较自信。 1. 强烈反对　2.反对　3.持中立态度　4. 同意　5.非常同意

37. 我觉得和孩子讨论健康饮食很重要。 1. 强烈反对 2.反对 3.持中立态度 4. 同意 5.非常同意
38. 我觉得和孩子讨论体重相关的问题很重要。 1. 强烈反对 2.反对 3.持中立态度 4. 同意 5.非常同意
39. 您监督他/她吃多少甜食吗？(例如，糖，冰淇淋，蛋糕， 饼干，等)。 1. 从不 2.很少 3.有时候 4. 经常 5. 总是
40. 您监督他/她吃零食的情况吗（包括薯片，膨化食品等）？ 1. 从不 2.很少 3.有时候 4. 经常 5. 总是
41. 您监督他/她吃油炸食品的情况吗？ 1. 从不 2.很少 3.有时候 4. 经常 5. 总是
42. 您监督他/她喝多少碳酸饮料、汽水和其果味甜汁饮料吗？ 1. 从不 2.很少 3.有时候 4. 经常 5. 总是
以下问题是关于家里备有食品的频率和家庭用餐的情况（问题52-59）. 选择答案中的数字0-7代表一周中食品可及（或用餐）的天数， 请在圈出最接近您家实际情况的数字（只选一个）。
43. 家里备有水果的频率 0 1 2 3 4 5 6 7 (天/每周)
44. 家里备有甜食的频率 (例如，糖，冰淇淋，蛋糕， 饼干，等) 0 1 2 3 4 5 6 7 (天/每周)
45. 家里有油炸食品(例如，炸鸡、炸菜团子，炸肉丸子，等) 的频率 0 1 2 3 4 5 6 7 (天/每周)
46. 家里有碳酸饮料或加糖的果汁饮料的频率 0 1 2 3 4 5 6 7 (天/每周)
47. 孩子在家吃早餐的频率 0 1 2 3 4 5 6 7 (天/每周)
48. 家人一起吃晚餐的频率 0 1 2 3 4 5 6 7 (天/每周)
49. 家人一起在外面餐馆就餐的频率 0 1 2 3 4 5 6 7 (天/每周)
50. 买快餐或者外卖食品回家吃的频率 0 1 2 3 4 5 6 7 (天/每周)
51. 孩子母亲年龄_____
52. 孩子父亲年龄_____
53. 孩子母亲体重 _____ .____（公斤/千克） 54. 孩子母亲身高_____ (公分/厘米)

55. 孩子父亲体重_____ .____（公斤/千克） 56. 孩子父亲身高 _____(公分/厘米)
57. 平均家庭月收入（包括父母双方的收入）_____元（例如， 孩子的父亲和母亲平均每月各自收入2000元，这个家庭的平均月收入即为4000元；如果是单亲家庭或着是孩子的父母中只有一人工作，这个家庭的平均月收入即为此家长月平均收入。）
58. 孩子母亲的文化程度 1.小学或者小学以下　2. 初中　3. 高中　4. 大学及大学以上文化程度
59. 孩子父亲的文化程度 1.小学或者小学以下　2. 初中　3. 高中　4. 大学及大学以上文化程度
60. 他/她是您的亲生子？ **0. 不是　1.是**
感谢您的参与!

Appendix G

Cover Letter for Parents (English and Chinese)

Cover Letter

The Child Feeding Practice Study among Chinese Adolescents

You are being invited to take part in a survey to help us learn more about eating behaviors. Please take your time to read the following information carefully and decide whether you want to participate.

We will conduct surveys among parents of middle-school students. This study aims to assess parents' attitudes and behaviors about feeding your child. We ask the parent who cooks the family meals most of the time to answer the questionnaire.

The survey will take about 20 minutes to finish. The information you provide will help us understand influences of parents and home food environment on children's eating behaviors. The findings from the study will provide evidences for effective intervention of healthy eating among Chinese children.

In addition, we ask your consent to use the data of height and weight of your child from his/her annual check-up. Students' names will only be used to link the data to the survey. After the data is entered in to database, student's names will be deleted. No identification information will be involved in final data analysis and reports.

Your participation is entirely voluntary and anonymous. You can refuse to participate without any penalty or loss of benefits to your child. You are free to withdraw your participation at any time during the study without any adverse consequences from your child's school or teacher.

You answers and your child's information will be kept confidential. The information will only be accessible by the researcher and be used only for research purpose. If you have any question about the study or are interested in the findings of the study, you can contact Xiaoyi Shan through email: xyshan7@hotmail.com (or call 15201676857), or Dr. Cao at Beijing CDC (Tel 010-64212461)

If you agree on participation, please complete the survey and ask your child to turn it in the next school day. More instruction about how to complete the survey is provided in the questionnaire. When you complete the survey, you automatically consent to let us use the information in this research.

Thanks for your time and cooperation!

Researcher: Xiaoyi Shan, Doctoral student

Advisor: Dr. Welshimer, Kethleen

Southern Illinois University, Carbondale

Cooperator: Dr. Cao, Ruoxiang

Beijing Center for Disease Prevention and Control

知情同意书

喂养行为调查

亲爱的家长们，为更好地了解中国儿童青少年的饮食行为，我在此邀请你们参加此次调查。请仔细阅读以下内容，已决定是否参加本研究。

我们研究的目标人群是中学生生家长，研究目的主要是评价家长关于喂养的态度和行为。调查问卷还涉及到社会经济背景和家庭饮食环境等问题。问卷大约需要 15 分钟左右来完成。你所提供的相关信息将帮助我们更好了了解家长及家庭环境对儿童饮食行为的影响，这些信息将为以后健康饮食行为的促进和干预提供指导性建议。

我们的调查研究需要学生的身高、体重，在此，我们征求你的同意。如果您同意我们使用此信息，我们通过学校年度体检的数据获得您孩子的身高、体重数据。我们将使用学生姓名和生日做数据联接，等数据都录入数据库后， 学生姓名将被删除。最后的数据库里不会有任何能够辨识身份的个人信息。

为鼓励您协助我们完成此次调查，我们将采取摇奖的方式，从所有认真完成问卷的人中。

您的参与完全是在自愿和匿名的基础上。我们会对您所提供的信息保密，此信息之用于本调查研究。如果您有任何问题，请联系单晓益 （电子邮件 xyshan7@hotmail.com 联系电话 15201676857）。

如果您同意参加此次调查，请如实回答问卷，并将完成的问卷由您的孩子次日将问卷交回学校。关于如何完成问卷的说明已包括在问卷中，请在回答问题时仔细阅读说明。一旦您完成此次调查，就意味着您同意我们在此次研究中使用您所提供的信息。

谢谢您的合作！

研究者：单晓益 （在读博士）

导师：Dr. Welshimer, Kethleen

Southern Illinois University, Carbondale

协作者：曹若湘主任， 王东

北京疾病控制中心

Appendix H

Human Subject Approval

SIUC HSC FORM A

REQUEST FOR APPROVAL TO CONDUCT RESEARCH ACTIVITIES INVOLVING HUMAN SUBJECTS

CERTIFICATION STATEMENT

By making this application, I certify that I have read and understand the University's policies and procedures governing research activities involving human subjects. I agree to comply with the letter and spirit of those policies. I acknowledge my obligation to:

1. Accept responsibility for the research described, including work by students under my direction.
2. Obtain written approval from the Human Subjects Committee of any changes from the originally approved protocol **BEFORE** implementing those changes.
3. Retain signed consent forms in a secure location separate from the data for at least **three** years after the completion of the research.
4. Immediately report any adverse effects of the study on the subjects to the Chairperson of the Human Subjects Committee, SIUC, Carbondale, Illinois - 618-453-4533 and to the Director of the Office of Research Development and Administration, SIUC.
   Phone 618-453-4531. E-mail: **siuhsc@siu.edu**

Project Title
Parental influence on children's weight status among Chinese adolescents in Beijing

RESEARCH ADVISOR'S ASSURANCE: My signature on this application certifies that the student is knowledgeable about the regulations and policies governing research with human subjects. I am aware of my obligations stated on Form A and will be available to supervise the research. When on sabbatical leave or vacation, I will arrange for an alternate faculty sponsor to assume responsibility during my absence. I will advise the Human Subjects Committee by letter of such arrangements.

Xiaoyi Shan — April 14, 2010

Researcher(s) or Project Director(s) — Xiaoyi Shan — Date

Please print or type name below signature.

Kathleen J Welshimer

Researcher's Advisor (required for all student projects) Dr. Welshimer — Date

Please print or type name below signature. Kathleen J Welshimer

The request submitted by the above-named researcher(s) was approved by the SIUC Human Subjects Committee.

This approval is valid for one year from the review date. Researchers must request an extension to continue the research after that date. This approval form must be included in all Master's theses/research papers and Doctoral dissertations involving human subjects that are submitted to the Graduate School.

Anthony J. Cuvo — 4-16-10

Chairperson, Southern Illinois University Human Subjects Committee — Date

Appendix I

Instruction Outline for School Nurses

- Hand out the survey and cover letters to students in selected classes.
- Explain the purpose of the study to students: to assess parents' attitudes and behaviors regarding child feeding.
- State clearly to students that the parent who cooks most of family meals answers the survey.
- Stress that the participation is voluntary.
- State clearly that students should tell the parent that more instruction can be found in the cover letter and in the survey.
- Stress that if students or parents have any questions about the study, they can contact the researcher or the CDC official listed in the cover letter.
- Ask students to bring the survey back in the next two days, if their parents agree to participate in the study.
- Stress that parents' signature on the last page of the survey is required for completion (This is added after the pilot study).
- Contact the researcher anytime when you have any questions about the survey.

The researcher's contact information

Xiaoyi Shan

Cell phone: 15201676857

Email: xyshan7@hotmail.com

Appendix J

International Obesity Task Force BMI cut-offs for Childhood Overweight and Obesity (Cole et al., 2000)

Age (years)	IOTF Reference			
	Overweight		Obesity	
	Males	Females	Males	Females
2	18.41	18.02	20.09	19.81
2.5	18.13	17.76	19.80	19.55
3	17.89	17.56	19.57	19.36
3.5	17.69	17.40	19.39	19.23
4	17.55	17.42	19.29	19.15
4.5	17.47	17.19	19.26	19.12
5	17.42	17.15	19.30	19.17
5.5	17.45	17.20	19.47	19.34
6	17.55	17.34	19.78	19.65
6.5	17.71	17.53	20.23	20.08
7	17.92	17.75	20.63	20.51
7.5	18.16	18.03	21.09	21.01
8	18.44	18.35	21.60	24.57
8.5	18.76	18.69	22.17	22.18
9	19.10	19.07	22.77	22.81
9.5	19.46	19.45	23.39	23.46
10	19.84	19.86	24.00	24.11
10.5	20.20	20.29	24.57	24.77
11	20.55	20.74	25.10	25.42
11.5	20.89	21.20	25.58	26.05
12	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13	21.91	22.58	26.84	27.76
13.5	22.27	22.98	27.25	28.20
14	22.62	23.34	27.63	28.57
14.5	22.96	23.66	27.98	28.87
15	23.29	23.94	29.30	29.11
15.5	23.60	24.17	28.60	29.29
16	23.90	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17	24.46	24.70	29.41	29.69
17.5	24.73	24.85	29.70	29.84
18	25.00	25.00	30.00	30.00

Appendix K

Table A

Demographic Information of the Pilot Study Subject (N=133)

	Mean Age (SD)	Overweight	Obesity	Education			
				Elementary school or less	Middle school	High school	College and/or graduate school
Parent*							
Father	43.9 (4.11)	46%	11.1%	0.8%	12.5%	46.1%	40.6%
Mother	41.2 (3.51)	28.5%	6.9%	0.8%	13.5%	44.4%	41.4%
Total	42.5 (4.04)	37.1%	9%	1%	13%	45.2%	41%
Children*				N/A			
Boy	13.7 (0.65)	19.2%	5.5%				
Girl	13.8 (0.61)	14.0%	5.3%				
Total	13.8 (0.63)	16.9%	5.4%				
Family monthly income: Average 4 624 Yuan (682 USD) Median 4 000 Yuan (590 USD)							

* Prevalence of overweight and obesity in both parents and children was based on parents' report information.

Table B

Paired t-tests of Subscale Means between Two Administrations in the Pilot Study (N=110)

Subscales	Mean (Std. Deviation)		Difference of means	*t*	*p*
	First	Second			
Perceived responsibility	3.59 (0.81)	3.58 (0.91)	<0.01	0.05	0.96
Pressure to eat	3.14 (0.53)	3.15 (0.54)	-0.01	-0.16	0.87
Perceived parent weight	3.03 (0.61)	2.96 (0.59)	0.07	1.33	0.19
Perceived child weight	2.96 (0.70)	2.98 (0.62)	-0.03	-0.83	0.41
Concern	2.49 (1.27)	2.58 (1.35)	-0.09	-1.02	0.31
Restriction	3.48 (0.45)	3.49 (0.54)	-0.01	-0.14	0.89
Communication	3.84 (0.54)	3.82 (0.50)	0.03	0.55	0.59
Monitoring	3.26 (0.98)	3.24 (0.97)	0.02	0.25	0.80
Food availability	4.80 (1.05)	4.87 (1.11)	-0.07	-0.71	0.48
Eating patterns	5.89 (0.96)	5.89 (0.82)	-0.01	-0.09	0.93

Table C

Correlation of Subscales from Both Surveys (N=133)

Subscales	***r***	***p***
Perceived responsibility	0.53	<0.001
Perceived parent weight	0.46	<0.001
Perceived child weight	**0.86**	<0.001
Concern	**0.74**	<0.001
Restriction	0.41	<0.001
Pressure to eat	0.30	<0.001
Communication	0.46	<0.001
Monitoring	0.56	<0.001
Food availability	0.46	<0.001
Eating patterns	**0.74**	<0.001

Appendix L

Cronbach Alpha from full data of 355 records

Subscales	Number of Items	Cronbach alpha
Perceived responsibility	3	0.60
Perceived parent weight	3	0.65
Perceived child's weight	4	0.65
Concern	3	0.87
Restriction	10	0.76
Pressure[a]	4	0.55
Communication	5	0.73
Monitoring	4	0.90
Food availability	4	0.61
Eating patterns[b]	4	0.50

[a]The Cronbach alpha was 0.58, if the item 30 '*my child should always eat all of the food in him/her bowl* '(first item in pressure to eat subscale) was deleted from the subscale.

[b]The Cronbach alpha was 0.63 if the item 47 '*frequencies of breakfast at home'* (first item in eating pattern subscale) was deleted from the subscale.

Appendix M

Comparison of Demographic Characteristics

Table A *Comparison of Demographic Characteristics between records with children's check-up data and those without it*

Demographic variables		With check-up data (N= 483)				Without check-up data (N=65)				Tests
Children's age	Mean(SD)	13.57 (0.72)				13.80 (0.83)				t (N=544)=-2.24, p=0.03
Children's gender	%boys(n)/girls(n)	51 (248)/49 (235)				58 (36)/ 42(26)				χ^2 (1, N=545)=0.99, p=0.32
Family monthly income	Mean(SD)	5865.52 (6903.83)				5034.89 (3596.04)				t (N=485)=0.86, p=0.35
		Elementary school	Middle school	High school	College	Elementary school	Middle school	High school	College	
Mother's education	% (n)	4.6 (22)	22.9(109)	36.1(172)	36.5 (174)	3.3 (2)	36.7(22)	30.0(18)	30.0(18)	χ^2 (3, N=537)=5.54, p=0.14
Father's education	% (n)	3.3 (2)	31.7(19)	33.3(20)	31.7(19)	1.9 (9)	19.9(95)	38.5(184)	39.7(190)	χ^2 (3, N=537)=5.32, p=0.15

Table B *Comparison of Demographic Characteristics between respondents who are responsible for family meals and those who are not*

Demographic variables		Responsible for family meals (N=)				Not responsible for family meals (N=)				Tests
Child's age	Mean(SD)	13.57 (0.74)				13.64 (0.70)				t (N=431)=-0.93, p=0.35
Child's gender	%boys(n)/girls(n)	53.9(171)/46.1 (146)				49.1 (57)/50.9 (59)				χ^2 (1, N=)=0.79, p=0.38
Child's BMI z-score		0.34 (1.16)				0.37 (1.17)				t (N=431)=-0.17, p=0.87
Mother's BMI		23.20 (3.19)				22.78 (4.75)				t (N=414)=1.03, p=0.30
Father's BMI		24.79 (3.90)				25.35 (3.68)				t (N=416)=-1.33, p=0.19
Family monthly income	Mean(SD)	5379.94 (4332.25)				6221.51 (7150.42)				t (N=431)=-1.48, p=0.14
		Elementary school	Middle school	High school	College	Elementary school	Middle school	High school	College	
Mother's education	% (n)	4.0 (14)	23.4 (82)	37.0(130)	35.6 (125)	6.3 (8)	21.4(27)	33.3(42)	38.9(49)	χ^2 (3, N=477)=1.90, p=0.59
Father's education	% (n)	2.3(8)	16.8(59)	40.5(142)	40.5(142)	1.6 (2)	27.6(35)	33.1(42)	37.8(48)	χ^2 (3, N=478)=7.19, p=0.07

Note: All respondents had children's check-up data. Parent's BMIs were calculated based on self-report data.

Table C

t-test of Subscale Meanscores between 355 Records and 128 Records

	Mean(SD)		*t*	*p*
	Who cooked most family meals (n=355)	Who didn't cook most family meals (n=128)		
Responsibility	3.63(0.72)	3.22(0.84)	5.38	**0.00**
Perceived parent weight	2.96(0.61)	2.97(0.56)	-0.16	0.87
Perceived child's weight	2.90(0.63)	2.93(0.68)	-0.51	0.61
Concern	2.36(1.17)	2.59(1.28)	-1.87	0.06
Restriction	3.43(0.50)	3.40(0.54)	0.73	0.47
Pressure to eat	3.22(0.58)	3.17(0.59)	0.74	0.46
Communication	3.80(0.50)	3.67(0.52)	2.48	**0.01**
Monitoring	3.14(0.37)	3.13(0.90)	0.10	0.92
Food availability	4.77(1.24)	4.49(1.32)	2.18	**0.03**
Eating patterns	5.69(1.18)	5.66(1.06)	0.26	0.80

Appendix N

Results from the dataset with 483 records

Table A

Internal consistency

Subscales	Number of Items	Cronbach alpha
Perceived responsibility	3	0.61
Perceived parent weight	3	0.65
Perceived child's weight	4	0.67
Concern	3	0.87
Restriction	10	0.79
Pressure	4	0.54
Communication	5	0.75
Monitoring	4	0.89
Food availability	4	0.63
Eating patterns	4	0.45

Table B

Demographic Information

	Mean Age (SD)	Underweight	Overweight	Obesity	Education			
					Elementary school or less	Middle school	High school	College and/or graduate school
Parent*								
Father	42.7 (4.04)	2.2%	40%	15.9%	1.9%	19.9%	38.5%	39.7%
Mother	40.2 (3.40)	7.0%	24.8%	8.3%	4.6%	22.9%	36.1%	36.5%
Total	41.5 (3.93)	4.6%	34.3%	12.8%	3.2%	21.4%	37.3%	38.1%
Children					N/A			
Boy	13.6 (0.76)	4.4%	23.0%	14.9%				
Girl	13.5 (0.67)	6.4%	16.7%	4.7%				
Total	13.6 (0.72)	5.4%	19.9%	10.0%				
Family monthly income: Average 5823 Yuan (858 USD) Median 4 000 Yuan (598 USD)								

*The prevalence of overweight and obesity in parents is based on self-report data.

Table C

Response rates, Means (M) and Standard Deviation (SD) of Individual Items

	Response n (%)							
	1	**2**	**3**	**4**	**5**	**NR**	**M**	***SD***
13. Your child during the first year of life	41(8.5)	101(20.9)	184(38.1)	134(27.7)	21(4.3)	2(0.4)	2.99	1.00
14. Your child as a pre-schooler	38(7.9)	154(31.9)	212(43.9)	72(14.9)	6(1.2)	1(0.2)	2.70	0.86
15. Your child from 3rd to 5th grade	27(5.6)	111(23.0)	223(46.2)	112(23.2)	9(1.9)	1(0.2)	2.93	0.87
16. Your child currently is	17(3.5)	106(21.9)	229(47.4)	107(22.2)	23(4.8)	1(0.2)	3.03	0.88
					Subscale summary		**2.91**	**0.65**

Response option:1=markedly underweight, 2=underweight, 3=normal, 4=overweight, 5=markedly overweight

Notes: NR=No response

Table D

Response Rates of Parental Concern

	Response n (%)							
Items	**1**	**2**	**3**	**4**	**5**	**NR**	***M***	***SD***
17. How concerned are you about your child eating too much when you are not around him/her?	196 (40.6)	102 (21.1)	119 (24.6)	39 (8.1)	25 (5.2)	2 (0.4)	2.16	1.19
18. How concerned are you about your child having to diet to maintain a desirable weight?	157 (32.5)	92 (19.0)	87 (18.0)	59 (12.2)	73 (15.1)	15 (3.1)	2.55	1.42
19. How concerned are you about your child becoming overweight?	157 (32.5)	92 (19.1)	87 (18.1)	59 (12.2)	73 (15.1)	15 (3.1)	2.57	1.45
				Subscale summary			**2.42**	**1.21**

Response option :1=unconcerned, 2=a little concerned, 3=concerned, 4=fairly concerned, 5=very concerned

Notes: NR=No response

Table E

Response Rates of Perceived Feeding Responsibility and Feeding Strategies

	Response n (%)							
Items	**1**	**2**	**3**	**4**	**5**	***NR***	***M***	***SD***
Perceived responsibility *Response option: 1=never, 2=seldom, 3=half of the time, 4=most of the time, 5=always*								
7. When your child is at home, how often are you responsible for preparing his/her meals?	7 (1.4)	48 (9.9)	59 (12.2)	179 (37.1)	187 (38.7)	3 (0.6)	4.02	1.02
8. How often are you responsible for deciding what your child's portion sizes are?	87 (18.0)	159 (32.9)	78 (16.1)	109 (22.6)	49 (10.1)	1 (0.2)	2.74	1.27
9. How often are you responsible for deciding if your child has eaten the right kind of foods?	7 (1.4)	59 (12.2)	75 (15.5)	215 (44.5)	126 (26.1)	1 (0.2)	3.82	1.00
						Subscale summary	**3.52**	**0.77**
Restriction *Response option: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree*								
20. I have to be sure that my child does not eat too many sweets.	7 (1.4)	26 (5.4)	202 (41.8)	186 (38.5)	60 (12.4)	2 (0.4)	3.55	0.83
21. I have to be sure that my child does not eat too many fried foods.	7 (1.4)	21 (4.3)	135 (28.0)	233 (48.2)	86 (17.8)	1 (0.2)	3.77	0.84
22. I have to be sure that my child does not eat too much of his/her favorite foods.	4 (0.8)	49 (10.1)	230 (47.6)	163 (33.7)	32 (6.6)	5 (1.0)	3.36	0.79

Table E

Response Rates of Perceived Feeding Responsibility and Feeding Strategies (continued)

Items	Response n (%) 1	2	3	4	5	*NR*	*M*	*SD*
Restriction *Response option: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree*								
23. I have to be sure that my child does not eat too much of snacks.	7 (1.4)	34 (7.0)	152 (31.5)	216 (44.7)	73 (15.1)	1 (0.2)	3.65	0.87
24. I have to be sure that my child does not drink too much soft drinks.	10 (2.1)	31 (6.4)	138 (28.6)	189 (39.1)	115 (23.8)	0	3.76	0.96
25. I intentionally keep some foods out of my child's reach.	9 (1.9)	18 (3.7)	77 (15.9)	261 (54.0)	117 (24.2)	1 (0.2)	3.95	0.85
26. I offer sweets to my child as a reward for good behaviors.	38 (7.9)	190 (39.3)	168 (34.8)	72 (14.9)	9 (1.9)	6 (1.2)	2.63	0.90
27. I offer my child his/her favorite foods in exchange for good behaviors.	12 (2.5)	94 (19.5)	215 (44.5)	140 (29.0)	19 (3.9)	3 (0.6)	3.12	0.86
28. If I did not guide or regulate my child's eating, he/she would eat too many junk foods.	31 (6.4)	118 (24.4)	133 (27.5)	168 (34.8)	31 (6.4)	2 (0.4)	3.10	1.05
29. If I did not guide or regulate my child's eating, he/she would eat too much of his/her favorite foods.	15 (3.1)	70 (14.5)	167 (34.6)	205 (42.4)	25 (5.2)	1 (0.2)	3.32	0.90
						Subscale summary	**3.42**	**0.51**
Pressure to eat *Response option: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree*								
30. My child should always eat all of the food in his/her bowl.	2 (0.4)	39 (8.1)	101 (20.9)	244 (50.5)	97 (20.1)	0	3.82	0.86
31. I have to be especially careful to make sure my child eats enough.	1 (0.2)	41 (8.5)	153 (31.7)	223 (46.2)	60 (12.4)	5 (1.0)	3.63	0.82
32. If my child says ``I'm not hungry'', I try to get him/her to eat anyway.	56 (11.6)	192 (39.8)	141 (29.2)	75 (15.5)	16 (3.3)	3 (0.6)	2.59	1.00
33. If I did not guide or regulate my child's eating, he/she would eat much less than he/she should.	28 (5.8)	169 (35)	176 (36.4)	99 (20.5)	10 (2.1)	1 (0.2)	2.78	0.91
						Subscale summary	**3.20**	**0.58**
Monitoring *Response option: 1=never, 2=seldom, 3=half of the time, 4=most of the time, 5=always*								
39. How much do you keep track of the sweets that your child eats?	49 (10.1)	100 (20.7)	171 (35.4)	113 (23.4)	50 (10.4)	0	3.03	1.12
40. How much do you keep track of the snack food that your child eats?	42 (8.7)	99 (20.5)	176 (36.4)	122 (25.3)	44 (9.1)	0	3.06	1.08
41. How much do you keep track of high-fat (fried) foods that your child eats?	40 (8.3)	91 (18.8)	154 (31.9)	141 (29.2)	56 (11.6)	1 (0.2)	3.17	1.12
42. How much do you keep track of soft drinks that your child drinks?	32 (6.6)	73 (15.1)	150 (31.1)	164 (34)	62 (12.8)	2 (0.4)	3.31	1.09
						Subscale summary	**3.14**	**0.95**

Notes: NR=No response

Table F

Communication about Weight and Healthy Eating

Items	Response n (%) 1	2	3	4	5	NR	*M*	*SD*
Response option: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree								
34. I often talk with my child about why he/she should or should not eat certain food.	4 (0.8)	26 (5.4)	130 (26.9)	257 (53.2)	64 (13.3)	2 (0.4)	3.73	0.79
35. I feel confident talking about healthy eating with my child.	3 (0.6)	10 (2.1)	156 (32.3)	249 (51.6)	60 (12.4)	5 (1.0)	3.74	0.72
36. I feel confident talking about weight related topics with my child.	3 (0.6)	20 (4.1)	209 (43.3)	214 (44.3)	37 (7.7)	0	3.54	0.72
37. I think that it is important to discuss healthy eating.	3 (0.6)	81 (16.8)	290 (60)	106 (21.9)	3 (0.6)	0	4.04	0.64
38. I think it is important to discuss weight related topics with my child.	1 (0.2)	9 (1.9)	162 (33.5)	242 (50.1)	68 (14.1)	1 (0.2)	3.76	0.72
						Subscale summary	**3.76**	**0.51**

Notes: NR=No response

Table G

Food Availability and Eating Patterns by Days A Week

Items	Response n (%) 0	1	2	3	4	5	6	7	NR	*M*	*SD*
43. Fruits at home	1 (0.2)	1 (0.2)	24 (5.0)	35 (7.2)	33 (6.8)	53 (11.0)	52 (10.8)	279 (57.8)	5 (1.0)	5.89	1.60
44. Sweets at home	27 (5.6)	63 (13.0)	98 (20.3)	77 (15.9)	49 (10.1)	42 (8.7)	23 (4.8)	94 (19.5)	10 (2.1)	3.58	2.24
45. Fried food at home	120 (24.8)	144 (29.8)	95 (19.7)	58 (12.0)	16 (3.3)	15 (3.1)	6 (1.2)	18 (3.7)	11 (2.3)	1.71	1.72
46. Soft drinks	74 (15.3)	103 (21.3)	82 (17.0)	64 (13.3)	42 (8.7)	28 (5.8)	20 (4.1)	65 (13.5)	5 (1.0)	2.81	2.30
									Subscale summary	**4.70**	**1.26**
47. Breakfast at home	41 (8.5)	29 (6.0)	26 (5.4)	24 (5.0)	25 (5.2)	37 (7.7)	39 (8.1)	258 (53.4)	4 (0.8)	5.17	2.46
48. Dinner together at home	8 (1.7)	9 (1.9)	6 (1.2)	27 (5.6)	22 (4.6)	29 (6.0)	51 (10.6)	328 (67.9)	3 (0.6)	6.12	1.64
49. Eat out at restaurant	127 (26.3)	186 (38.5)	86 (17.8)	39 (8.1)	11 (2.3)	12 (2.5)	6 (1.2)	10 (2.1)	6 (1.2)	1.44	1.51
50. Purchasing take-out food for family meals	207 (42.9)	150 (31.1)	64 (13.3)	24 (5.0)	13 (2.7)	5 (1.0)	4 (0.8)	12 (2.5)	4 (0.8)	1.12	1.51
									Subscale summary	**5.68**	**1.15**

Note: NR=No response

Table H

Pearson correlation of Subscales and Children's BMI z-scores

Subscales	***r***	***p***
Responsibility	-0.05	0.31
Perceived parent weight	0.14	0.002
Perceived child's weight	0.58	<0.001
Concern	0.48	<0.001
Restriction	0.16	<0.001
Pressure to eat	-0.24	<0.001
Communication	0.05	0.23
Monitoring	0.14	0.002
Food availability	0.11	0.02
Eating patterns	-0.01	0.85

Table I

Regression Analysis of the Feeding Practices and Children's BMI z-scores

	Beta	***B***	R^2	***t***	***p***
Dependent variable: Children's BMI z score					
Independent variables:					
Restriction	0.16	0.37	0.03	3.26	0.00
Pressure to eat	-0.24	-0.48	0.07	-5.21	0.00
Monitoring	0.03	0.04	0.00	0.58	0.56
Communication	-0.01	-0.02	0.00	-0.15	0.88
Food availability	0.09	0.08	0.01	1.73	0.08
Eating patterns	-0.07	-0.07	0.00	-1.37	0.17
Adjusted variables:					
Family income	0.04	0.00	0.00	0.90	0.37
Father's education (dummy coded)					
Elementary school vs College or above	-0.03	-0.24	0.00	-0.58	0.57
Middle school vs College or above	0.02	0.07	0.00	0.38	0.71
High school vs College or above	0.03	0.06	0.00	0.45	0.65
Mother's education (dummy coded)					
Elementary school vs College or above	-0.05	-0.25	0.00	-0.84	0.40
Middle school vs College or above	-0.02	-0.06	0.00	-0.34	0.74
High school vs College or above	0.04	0.10	0.00	0.69	0.49
Father's BMI	0.16	0.05	0.03	3.52	0.00
Mother's BMI	0.28	0.09	0.09	6.19	0.00
Model Summary	Sum of squares		R^2	$F_{(15, 391)}$	*p*
	Regression	123.90	0.23	7.95	<0.001
	Residual	406.32			