CHILD CAREGIVER FEEDING BEHAVIORS, CHILD EATING BEHAVIORS, AND WEIGHT STATUS OF PRESCHOOL-AGED CHILDREN IN THE UNITED STATES AND CHINA

By

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ABSTRACT OF THE THESIS

“MATERNAL FEEDING BEHAVIOR, CHILDREN’S EATING BEHAVIOR, AND WEIGHT STATUS AMONG PRESCHOOL AGED CHILDREN IN THE UNITED STATES”

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Childhood obesity is an expanding problem throughout the world, with the prevalence varying considerably worldwide. A greater understanding of child caregiver feeding behaviors and child eating behaviors and the relationship of these behaviors to children’s weight status is needed. Thus, one purpose of this study was to explore these relationships in preschool-age children in the United States. A second purpose was to compare findings from the United States with a comparable study conducted in China to explore cross-cultural differences. The online Home Obesogenicity Measure of EnvironmentS (HOMES) survey conducted in the United States with 412 mothers of children aged 3 to 5 years was analyzed and compared with similar survey data collected from 768 caregivers of children aged 3 to 5 years living in China. These surveys gathered sociodemographic data and assessed child feeding practices and child eating behaviors. The secondary analysis of U.S. data revealed mothers had low concern with child weight and their concern did not differ by child BMI status. The 5 types of child feeding practices assessed (i.e., pressures child to eat, restricts child food intake, rewards child with food, controls child food access, and controls child intake) showed no significant differences by child BMI status. When comparing children’s eating behaviors (i.e., food
neophobia, child self-regulation, and emotional eating) by child BMI status, few significant differences were noted. Thus, the data from this sample of mothers from the United States indicate that their child feeding behaviors and their children’s eating behaviors did not differ by the BMI status of their preschool children. Concern about child weight, caregiver feeding behaviors, and child eating behaviors of U.S. mothers were compared with China caregivers. China caregivers had higher concern about child weight and used pressure and controlling child feeding behaviors more than U.S. mothers. While China caregivers reported that children exhibited less frequent food neophobia behaviors than their U.S. counterparts, both groups of participants reported similar child eating self-regulation behaviors. China child emotional eating scores were higher than U.S. children. The reasons for these differences in U.S. mothers and China caregivers are not clear, however they may be related to parenting styles. Traditionally, Chinese parenting is considered authoritarian emphasizing high standards and a tendency to control children. Whereas, in the U.S., permissive and authoritative parenting are common. Permissive parents tend to accept and reinforce a child's impulses, desires, and actions with little or no redirection. Authoritative parents attempt to direct children in a rational and logic driven manner. The findings of the China study suggest that the low control over child eating exerted by caregivers, greater child self-regulation, food neophobia, and emotional eating were associated with a higher child weight status. With the exception of emotional eating, these findings are in contrast with studies conducted in the U.S. Future research should model these relationships and aim to investigate why the associations in the study of China caregivers tend to differ from research conducted in Western countries. These findings can inform the development of culturally tailored
nutrition education interventions. Additionally, future studies should investigate how parenting styles affect child feeding and child eating behaviors and aim to understand impact of cultural differences on these behaviors.
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CHAPTER ONE: INTRODUCTION

Childhood obesity is an expanding problem throughout the world, with the prevalence varying considerably worldwide.¹ For example, in the United States, about 17% of children and adolescents are categorized as obese.² Europe and parts of the Western Pacific have overweight and obesity rates similar to the United States.² According to the latest statistics from China, the proportion of children under the age of 15 with obesity increased from 15% in 1982 to 27% today.³

Obesity is a health condition that results in many psychological and physical consequences, such as depression, poor self-esteem, hypertension, hyperlipidemia, diabetes, and sleep apnea.² In addition, children with obesity who were followed up until adulthood were much more likely to suffer from cardiovascular and digestive diseases than their non-obese peers.² Excess body fat also increases the risk of numerous forms of cancer, such as breast, colon, esophageal, kidney, and pancreas.⁴

Many factors affect children’s weight status. These include dietary patterns, physical activity, sleep, home environment, socioeconomic conditions, and psychological factors.² Among the predisposing factors contributing to increased prevalence of childhood obesity is the popularity of fast food, physical inactivity, short sleep times, lack of support for weight healthy behaviors in the home, limited income, and mental illness.²,⁵,⁶ Parent and caregiver feeding behaviors also are bidirectionally associated with children’s eating behaviors and their weight status.⁷

There are a variety of reasons parents interact with their children in specific ways at snack and mealtimes. It may be the parent’s preconception of how much a child should weigh or how they should look as compared to the parent’s ideal of a healthy child.⁸ Gender bias and
societal attractiveness standards are documented influences on parental feeding strategies. For example, greater emphasis on managing the weight and eating habits of daughters rather than sons may result from parental awareness of female physical attractiveness societal standards. Family affluence and parent education level influence all adults’ behaviors to some degree, including child feeding behaviors. Family affluence level is a determinant of many factors including food availability, availability of physical activity opportunities, and parent stress level. In situations where financial resources are limited, mothers may pressure children to eat so they do not waste food that is available. If resources are plentiful, maternal habits may increase parental leniency about discarding leftover food and encouraging snacking if child expresses hunger. Parent personality characteristics, mental and physical health, and lifestyle circumstances, such as single parent status and employment status, are other considerations that can affect parent feeding behaviors. For instance, low levels of maternal emotional sensitivity or responsiveness are associated with poorer child self-regulation behaviors and maternal use of fewer positive feeding practices. Parental self-efficacy for feeding children a healthy diet and helping them keep their weight healthy is another factor to consider as a predictor of parenting practices. Mothers who believe in their own abilities to provide a healthful household food structure are more likely to encourage their children to make independent food choices within parameters set by mothers. Cultural and community norms also can impact family eating habits and, therefore, parent feeding practices. Less acculturated parents in certain groups, such as acculturating Hispanic mothers, may utilize behaviors such as pressuring children to eat, rewarding children using food, and offering sweets more often than parents who are more acculturated. Depending on a child’s eating behavior phenotype, parents may adjust their feeding behaviors to increase or decrease consumption of specific types of foods. For example,
when parents are concerned that children are frequently eating less healthy foods, such as high sugar, high fat, or sugar-sweetened beverages, they may try to restrict consumption of these foods. Finally, parent age and the presence of older siblings influences their feeding behaviors. In families with older siblings, sibling exposure to more advertising, school and social eating experiences, as well as busy schedules and reliance on prepared meal options can create an environment where there are more opportunities for children to be exposed to salty snacks, sweets, and fast food.

Individual child eating phenotypes also contribute to child weight status. Children may exhibit many eating behaviors such as emotional eating, food neophobia and pickiness, varying levels of satiety and hunger responsiveness, and external eating for reasons other than hunger. Children who overeat when they are upset or worried can consume additional calories thus putting them at risk for increased weight status. Food neophobia can impact the quality of children’s diets. Depending on the foods that are avoided or consumed, their dietary requirements may not be met and non-nutritious choices may be more prevalent. The development of self-regulation behaviors (i.e., appropriate responsiveness to satiety and hunger signals) is associated with positive health outcomes in childhood into adulthood. There are multiple reasons that children have varying degrees of self-regulation, such as greater autonomy of food choices and decreased parental control over food intake. Eating for reasons of enjoyment, boredom, presence of desirable items, or for any other non-physiological reason can cause overconsumption of food, especially at times other than meals. This, in turn, can result in decreased consumption at meals where nutritious foods are most likely present.

A greater understanding of child caregiver feeding behaviors and child eating behaviors and the relationship of these behaviors to children’s weight status is needed. Thus, one purpose
of this study was to explore these relationships in preschool-age children in the United States. A second purpose was to compare findings from the United States with a comparable study conducted in China to explore cross-cultural differences. This study’s research questions are as follows:

Research Question 1: What are the relationships between child caregiver feeding behaviors and child eating behaviors and child weight status as reported by maternal caregivers of preschool children in the United States?

Research Question 2: How do child caregivers’ feeding behaviors and child eating behaviors reported by mothers in the United States differ from those reported by child caregivers in China?

Findings from this study may inform the development of nutrition education interventions to help parents make more thoughtful choices regarding child feeding situations and to promote the development of self-regulation behaviors which could improve child health outcomes thus having a positive effect on their weight status. Child eating behaviors and caregiver feeding behaviors have immediate consequences on child health outcomes as well as for their long-term health trajectory. Gaining understanding of the complex interactions that occur between mother and child during feeding interactions will benefit families who strive to provide their children with the best opportunities for long term physical and psychological health.
CHAPTER TWO: LITERATURE REVIEW

The following literature review is organized by key topics related to this study’s research questions. The topics include childhood obesity rates, factors affecting children’s weight status, caregiver feeding behavior, and preschool child eating behavior.

Childhood Obesity Rates

Childhood obesity is an expanding problem throughout the world. Globally, 39 million children under the age of 5 were overweight or obese in 2020. In the United States, currently about 17% of children and adolescents are categorized as obese. In China, the childhood obesity rate is 27%. Within the past 3 decades, childhood obesity prevalence in the U.S. has more than doubled in children and tripled in adolescents. In China, the prevalence has increased 12% in the last 3 decades.

Obesity results in many psychological and physical consequences, such as depression, poor self-esteem, hypertension, hyperlipidemia, diabetes, and sleep apnea. In addition, children with obesity who were followed up until adulthood were much more likely to suffer from cardiovascular and digestive diseases than their non-obese peers. Excess body fat increases the risk of numerous forms of cancer, such as breast, colon, esophageal, kidney, and pancreas.

Factors Affecting Young Children’s Weight Status

Many factors affect children’s weight status. These include dietary patterns, physical activity, sleep, home environment, socioeconomic conditions, and psychological factors.

Children’s dietary patterns in the United States are characterized by high intakes of added sugars and fat and limited intake of fruits, vegetables, milk, and whole grains. These dietary patterns can affect children’s weight status in a negative way. Empty calories from fruit drinks, dairy and grain desserts, whole milk, and other sources account for approximately 40% of the daily calorie intake of children ages 2-18 years old. These calories are mostly from added
Intake of these foods is a main reason why children’s diets tend to be much higher than the 10% of calories recommended for added sugars and the 30 to 35% of calories from fat recommended by the Dietary Guidelines for Americans. Most children do not eat the recommended serving of 1-2 cups of fruits and vegetables daily. They also do not consume the 2-2½ cups of low fat milk or yogurt and 3-5 servings of whole grains daily. Children who eat the recommended servings of fruits and vegetables, whole grains, and low fat milk and control intakes of added sugar and fat have healthier body weights than those who do not.

Children’s level of physical activity contributes to weight status. Physical activity offers numerous physiological and psychological benefits for young children and higher intensity physical activity is strongly associated with a healthy BMI. Physical activity guidelines recommend that preschool children get at least 3 hours of physical activity daily spread throughout the day with a variety of both indoor and outdoor play. All movement counts; for example jumping, walking, dancing, and swimming are acceptable physical activities. In addition, television and computer exposure should be limited to less than 2 hours daily. In the United States, many children ages 2-5 years fall short of these physical activity and sedentary behavior goals. In fact, only 2%–41% of their day is spent involved in moderate to vigorous physical activity and 4%–33% in light physical activity and children spend an average 34%–94% sedentary. Children were more likely to meet physical activity recommendations when parents are active with their children. Sufficient physical activity during the preschool years is especially important because it is a predictor in future activity levels.

Children’s sleep patterns, such as inadequate or interrupted sleep, can adversely affect weight status. Sleep recommendations for children 1- to 2-years-of-age are 11 to 14 hours per 24 hours (including naps) on a regular basis to promote optimal health. Children 3- to 5-years-of-
age should sleep 10 to 13 hours per 24 hours (including naps). In the United States, children average 37 minutes less sleep per 24 hours than recommended. Children who sleep an adequate amount have health benefits of improved attention, emotional regulation, quality of life, and mental and physical health. Regularly sleeping fewer hours than recommended is associated with attention, behavior, and learning problems, hypertension, obesity, and diabetes.

The dietary patterns and physical activity of young children are shaped primarily by the home environment. The home environment, especially mealtimes, are important factors affecting child weight status. The more frequent family meals are, the greater the positive effect on child BMI. Longitudinal research indicates that frequency of family meals during childhood predicts reduced risk for obesity in adulthood. Shared family mealtimes also are linked to other positive child health outcomes, such as higher consumption of healthy foods, lower consumption of unhealthy foods, and healthier eating patterns in general.

Family meals also provide opportunities for children to learn to healthy eating behaviors. For instance, a structured food environment that provides a regular pattern of meals and snacks throughout the day that are comprised of healthy foods supports children’s ability to self-regulate dietary intake. Children tend to be able to better regulate their intake in response to hunger and satiety signals when family meals are calm and routine than when mealtimes are hectic. Children are more likely to meet fruit and vegetable intake recommendations when parents role model eating these foods at meals and snacks.

Distractions including electronics, television, or a chaotic environment involving excessive disruptions or arguments can have a negative impact on the quality of family mealtimes. During mealtimes when no distractors were present, children demonstrate fewer fussy eating behaviors. Research findings suggest the importance of parents providing
structured mealtimes where the family eats together and distractions are minimal. This type of high quality family mealtime is associated with positive child eating traits such as autonomous self-regulation, especially when children have additional opportunities to participate in determining their portion sizes and food choices. Healthy weight status is associated with this type of setting based on current knowledge related to the home environment and parent feeding behaviors.

Opportunities for movement in the home environment are associated with children’s physical activity. Access to outside play areas, having other children nearby to play with, parent knowledge, and positive mother–child interactions provide contextual factors associated with increased physical activity. For example, one study found that children whose parents received information on how, when, and where to encourage their child’s physical activity, spent more time playing outdoors in comparison to children whose parents received no information.

Many young children also spend time outside the home in preschool and daycare settings which can affect both their dietary intake and physical activity level. For example, kids may be introduced to new foods in preschool settings that affect their food preferences. In addition, when increased amount of fruits, vegetables, whole grains, and lean meats are served in preschool classrooms, children increase their intakes of these food groups in this setting. At school, children also have the opportunity to observe the eating behaviors of other children and caregivers. When children have the opportunity to try new foods that are modeled by caregivers, they are more likely to try the food.

Three-fourths of U.S. preschool-age children spend time in child care centers. Children are primarily sedentary in these settings, and are not meeting the recommended levels of physical activity. Several barriers to physical activity in these settings include time limitations, financial
constraints, cultural educational achievement expectations, and safety regulations about equipment design and use within the preschool environment.  

Modifiable preschool characteristics, such as formalized physical activity policies and more time spent outdoors, were positively associated with increased levels of physical activity during preschool hours. The incorporation of formalized physical activity policies can increase the daily amount of time spent outdoors.

Low income status disproportionately affects the obesity rate for children, with prevalent rates of obesity being negatively correlated with income. A variety of factors including lower parent education level, less access to fresh fruits and vegetables, as well as less access to physical activity opportunities contribute to higher obesity rates in low income populations. Cultural beliefs and community conditions, such as food insecurity and limited support networks, also influence the ability of families to provide adequate nutritious food on a consistent basis.

Personal, parental, and family psychological status contribute to an overall stressful or calm feeling in the household. As discussed, consistent calm family mealtimes are beneficial to child, providing routine and structure that is associated with better self-regulation result in a more healthful weight status. In cases where a high level of emotional stress is present, eating can become irregular and have a negative result on weight status. High levels of stress in the home also can reduce the quality and duration of sleep and may hinder self-care, such as getting enough exercise.

Factors Affecting Child Caregiver Feeding Behaviors

Parents’ feeding behaviors impact the development of children’s eating behavior and their corresponding weight status. There are a variety of reasons parents interact with their children in specific ways at snack and meal times. It may be the parent’s preconception of how
much a child should weigh or how they should look as compared to the parent’s ideal of a healthy child. Gender bias and societal attractiveness standards are documented influences on parental feeding strategies. Family affluence and parent education level also influence parents’ child feeding behaviors. Family affluence level is a determinant of many factors, including food availability, availability of physical activity opportunities, and parent stress level. Parent mental and physical health and lifestyle circumstances, such as single parent status and employment status, are other considerations that can affect parent feeding behaviors. Parental self-efficacy for feeding children a healthy diet and helping them keep their weight healthy is another factor to consider as a predictor of parenting practices. Cultural and community norms also can impact family eating habits and, therefore, parent feeding practices. Depending on a child’s eating behavior phenotype, parents may adjust their feeding behaviors to promote the child’s increased consumption of the desired healthful foods. Conversely, when a parent is concerned that the child is frequently eating less healthy foods such as high sugar, high fat, or sugar sweetened beverages they may try to modify the consumption of these foods. Finally, parent age and the presence of older siblings influences parent feeding behaviors.

The desire of parents to create an optimal health environment for their children as well as the desire to meet society attractiveness standards is a determinate of how parents choose to feed their children. Parental concern that children are or may become overweight is associated with an increase in parental restrictive feeding. Restrictive feeding is when parents intend to control a child’s intake of certain foods, often highly palatable, high calorie foods. Parents might control children’s intake with the purpose of limiting unhealthy foods or decreasing energy intake to reduce or maintain a child’s weight.
Parental weight concern often is greater for female children who parents may see as overweight even when at a healthy weight whereas male children may be perceived to be a healthy weight even when they are overweight. The difference in ability to discriminate between healthy weights of male and female children may be attributable to Western cultural norms that favor slender body types for girls, and promote the perception that overweight boys are strong. Higher levels of parental concern about child weight and the use of more restrictive feeding practices among parents of girls is well documented. Parents’ greater emphasis on managing the weight and eating habits of daughters, rather than sons, can result from parents’ awareness of societal standards of female physical attractiveness and convey these standards to their children. The more that a parent perceives their children to be outside of the desired weight status, the more likely the parent is to use restrictive feeding practices at meals and snacks.

Parents who perceive their children as having a small appetite are more likely exert pressure to eat more at meals and snacks than the child wants to eat. However, parental perceptions of a small appetite do not necessarily mean that the child is eating too little. Perceptions of a small appetite may reflect parents’ difficulties in assessing appropriate portion sizes and recommended intake for preschoolers, or their lack of trust in the child’s ability to self-regulate food intake.

Family affluence and socioeconomic predictors, such as parent education level and occupation, influence multiple aspects of family life including food availability, physical activity opportunities, and parent stress and emotional status. Parent education level and family affluence are strongly and positively correlated. Maternal education, including knowledge of and attitudes towards healthy eating, self-efficacy related to maintaining a healthy child feeding
environment, child feeding practices, and modelling of healthy behaviors, as well as the quality of foods made available and accessible at home, are associated with healthier dietary patterns across early childhood. Higher maternal education level is associated with significantly lower levels of sweets consumption. Sweets are consumed especially frequently by preschool children whose parents had a low level of knowledge concerning healthy nutrition and let their children decide freely when and where they eat sugary snacks, like candy and dessert foods. Links between maternal education and healthier child diets may be reflective of greater capacity to access, interpret, and put into practice health information. For example, parents’ level of nutrition education may help them serve recommended amount of fruits, vegetables, whole grains, lean proteins, and low-fat dairy. 

Income also can affect child feeding practices. A greater abundance of less nutritious foods (e.g., high sugar, high fat, low-nutrient density foods) was present in households presenting with higher financial hardship. Energy-dense and nutrient-poor diets often cost less than nutrient dense foods, which could indicate why individuals with a constrained budget being more inclined to purchase such items. In addition, a low level of daily moderate to vigorous physical activity is prevalent among low family affluence children. This phenomenon occurs when neighborhoods have less dedicated free space for parks and playgrounds and congested streets make outside play potentially dangerous. Crowded living conditions further add to physical activity opportunities as children have less space to move freely within the home.

Maternal employment status is associated in some instances with children’s consumption of less healthy diets. Compared to children of non-working mothers who presumably have more time to devote to food related tasks such as grocery shopping, cooking, and eating with their children, children of working mothers may not have the opportunity to enjoy the benefits of such
parent involvement because working mothers may not have as much time for those same tasks.\textsuperscript{54} Children of time-stressed working parents may be served more convenience foods, which often are higher in sugar, fat, and calories and lower in fiber.\textsuperscript{13}

Parents’ confidence in their own ability to present their children with a healthy diet influences their child feeding behaviors.\textsuperscript{14,57} Parental confidence in managing child eating behaviors related to keeping weight status healthy is negatively associated with parental child feeding practices of restriction and pressure to eat.\textsuperscript{57} The negative association is indicative of lower confidence in handling problematic child eating behaviors, such as a too large or too small appetite.\textsuperscript{14} Conversely, when parents perceive that a child has a healthy weight status, the inclination to allow children freedom to have more choice relative to their food selection and the quantity of those foods increases.\textsuperscript{18,57}

Depending on the child’s eating behavior phenotype, parents may adjust feeding behaviors to increase consumption of the desired healthy foods.\textsuperscript{58} Conversely, when a parent is concerned that the child is eating too much of high sugar, high fat foods and beverages, they may try to reduce the consumption of these foods by restriction.\textsuperscript{56} When children exhibit a difficult temperament at feeding times, parental restriction and pressure behaviors are common.\textsuperscript{59} Parent use of these feeding practices was higher with difficult temperament children relative to easy temperament children.\textsuperscript{16} Evidence suggests that parental restriction and pressure feeding practices may shape obesogenic eating behaviors.\textsuperscript{16}

Finally, parent age and the presence of older siblings in the home influences parent feeding behaviors.\textsuperscript{14} Dietary patterns the include highly processed, high fat, and high sugar foods are observed more often in children of younger mothers and in children who have older siblings.\textsuperscript{14} Generational differences in lifestyle and/or lower concern with healthy eating
behaviors is seen more often in younger than older mothers.\textsuperscript{14} Older siblings are more exposed to snacks or sweetened beverages, given their larger social network, and may request these foods which introduces these foods in the home and increases their access to younger children.\textsuperscript{14} It is also possible that the other responsibilities parents of larger families yield less time available to purchase and cook healthy foods.\textsuperscript{18} There are many factors on an individual, family, and community level that influence parent feeding behaviors.

**Caregiver Feeding Behaviors**

Coercive control of child feeding behaviors occurs when parents attempt to dominate, pressure, or impose their own will on the child to meet parental goals and desires.\textsuperscript{52} This is an authoritarian approach to feeding. Restrictive feeding, exertion of pressure to eat, and rewarding children for eating are all types of coercive control child feeding behaviors. Coercive control practices provide few opportunities for children to make their own choices about food and eating and to develop self-regulatory skills.\textsuperscript{60} In fact, controlling feeding practices are negatively associated with the development of children’s self-regulatory skills which tends to increase their food intake and ultimately weight status. Controlling practices also are positively associated with increased eating when not hungry, picky eating, and weight status in adulthood.\textsuperscript{60} All of these coercive control feeding behaviors are correlated with higher BMI status in children.\textsuperscript{52}

Restrictive feeding behaviors can be defined as any behavior that limits food intake to a certain amount of calories or to certain foods or food groups.\textsuperscript{61} Parents may use restriction for child weight control and perceived child health improvement. The use of restrictive feeding is associated with lower maternal education and higher concern about child overweight.\textsuperscript{62} Children who experience restrictive feeding in the home tend to overeat restricted foods when they are readily available.\textsuperscript{60} Restrictive feeding is correlated with increased childhood and adulthood
Contrary to the intent of caregivers who restrict children’s intake, food restriction by any means has been linked to problems with overeating and energy balance in children.\textsuperscript{62}

The practice of applying pressure to a child to eat is a controlling, directive feeding practice that aims to increase a child’s food intake regardless of hunger.\textsuperscript{60} Maternal pressure on children to eat specific quantities or specific types of food is associated with future problems with children’s ability to self-regulate their own energy intake.\textsuperscript{64} Mothers may pressure children to eat out of concern that the child is eating too little.\textsuperscript{64} Overprotective parents report higher use of pressuring children to eat and a high level of involvement in child eating.\textsuperscript{58} Pressure exerted on children by parents during mealtimes results in a lack of opportunities for autonomous decision making by children to occur.\textsuperscript{36} Children of authoritarian mothers showed the highest levels of food fussiness and the lowest enjoyment of food.\textsuperscript{65} Ultimately, the use of pressure as a means to control child feeding leads to poor self-regulation and an increase in child weight status as well as a predisposition for obesity in adulthood.\textsuperscript{36}

Parents may use foods, such as candy, to reward or bribe children to behave in a certain way, such as demonstrating good conduct or eating a healthy food, such as vegetables.\textsuperscript{60} Rewards increase children’s food responsiveness, however they are also associated negatively with self-regulation.\textsuperscript{36} Children's preferences and adults' responses to them can strengthen children’s food preference and increase consumption resulting in overweight and obese status.\textsuperscript{66} Food preferences are learned and are modifiable; focusing on young children’s development of healthy eating patterns holds promise for lifelong healthy dietary patterns.\textsuperscript{66}

Positive child feeding behaviors are those where parents are attentive to children’s eating behaviors while providing a positive feeding environment that enables children to exercise some
autonomous control. These styles of child feeding are positively associated with greater enjoyment of food and a lower incidence of food fussiness. Ellen Satter describes competent eaters as “positive, comfortable, and flexible with eating and are matter-of-fact and reliable about getting enough to eat of enjoyable and nourishing food”. Positive feelings about eating and satiety vary greatly based on individual experiences related to food interactions beginning in childhood. Encouragement and modeling of healthy eating and creating an environment where nutritious food is available within a structured setting are linked to healthy weight status in childhood which may continue into adulthood.

Parents who encourage and model healthy eating demonstrate the skills that children need to develop intuitive skills regarding healthful eating practices. Modelling by parents is an effective way to encourage healthy eating, and may contribute to the strong correlations between parental and child diets and food preferences, especially for foods such as fruits and vegetables. Children who are encouraged to eat moderately disliked and/or unfamiliar foods by repeated brief tasting of the target food in a positive social context show improvement in liking or intake. Verbal praise is beneficial and has been shown to produce a long-lasting increase in liking for vegetables. Additionally, foods such as fruits and vegetables should be made as visually appealing as possible to further entice the child in multiple ways. All efforts that encourage consumption of healthy foods through modeling, encouragement, and visual attractiveness help increase consumption of desired foods such as fruits and vegetables.

When the eating environment is structured in a way that allows children the framework to have healthy food available in a safe and predictable setting where there is some freedom of choice, there is an increased likelihood of the development of adequate self-regulation. More supportive approaches, such as questions, suggestions, and offering choices within a structured
environment that limits the types of low-nutrient density/high-calorie foods available and has
regular timing of meals rather than places limits on children's eating behaviors and irregular
mealtimes is associated with better eating self-regulation and growth trajectories. Mealtime
ritualization and a positive climate during family meals is associated with lower incidence of
picky eating behavior. Mealtime ritualization also is positively associated with healthy child
eating behaviors. Parent involvement with family meals, such as parent presence and frequency,
is positively associated with healthy dietary intake in children, particularly for fruits, vegetables,
whole-grains, and calcium-rich foods.

Other factors, such as concern for child weight status, may influence maternal feeding
behaviors. Cultural beliefs influencing maternal perception of healthy weight status may affect
child feeding behaviors more than actual child BMI z-score. For instance if a mother perceives
a child has a low weight status, she may pressure the child to eat whereas if she perceives a child
is overweight or obese, then the mother may tend to use restriction, reward, or monitoring
feeding behaviors. Interventions to increase the accuracy of maternal weight perceptions along
with the use of recommended child feed behaviors are suggested.

**Parenting Style and Child Feeding Behaviors**

Caregiver feeding styles can be viewed as an extension of parenting styles. Parenting
styles can be categorized into 3 categories. Permissive parents tend to accept and reinforce a
child's impulses, desires, and actions with little or no redirection. Authoritative parents attempt to
direct children in a rational and logic driven manner. Authoritarian parenting is the most rigid in
attempting to shape and control child behavior compared to a standard of parent-defined conduct.

Children’s emotional states and personalities are influenced by specific parenting styles. For instance, permissive parenting often results in children with poor emotional regulation and
antisocial behaviors as well as failure to stick with challenging tasks. Authoritative parents tend to have children who behave in a lively and joyful manner with self-confidence about their own abilities. Children with authoritarian parents are often anxious and withdrawn. However, they tend to do well in school and avoid antisocial behaviors.

Traditionally, Chinese parenting is considered authoritarian emphasizing high standards and a tendency to control children through shaming and punishments. Contrary to the belief that authoritarian parenting creates distance between child and parent, strict Chinese parents enjoy a sense of closeness with their children. This parenting style is an attempt to help children behave in a mannered and socially acceptable way and enables children to respect themselves and others. Caregiver feeding behaviors and child eating behaviors are reflective of this caregiver and child interaction.

**Preschool Child Eating Behavior**

Children may exhibit eating behaviors such as emotional eating, food neophobia and pickiness, and varying levels of responsiveness to internal hunger and satiety signals and eating responsiveness to external factors. The development of self-regulating eating behaviors (i.e., eating in response to internal hunger and satiety signals) is associated with positive health outcomes in childhood and adulthood. There are multiple reasons why children vary in their ability to self-regulate dietary intake. This section aims to describe common child feeding behaviors and the effect those behaviors may have on overall child health and weight status.

Emotional eating is eating in response to distress, which may result in overeating or in undereating or food avoidance. Emotional eating may be related to child temperament. A calm and routine family meal environment helps reduce emotional eating. When children know what to expect and have a structured and predictable eating environment, they experience less stress
and emotional distress and are better able to self-regulate dietary intake.\textsuperscript{13} Children who are emotional eaters are at-risk for weight regulation problems.\textsuperscript{73} Emotional eaters who undereat or avoid food are at risk for underweight and growth problems.\textsuperscript{20} Emotional eaters who overeat have a greater risk for high body mass index and a less healthy diet.\textsuperscript{20}

Children who are described as picky or fussy may also have food neophobia which is the reluctance or avoidance of eating particular foods.\textsuperscript{61} Picky eating may be categorized as part of a spectrum of feeding difficulties, as there is a wide degree of variation in expression of picky eating among individuals.\textsuperscript{74} Picky eating is defined by an unwillingness to eat foods that are familiar or reluctance to try new foods.\textsuperscript{74} On the other end of the spectrum are tendencies toward strong food preferences.\textsuperscript{75} Children who exhibit an unwillingness to eat unfamiliar foods or to try new foods or who have strong food preferences to the exclusion of other foods, may be considered picky or fussy eaters.\textsuperscript{74} The consequences may include poor dietary variety. This, in turn, can lead to concern about the adequacy of the nutrient composition of the diet and thus possible adverse health outcomes.\textsuperscript{74} There are many reasons that a child may avoid certain foods, and they may be due to a bidirectional relationship between nonresponsive and structure-related maternal feeding practices.\textsuperscript{76} Nonresponsive feeding situations occur when children’s feelings and preferences are not considered. Additionally, peer modeling, sensory sensitivity, and disgust for foods perceived as undesirable may influence children’s behaviors.\textsuperscript{19} Children who have full control over food choices, without parent guidance, and experience distractions during meals also are at increased risk for picky eating.\textsuperscript{70} However, when positive family mealtimes and routine eating times were implemented as part of an intervention strategy, picky eating decreased and dietary intake improved.\textsuperscript{70}
Responsiveness to satiety and food may affect the dietary patterns of children. Satiety responsiveness, which is the ability to regulate the amount of food consumed based on satiety, is associated with lower energy intake because the child stops eating when the feeling of fullness occur. Food responsiveness and food enjoyment however, are associated with higher energy intake because the desire for food promotes eating past the point of satiety. Impaired food intake regulation among overweight children is associated with low satiety responsiveness, high food responsiveness, and greater food intake. As with food pickiness, interventions including family mindful eating exercises that promote recognition of internal hunger and fullness feelings and nutrition education have resulted in improved BMI status.

External eating, which is the tendency to eat in response to external cues, such as sight or smell of food or beverages, may increase vulnerability to overeating. Conditioned eating in response to external food cues may also contribute to obesity risk in young children. For example, once the habit of consuming sweet drinks is established, it tends to persist. This unnecessary energy intake as a response to the beverage being present instead of a water contributes to dietary patterns that may last into adulthood. External eating can be in response to readily available snacks within the household with little or no restrictions on eating them or regular snack and mealtime routines. Children are reliant on their caregivers to create a healthful environment where children can make choices within boundaries, thus the home environment is an important contributing factor to children’s opportunities for eating externally.

Preschool-aged children display widely varying eating behaviors for many reasons, including their own taste preferences and possible sensory issues, outside influences of caregivers and peers, and emotional and environmental conditions. Self-regulation is the ability to control the level of energy consumption in the presence of external factors avoiding over
consumption. The regulation of eating is automatic in the biological sense of starting and stopping eating in response to hunger and satiety cues, yet this regulation can be adversely influenced by many external factors and lead to energy intakes mismatched to needs. This mismatch often is eating more than is needed and leads to increased adiposity. Much of the literature regarding children’s eating habits supports the belief that when children are not manipulated in any way but offered healthful foods at regular, routine meals and snacks, healthful self-regulation occurs. In other words, allowing children to develop their own eating habits and eating styles within a healthy lifestyle framework seems to be an effective long-term obesity prevention strategy.

Conclusion

There is strong evidence that child eating behaviors and caregiver feeding behaviors are bidirectionally related. Evidence supports the conclusion that child eating behaviors and caregiver feeding behaviors have immediate and long-term implications concerning child health outcomes. Childhood obesity has reached all-time high rates throughout the world and interventions are necessary to stop the devastating physical and psychological effects related to increased child weight status. Maternal feeding practices in the home as well as child eating patterns within the home and outside the home should be considered. Specifically, restrictive and pressuring maternal/caregiver feeding behaviors should be avoided as they have been associated with higher child weight status. Providing children with the opportunity to make some choices within a structured framework of healthy foods and calm, routine mealtimes teaches them the skills necessary to implement their inborn self-regulatory behaviors. Children who are able to self-regulate make healthier dietary choices and, thus, will have better health incomes in both the short and long term.
CHAPTER THREE: METHODS

This study was a secondary analysis of the online Home Obesogenicity Measure of EnvironmentS (HOMES) survey conducted in 2013. The goal of the study reported here was to describe the maternal caregiver feeding practices and child eating behaviors of survey participants and their relationship to child weight status. A second goal was to compare mothers in HOMES survey who resided in the United States with similar survey data collected from caregivers of young children living in China. These surveys gathered data about sociodemographic and weight-related psychographic characteristics, behaviors, and physical environment characteristics of the home.

HOMES Study Participants

Participants in the HOMES survey were mothers of young children. Recruitment of participants was conducted by Survey Sampling International (SSI). This company is a for-profit organization that awards points for survey completion. The points are later used by participants to obtain gift cards for payment. To participate in the study, mothers had to be between 18 to 45 years old. The study participants also could not be employed in any health profession or have a spouse/live-in partner employed in the healthcare field. They were required to be the main household food gatekeeper. Participants had to be able to read and write in English. An additional criterion for the study reported here is that the mothers had to have at least one child aged 3 to 5 years of age.

HOMES Instruments

The survey instrument, HOMES, was posted online using Qualtrics® for convenient collection of data from participants. The survey collected sociodemographic and child anthropometric data and assessed maternal concern regarding child weight, maternal feeding
practices, and child eating behaviors. The instruments described below are those in the HOMES survey.

**Sociodemographic Information.** Maternal sociodemographic information collected in the HOMES study included participant age and education level, child sex and age, and family affluence. The Family Affluence Scale is considered a reliable indicator of family socioeconomic status and includes 4 items that generate scores ranging from 0 to 9; higher scores indicate greater family affluence. Race/ethnicity, marital status, number of children under age 18 years in the home, U.S. region of residence (i.e. Eastern, Midwestern, Southern, and Western), and food insecurity risk also were collected in the HOMES study. Food insecurity risk was assessed with Hager et al’s 2-item scale, which generates a score of 1 to 4 with higher scores indicating greater risk.

**Body Mass Index and Weight Perceptions and Concerns.** Mothers reported their height and weight and the height and weight of their child. Mothers who had more than one child in the age range under study were instructed to report on the child born closest to a randomly selected time (i.e., June 1 at noon). Height and weight data were used to calculate maternal BMI using the standard formula. Child height and weight were used to calculate BMI percentile and BMI z-score.

Maternal Perceptions about Child Weight was assessed using a visual scale depicting 7 child body shapes ranging from underweight to obese. Maternal Concerns About Child Weight evaluated concern their child would become overweight. This scale had 2 items (I am concerned that my child will become overweight. I am concerned that my child will have to diet to keep weight under control.). The answer choices for this scale were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree, scored 1 to 5 respectively. The score for
this scale was determined by averaging the item responses, with higher scores indicating greater concern about the child becoming overweight.

**Maternal Feeding Practices.** Maternal feeding practices evaluated were use of pressure, restriction, rewards, control of child food access, and control of child food intake. Maternal use of pressure as a strategy for getting children to eat was measured using a 3-item scale originally based on the Caregiver’s Feeding Styles Questionnaire, Home Environment Inventory, and the Child Feeding Questionnaire. The Pressures Child to Eat scale from the HOMES survey assessed maternal responses to these 3 questions: I really have to pressure my child to eat vegetables, I really have to pressure my child to eat fruit, and I really have to pressure my child to drink milk. Answer choices for these items were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree, scored 1 to 5, respectively. Item scores were averaged to create the scale score, with higher scores indicating greater use of pressure.

Parent restriction of palatable foods was measured using a 2-item scale Restricts Child Food Intake scale that aims to determine whether parents restrict access to salty and sweet snacks foods. These items were originally based on the Parent Feeding Style Questionnaire, an Overt/Covert Control Scale, the Parent Dietary Modeling Scale, the Caregiver Feeding Styles Questionnaire, and the Physical and Nutritional Home Environment Survey. Scale items from the HOMES survey are: I have to make sure my child does not eat too many sweets, like cookies and soda and I have to make sure that my child does not eat too many snacks like potato chips. Answer choices for these items were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree, scored 1 to 5, respectively. Item scores were averaged to create the scale score, with higher scores indicating greater use of restriction.
Rewards Child with Food assessed maternal use of food as a reward using a 3-item scale based originally on a variety of questionnaires including the Caregiver’s Feeding Styles Questionnaire, Parental Feeding Style Questionnaire, Project EAT survey, FEEDS survey, Physical and Nutritional Home Environment Inventory, measures of overt and covert control, Home Environment Survey, and the Child Feeding Questionnaire.\textsuperscript{85,89-91} This scale from the HOMES survey has 3 items: If my preschool kids misbehave, I do not let them have a favorite food; I encourage my preschool kids to eat something by using a reward (for example if you finish your vegetables, you will get a dessert); and I reward my preschool kids with something to eat when they are well behaved.\textsuperscript{85} Answer choices for these items were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree, scored 1 to 5, respectively. Item scores were averaged to create the scale score, with higher scores indicating greater use of incentives.\textsuperscript{85}

Parent control of child food access and child food intake was assessed using a scale originally based on a variety of questionnaires including the Caregiver’s Feeding Styles Questionnaire, Parental Feeding Style Questionnaire, Project EAT survey, FEEDS survey, Physical and Nutritional Home Environment Inventory, measures of overt and covert control, Home Environment Survey, and the Child Feeding Questionnaire.\textsuperscript{85,89-91} The Controls Child Access scale used in the HOMES survey had 2 items: I keep foods that I want my preschool kids to eat in places that are easy for them to see and reach and I keep food I do not want my preschool kids to eat like soda and cookies, in places where they cannot see or reach them. Answer choices for these items were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree, scored 1 to 5, respectively, with the first item reverse scored. Item scores were averaged to create the scale score, with higher scores indicating greater use of parent
control of child food access. The Controls Child Food Intake had two questions: “I decide the amounts of food that my preschool kids eat at meals” answered using a 5-point Likert scale (strongly disagree to strongly agree) and “Which of these foods do you allow your preschool kids to get for a snack without your help?” The second item had 6 food choices potatoes chips, popcorn, crackers, corn chips [like Doritos, tortilla chips, Fritos]; doughnuts, pastries, cookies, cake [like Ho-Hos]; ice cream; candy or candy bars; soft drinks and soda/pop [like Coke or 7-Up]; Fruit drinks or other sugary beverages, that were answered “yes” or “no”. The “yes” answer choices were scored as 1 and the “no” choices as 0. Scores for item 2 were summed to indicate total number of snack foods children could serve themselves. If the sum was 0, 1, 2, 3, 4, 5, or 6, the score assigned was 1, 2, 2, 3, 4, 4, or 5, respectively. Scores of items 1 and 2 were averaged to create the scale score, with higher scores indicating greater control of intake.

**Child Eating Behaviors.** Children’s eating behaviors assessed were food neophobia, self-regulation, and emotional eating. The Food Neophobia scale was adapted for the HOMES survey by selecting the 4 items with the highest factor loading for fussiness in the Children’s Eating Behavior Questionnaire. Neophobia includes food fussiness and unwillingness to try new foods and was assessed with 4 items (i.e., My child enjoys tasting new foods, My child refuses new foods at first, My child decides to not like a food without even tasting it, and My child is interested in tasting food the child hasn’t tasted before). Answer choices for these items were never, seldom, half of the time, most of the time, and always, scored 1 to 5, respectively. Items 1 and 4 were reverse scored. Item scores were averaged to create the scale score, with higher scores indicating greater degree of food neophobia.

Self-regulation items assessed how well child respond to hunger and satiety signals to regulate intake. Items used on the HOMES survey were adapted by selecting items with the
highest factor loadings in the Children’s Eating Behavior Questionnaire and Self-Regulation in Feeding questionnaire. Child Self-Regulation was assessed from the responses of 2 item: Given the chance, my child would eat most of the time and If I allowed it, my child would eat too much. Answer choices for these items were never, seldom, half of the time, most of the time, and always, scored 1 to 5, respectively. Items were reverse scored. Item scores were averaged to create the scale score. Higher scores indicated greater degree of self-regulation.

The Emotional Eating scale assessed how a child’s emotions influence the urge to eat or overeat. This was adapted for the HOMES survey by selecting the 2 items with the highest factor loading items for emotional eating in the Children’s Eating Behavior Questionnaire (i.e., My child eats more when feeling nervous and My child eats more when feeling worried). Answer choices for these items were never, seldom, half of the time, most of the time, and always, scored 1 to 5, respectively. Item scores were averaged to create the scale score, with higher scores indicating greater degree of emotional eating.

**Instruments used in the Caregivers’ Feeding Behavior, Children’s Eating Behavior, and Weight Status among Children of Preschool Age in China Study**

A goal of the study reported here is to compare findings of mothers in United States who completed the HOMES survey with those child caregivers completing similar questionnaires in China. Primary caregivers of preschool children 3-6 years old were the participants in the China study. These dyads were recruited from kindergartens in urban and suburban Xi’an and Jinan City in China. The instruments described below are those used in the China study that are most comparable to the HOMES survey conducted in the United States (Table 1).  

**Sociodemographic Information.** Caregiver demographic information collected in the study conducted in China included participant age, education level, and total monthly household
income. Child age and sex also were collected. In addition, caregiver and child BMI weight status were collected.

**Maternal Concerns about Child Weight** were compared using China caregiver Weight Concerns scale which evaluates the association between parental worry about children’s weight and their daily feeding behaviors and U.S mothers Maternal Perceptions about Child Weight scale which evaluated concern their child would become overweight. Responses to 3 questions were assessed: I am concerned about my child becoming overweight, I am concerned about my child dieting to maintain a desirable weight, and I am concerned about my child eating too much when I am not around her or him. Answer choices are never, rarely, sometimes, often, and always, scored 1 to 5 respectively. The scale score is the mean of the item responses. Higher scores indicate a greater tendency for maternal weight concern.

**Maternal Feeding Practices.** The Forced Feeding scale in the study conducted in China is comparable to the Pressures Child to Eat scale used in the HOMES study. Forced Feeding measures the association between mandatory feeding practices and the children’s healthy eating behaviors. Responses to 3 questions were assessed: At mealtime, I will try to get him or her to eat all of the food off her or his plate in some way (e.g., persuading, playing, and praising); At mealtime, I will try to have him or her eat even if my child says she or he is not hungry; and I have to be especially careful to make sure my child eats enough. Answer choices are never, rarely, sometimes, often, and always, scored 1 to 5 respectively. The scale score is the mean of the item responses. Higher scores indicate a greater tendency for parents to force feed.

The Content Restricted Feeding scale from the Caregivers’ Feeding Behavior scale used in the study conducted in China is comparable to the Restricts Child Food Intake scale used in
the HOMES study. The Content Restricted Feeding scale had 4 items: 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 many of her or his favorite foods, I have to be sure that my child does not eat too many sweets (candy, ice cream, cake or pastries), and I intentionally keep some junk foods out of my child’s reach. Answer choices are never, rarely, sometimes, often, and always, scored 1 to 5 respectively. The mean score is calculated from the response scores to each item. Higher scores indicate a greater tendency for parents to restrict children’s food intake.

The Encourage Healthy Eating scale in the study Caregivers’ Feeding Behavior, Children’s Eating Behavior, and Weight Status among Children of Preschool Age in China study is comparable to the Controls Child Food Access scale. Responses to 6 items were assessed: I will serve my child fresh vegetables and fruits each day, I will serve my child fish products each day, I will encourage my child to try new foods, I will encourage my child to eat healthy foods, I will try to ensure that each meal has a fixed time and place, I will try to ensure that my child I’ll eat healthier, and I will prepare each meal carefully. Answer choices are never, rarely, sometimes, often, and always, scored 1 to 5, respectively. The scale score is the average of the responses to each scale item. Higher scores indicate a greater tendency for parents to encourage health eating.

The Supervised Eating scale in the study Caregivers’ Feeding Behavior, Children’s Eating Behavior, and Weight Status among Children of Preschool Age in China is comparable to the Controls Food Intake scale used in the HOMES study. Supervised Eating evaluates the caregiver monitoring of children’s eating behaviors. Responses to 4 questions were assessed: I will supervise my child so she or he drinks less (e.g., cola, pulpy juices), I will supervise my child so she or he eats less snack food (e.g., potato chips, cheese puffs), I will supervise my child
so she or he eats less high-fat food (e.g., beef jerky, sausage, fried food), and I will supervise my child so she or he eats less sweet food (e.g., candy, ice cream cake, pies, pastries). Answer choices are never, rarely, sometimes, often, and always, scored 1 to 5, respectively. The scale score is the mean of the item scores. Higher scores indicate a greater tendency for caregivers to control amounts children eat.

The Content Restricted Feeding scale in Caregivers’ Feeding Behavior, Children’s Eating Behavior, and Weight Status among Children of Preschool Age in China is comparable to the Children’s Access to Food scale used in the HOMES study. Responses to 4 questions were assessed: 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 many of her or his favorite foods, I have to be sure that my child does not eat too many sweets (candy, ice cream, cake or pastries), and I intentionally keep some junk foods out of my child’s reach. Answer choices are never, rarely, sometimes, often, and always, scored 1 to 5, respectively. The scale score is calculated by averaging item responses. Higher scores indicate a greater tendency for parents to restrict the foods children eat.

Child Eating Behaviors. The Food Fussiness scale use in the study Caregivers’ Feeding Behavior, Children’s Eating Behavior, and Weight Status among Children of Preschool Age in China study is comparable to the Food Neophobia scale used in the HOMES study. The Food Fussiness scale examines the relationship between caregivers feeding styles and preschool children’s eating patterns and the corresponding effect on child weight status. Food fussiness examines whether the child refuses food because of its taste, appearance, smell, or texture using 7 items: My child only eats the foods he/she selected; My child refuses many foods because of the foods smell, taste, appearance, texture, etc.; My child refused foods he/she didn’t eat before; No matter what foods I give him/her during a meal, my child would eat; My child would throw
away, spit out foods he/she does not like; My child enjoys all kinds of food; and My child often loses his/her temper because of the meal. Answer choices were never, seldom, sometimes, often, and always, scored 1 to 5, respectively. Item 6 was reversed scored. The scale score was the mean of the item responses. Higher scores indicate greater food fussiness.

The Food Responsiveness scale used in the study Caregivers’ Feeding Behavior, Children’s Eating Behavior, and Weight Status among Children of Preschool Age in China study is comparable to the Eating Responsiveness scale used in the HOMES study. Food Responsiveness was assessed with 5 items: Usually, my child would become full after eats a few mouths in a meal; My child eats less than other age-matched child; My child has a good appetite; My child always leave foods in his/her dishes when a meal is finished; and No matter how much I give him/her my child would eat completely during a meal. Answer choices were never, seldom, sometimes, often, and always, scored 1 to 5, respectively. Item 5 was reverse scored. Scale score was the average of the item responses. Higher scores indicate greater food responsiveness.

The Emotional Eating scale use in the study Caregivers’ Feeding Behavior, Children’s Eating Behavior, and Weight Status among Children of Preschool Age in China study is comparable to the Emotional Eating scale used in the HOMES study. Emotional Eating assesses eating behaviors when the child experiences negative emotions using 5 items: My child eats more when angry, My child eats more when he/she makes a mistake, My child eats more when worried, My child eats more when nobody play with him/her, and My child eats more when there is nothing else to do. Answer choices are never, seldom, sometimes, often, and always, scored 1 to 5, respectively. Item scores were averaged to create the scale score. Higher
<table>
<thead>
<tr>
<th>HOMES Scale Name</th>
<th>Answer Choices</th>
<th>China Caregiver Study Scale Name</th>
<th>Answer Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Concerns About Child Weight</td>
<td>strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree, scored 1 to 5 respectively. The score for this scale was determined by averaging the item responses, with higher scores indicating greater concern about the child becoming overweight.</td>
<td>Weight Concerns</td>
<td>never, rarely, sometimes, often, and always, scored 1 to 5, respectively; scale score is an average of item responses</td>
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<tr>
<td>1. I am concerned that my child will become overweight.</td>
<td>1. I am concerned about my child becoming overweight.</td>
<td>2. I am concerned about my child dieting to maintain a desirable weight.</td>
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<tr>
<td>2. I am concerned that my child will have to diet to keep weight under control. The answer choices for this scale</td>
<td>3. I am concerned about my child eating too much when I am not around her or him.</td>
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<tr>
<td>Cronbach’s Alpha: 0.904</td>
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<tr>
<td>Pressures Child to Eat</td>
<td>strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree, scored 1 to 5, respectively; scale score is an average of item responses</td>
<td>Forced Feeding</td>
<td>never, rarely, sometimes, often, and always, scored 1 to 5, respectively; scale score is an average of item responses</td>
</tr>
<tr>
<td>1. I really have to pressure my child to eat vegetables</td>
<td>1. At mealtime, I will try to get him or her to eat all of the food off her or his plate in some way (e.g., persuading, playing, and praising)</td>
<td>2. At mealtime, I will try to have him or her eat even if my child says she or he is not hungry</td>
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<tr>
<td>2. I really have to pressure my child to eat fruit</td>
<td>3. I have to be especially careful to make sure my child eats enough</td>
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<tr>
<td>3. I really have to pressure my child to drink milk.</td>
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<td>Cronbach’s Alpha: 0.701</td>
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<tr>
<td>Restricts Child Food Intake</td>
<td>strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree, scored 1 to 5, respectively; scale score is an average of item responses</td>
<td>Content Restricted Feeding</td>
<td>never, rarely, sometimes, often, and always, scored 1 to 5, respectively; scale score is an average of item responses</td>
</tr>
<tr>
<td>1. I have to make sure my child does not eat too many sweets, like cookies and soda</td>
<td>1. I have to be sure that my child does not eat too many high fat foods</td>
<td>2. I have to be sure that my child does not eat too many of her or his favorite foods</td>
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<tr>
<td>2. I have to make sure that my child does not eat too many snacks like potato chips</td>
<td>3. I have to be sure that my child does not eat too many sweets (candy, ice cream, cake or pastries)</td>
<td>4. I intentionally keep some junk foods out of my child’s reach.</td>
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<tr>
<td>Cronbach’s Alpha: 0.635</td>
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<tr>
<td><strong>Controls Child Food Access</strong></td>
<td><strong>Encourages Healthy Eating</strong></td>
<td><strong>Controls Child Food Intake</strong></td>
<td><strong>Supervised Eating</strong></td>
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</tbody>
</table>
| 1. I keep foods that I want my preschool kids to eat in places that are easy for them to see and reach.  
2. I keep food I do not want my preschool kids to eat like soda and cookies, in places where they cannot see or reach them.  
**Cronbach’s Alpha: 0.258** | 1. I will serve my child fresh vegetables and fruits each day  
2. I will serve my child fish products each day  
3. I will encourage my child to try new foods  
4. I will encourage my child to eat healthy foods  
5. I will try to ensure that each meal has a fixed time and place  
6. I will try to ensure that my child I’ll eat healthier  
7. I will prepare each meal carefully | 1. I decide the amounts of food that my preschool kids eat at meals  
2. Which of these foods do you allow your child to get for a snack without your help?  
a. potato chips, popcorn, crackers, corn chips, like Doritos, tortilla chips, Fritos*  
b. doughnuts, pastries, cookies, cake (like Ho-Hos)*  
c. ice cream*  
d. candy or candy bars*  
e. soft drinks and soda/pop like Coke or 7-Up*  
f. fruit drinks or other sugary beverages*  
**Cronbach’s Alpha: N/A** | 1. I will supervise my child so she or he drinks less (e.g., cola, pulpy juices)  
2. I will supervise my child so she or he eats less snack food (e.g., potato chips, cheese puffs)  
3. I will supervise my child so she or he eats less high-fat food (e.g., beef jerky, sausage, fried food)  
4. I will supervise my child so she or he eats less sweet food (e.g., candy, ice cream cake, pies, pastries)  
5-point scale (never, seldom, sometimes, often, and always, scored 1 to 5, respectively). Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured. | 1. My child enjoys tasting new foods  
**never, seldom, half of the time, most of** | 1. My child only eats the foods he/she selected  
5-point scale (never, seldom, often, and always, scored 1 to 5, respectively). | 5-point scale (never, seldom, often, and always, scored 1 to 5, respectively). |
<table>
<thead>
<tr>
<th>Cronbach’s Alpha: 0.876</th>
<th>Cronbach’s Alpha: 0.619</th>
<th>Cronbach’s Alpha: 0.816</th>
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<tbody>
<tr>
<td>Given the chance, my child would eat most of the time</td>
<td>Never, seldom, half of the time, most of the time, and always, scored 1 to 5, respectively; items were reverse scored; scale score is an average of item responses.</td>
<td>Never, seldom, half of the time, most of the time, and always, scored 1 to 5, respectively; scale score is an average of item responses.</td>
</tr>
<tr>
<td>If I allowed it, my child would eat too much</td>
<td>5-point scale (never, seldom, sometimes, often, and always, scored 1 to 5, respectively). Item scores averaged to create scale score. Item 5 was reverse scored. Higher scores indicate greater expression of the characteristic measured.</td>
<td>5-point scale (never, seldom, sometimes, often, and always, scored 1 to 5, respectively). Item scores averaged to create scale score. Item 5 was reverse scored. Higher scores indicate greater expression of the characteristic measured.</td>
</tr>
<tr>
<td><strong>Child Eating Responsiveness</strong></td>
<td><strong>Food Responsiveness</strong></td>
<td><strong>Emotional Eating</strong></td>
</tr>
<tr>
<td>1. <strong>Given the chance, my child would eat most of the time</strong></td>
<td>1. Usually, my child would become full after eating a few mouthfuls in a meal</td>
<td>1. My child eats more when feeling nervous</td>
</tr>
<tr>
<td>2. <strong>If I allowed it, my child would eat too much</strong></td>
<td>2. My child eats less than other age-matched child</td>
<td>2. My child eats more when feeling worried</td>
</tr>
<tr>
<td><strong>Cronbach’s Alpha: 0.619</strong></td>
<td>3. <strong>My child has a good appetite</strong></td>
<td>3. My child eats more when he/she makes a mistake</td>
</tr>
<tr>
<td><strong>Emotional Eating</strong></td>
<td>4. <strong>My child always leave foods in his/her dishes when a meal is finished</strong></td>
<td>4. My child eats more when nobody plays with him/her</td>
</tr>
<tr>
<td>1. <strong>My child eats more when feeling nervous</strong></td>
<td>5. No matter how much I give him/her my child would eat completely during a meal</td>
<td>5. My child eats more when there is nothing else to do.</td>
</tr>
<tr>
<td>2. <strong>My child eats more when feeling worried</strong></td>
<td><strong>Emotional Eating</strong></td>
<td><strong>Emotional Eating</strong></td>
</tr>
<tr>
<td>3. My child eats more when angry</td>
<td>1. My child eats more when feeling worried</td>
<td>1. My child eats more when feeling nervous</td>
</tr>
<tr>
<td>4. My child eats more when he/she makes a mistake</td>
<td>2. My child eats more when worried</td>
<td>2. My child eats more when feeling bothered</td>
</tr>
<tr>
<td>5. My child eats more when nobody plays with him/her</td>
<td>3. My child eats more when feeling sad</td>
<td>3. My child eats more when feeling depressed</td>
</tr>
<tr>
<td>6. My child enjoys all kinds of food</td>
<td>4. My child eats more when there is nothing else to do.</td>
<td>4. My child eats more when feeling lonely</td>
</tr>
<tr>
<td>7. My child often loses his/her temper because of the meal</td>
<td>5. My child eats more when he/she feels tired</td>
<td>5. My child eats more when feeling exhausted.</td>
</tr>
</tbody>
</table>
scores indicate greater emotional eating. Table 1 compares the scales on the HOMES survey and from the study of child caregivers in China.\textsuperscript{21,56,92}

**Data Analysis**

All statistical analyses were conducted with IBM Statistics v22 SPSS, version 28 (IBM Corporation, Chicago, Illinois). Descriptive statistics (means, standard deviations, confidence intervals) of the sociodemographic, maternal feeding practices, child eating behaviors, and BMI status were calculated to describe the U.S. sample. Next, the U.S. sample was separated into four comparison groups based on child weight status (i.e., Underweight, Normal Weight, Overweight, and Obese) and analysis of variance (ANOVA) and Tukey post hoc tests were calculated to determine differences in maternal feeding and child eating behaviors by child weight status. The significance was set at $p<0.05$. Partial Eta-Squared was used to estimate effect size. Thresholds for small, medium, and large effects were 0.2, 0.5, and 0.8, respectively.\textsuperscript{94}

Student’s t-tests were conducted to compare the U.S. sample to the published means and standard deviations of analogous variables in the Chinese sample. Significance was set at $p<0.05$. Cohen’s D was calculated to estimate effect size.
CHAPTER FOUR: RESULTS

The purpose of this study was to gain a greater understanding of child caregivers’ feeding behavior and children’s eating behavior, and their relationship to children’s weight status. One purpose of this study was to explore these relationships in a sample of mothers in the United States who completed the HOMES survey. A second purpose was to compare these U.S. mothers with published survey data of caregivers of young children living China. These surveys gathered data about the maternal caregivers’ (U.S.) or caregivers’ (China) sociodemographic characteristics and weight-related psychographic characteristics and behaviors.

**United States Sample**

A total of 910 mothers completed the online survey screener. Participants not meeting all the inclusion criteria described in Chapter 3 were eliminated from the data set. Thus, the analytic sample was 412 mothers who fit all inclusion criteria including being 18 to 45 years old, having at least 1 child 3- to 5-years-old, being the primary food gatekeeper, and female were studied.

**Sociodemographic Characteristics of Mothers in United States.** Table 2 reports the sociodemographic characteristics of study participants. Participants were 32.79±5.76SD years old. They were primarily White (71%) with most of the remainder being Black or African American (9%) or Hispanic, Latino, or Spanish (6%). American Indian, Asian Indian, Asian, Pacific Islander, and mixed race/ethnicity, combined, represented less than 10% of the total sample. More than 80% of participants had at least some college. Most were in dual parent households (79%, either married or living with a partner). Participants resided in states throughout the country, with a plurality (41%) living in the southern region of the United States. There was an average of 2.3 children per household.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean±SD</th>
<th>(95% CI*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>32.79±5.76</td>
<td>(32.24, 33.35)</td>
</tr>
<tr>
<td>Family Affluence&lt;sup&gt;1&lt;/sup&gt;</td>
<td>5.63±1.53</td>
<td>(5.48, 5.77)</td>
</tr>
<tr>
<td>Race/ Ethnicity&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.29±0.45</td>
<td>(0.24, 0.33)</td>
</tr>
<tr>
<td>White</td>
<td>294 (71.4%)</td>
<td></td>
</tr>
<tr>
<td>Total Non-White</td>
<td>118 (28.6%)</td>
<td></td>
</tr>
<tr>
<td>Hispanic, Latino, or Spanish</td>
<td>23 (5.6%)</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>37 (9.0%)</td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>1 (0.2%)</td>
<td></td>
</tr>
<tr>
<td>Asian Indian</td>
<td>8 (1.9%)</td>
<td></td>
</tr>
<tr>
<td>Asian (e.g., Japanese, Chinese, Korean)</td>
<td>14 (3.4%)</td>
<td></td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>2 (0.5%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>27 (6.6%)</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>6 (1.5%)</td>
<td></td>
</tr>
<tr>
<td>Body Mass Index&lt;sup&gt;3&lt;/sup&gt;</td>
<td>27.69±7.62</td>
<td>(16.44, 60.46)</td>
</tr>
<tr>
<td>Education Level&lt;sup&gt;4&lt;/sup&gt;</td>
<td>2.19±0.04</td>
<td>(2.12, 2.26)</td>
</tr>
<tr>
<td>High school or less</td>
<td>73 (17.7%)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>187 (45.4%)</td>
<td></td>
</tr>
<tr>
<td>College graduate or higher</td>
<td>152 (36.9%)</td>
<td></td>
</tr>
<tr>
<td>Relationship Status&lt;sup&gt;5&lt;/sup&gt;</td>
<td>0.88±0.33</td>
<td>(0.84, 0.91)</td>
</tr>
<tr>
<td>Single Parent Household</td>
<td>51 (12.4%)</td>
<td></td>
</tr>
<tr>
<td>Single and never married</td>
<td>30 (7.3%)</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>21 (5.1%)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>0 (0.0%)</td>
<td></td>
</tr>
<tr>
<td>Dual Parent Household</td>
<td>361 (87.6%)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>325 (78.9%)</td>
<td></td>
</tr>
<tr>
<td>Single and living with partner</td>
<td>36 (8.7%)</td>
<td></td>
</tr>
<tr>
<td>Region of Residence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern</td>
<td>59 (14.3%)</td>
<td></td>
</tr>
<tr>
<td>Midwestern</td>
<td>93 (22.6%)</td>
<td></td>
</tr>
<tr>
<td>Southern</td>
<td>167 (40.5%)</td>
<td></td>
</tr>
<tr>
<td>Western</td>
<td>93 (22.6%)</td>
<td></td>
</tr>
<tr>
<td>Number of Children in Household</td>
<td>2.30±1.04</td>
<td>(2.20, 2.40)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Child Age</strong></td>
<td>3.97±0.79</td>
<td>(3.39, 4.04)</td>
</tr>
<tr>
<td><strong>Child Biological Sex</strong></td>
<td>0.52±0.50</td>
<td>(0.47, 0.57)</td>
</tr>
</tbody>
</table>

*CI- Confidence Interval

1Family Affluence includes 4 items that generate scores ranging from 0 to 9; higher scores indicate greater family affluence.

2Race/ethnicity mean calculated using dichotomous variable: (0=white, 1= non-white)

3Body mass index mean calculated using (weight[kg]/height[in])²

4Education mean calculated as: 1=high school or less, 2=some college, 3=college graduate or higher

5Relationship status mean calculated as: 0=single parent household; 1=dual parent household

6Child biological sex mean calculated using dichotomous variable: (1=boy, 2=girl)
The average age of the child was $3.97 \pm 0.79$SD years old. The proportion of male and female children was 52% and 48%, respectively.

**Child BMI and Maternal Concerns about Child Weight of Mothers in the United States.** Table 3 reports the child BMI and maternal concerns about child weight. Average child BMI percentile and z-score was in the healthy range (i.e., <85th percentile). Mothers placed children near the mid-point of a 7-point visual scale which is indicative of the perception that children were at a normal weight status. Mothers disagreed that they were concerned about their child’s weight.

Table 4 reports mean scores for maternal feeding practices. Mothers generally disagreed that they pressured children to eat. Mothers tended to agree that they restricted child access to sweets and salty snacks. Mothers were neutral regarding using food as a reward for eating health foods, controlling food access.

Table 5 reports mean child eating behavior scores. Mothers reported a food neophobia score indicative of children with only a very slight fear of new or unfamiliar foods. Child self-regulation scores showed children exhibited self-regulation behaviors more than half of the time. Overall, mothers disagreed that their children were emotional eaters.

**Comparison by Child Weight Status.** To determine whether mothers’ feeding behavior and children’s eating behavior differed by children’s weight status, children were grouped by BMI percentile into four weight status categories. The sample of 369 children were categorized as underweight, healthy weight, overweight, or obese if their BMI percentiles were <5th percentile, 5th to <85th percentile, 85th to <95th percentile, or
Table 3. Child BMI and Weight Concerns Reported by Mothers of Young Children in the United States (N=412)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(95% CI)</td>
</tr>
<tr>
<td>BMI Percentile&lt;sup&gt;1&lt;/sup&gt;</td>
<td>65.89±34.99</td>
</tr>
<tr>
<td></td>
<td>(62.50, 69.28)</td>
</tr>
<tr>
<td>BMI z-score</td>
<td>0.77±2.59</td>
</tr>
<tr>
<td></td>
<td>(0.52, 1.02)</td>
</tr>
<tr>
<td>Maternal Perceptions about Child Weight&lt;sup&gt;2&lt;/sup&gt;</td>
<td>3.75±0.71</td>
</tr>
<tr>
<td></td>
<td>(3.69, 3.82)</td>
</tr>
<tr>
<td>Maternal Concerns About Child Weight&lt;sup&gt;3&lt;/sup&gt;</td>
<td>1.91±1.05</td>
</tr>
<tr>
<td></td>
<td>(1.81, 2.01)</td>
</tr>
</tbody>
</table>

<sup>1</sup> Child BMI percentile category calculated using child height and weight as reported by mothers; Underweight BMI <5<sup>th</sup> percentile, Healthy Weight BMI between 5 to <85<sup>th</sup> percentile, Overweight between 85 to <95<sup>th</sup> percentile, and Obese BMI ≥95<sup>th</sup> percentile

<sup>2</sup> 7-point visual scale of child body shapes ranging from underweight to obese.

<sup>3</sup> 5-point scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly disagree) scored 1 to 5, respectively. Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.
### Table 4. Maternal Feeding Practices of Mothers of Young Children in the United States (N=412)

<table>
<thead>
<tr>
<th>Feeding Practice</th>
<th>Mean±SD (95% CI*)</th>
<th>Or %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressures Child to Eat (^{1})</td>
<td>2.19±0.97</td>
<td>(2.10, 2.29)</td>
</tr>
<tr>
<td>Restricts Child Food Intake (^{1})</td>
<td>3.86±0.86</td>
<td>(3.78, 3.94)</td>
</tr>
<tr>
<td>Rewards Child with Food (^{1,2})</td>
<td>2.96±0.91</td>
<td>(2.87, 3.05)</td>
</tr>
<tr>
<td>Controls Child Food Access (^{1})</td>
<td>3.68±0.88</td>
<td>(3.60, 3.77)</td>
</tr>
<tr>
<td>Controls Child Intake (^{2})</td>
<td>3.02±0.60</td>
<td>(2.96, 3.08)</td>
</tr>
</tbody>
</table>

\(^{1}\) 5-point scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree) scored 1 to 5, respectively. Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.

\(^{2}\) Two items were used to describe controls child intake (i.e., “I decide the amounts of food that my preschool kids eat at meals” and a summation of unhealthy food choices the child is allowed independent access to [i.e., potato chips, doughnuts, ice cream, candy, soft drinks, sugar-sweetened beverages]). The item, “I decide the amounts of food that my preschool kids eat at meals” used a 5-point scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly disagree) scored 1 to 5, respectively. The summation of unhealthy food items included 6 total items which were scored 1 to 5, where a score of 0 was scored 1, a score of 1 or 2 were scored as 2, a score of 3 was scored as 3, a score of 4 or 5 were scored as 4, and a score of 6 was scored as 5. The score of the two items were averaged; higher scores indicate the parent used greater control over their child intake.

\(^{2}\) Cronbach’s alpha: 0.736
Table 5. Eating Behaviors of Young Children in the United States (N=412)

<table>
<thead>
<tr>
<th>Child Eating Behavior</th>
<th>Mean±SD</th>
<th>(95% CI*) Or %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Neophobia¹</td>
<td>3.19±1.08</td>
<td>(3.09, 3.30)</td>
</tr>
<tr>
<td>Child Self-regulation¹</td>
<td>3.50±1.01</td>
<td>(3.41, 3.60)</td>
</tr>
<tr>
<td>Emotional Eating ¹</td>
<td>1.74±0.82</td>
<td>(1.66, 1.82)</td>
</tr>
</tbody>
</table>

¹ 5-point scale (never, seldom, half of the time, most of the time, and always) scored 1 to 5, respectively. Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.
\( \geq 95^{th} \) percentile respectively. (Note: 43 children were omitted from analysis due to implausible heights and/or weights reported by mothers.) Analysis of variance and Tukey post-hoc tests were conducted to compare behaviors by weight status. As shown in Table 6, Maternal Concerns About Child Weight scores indicate mothers disagreed that they were concerned with child weight. Maternal Concerns about Child Weight scores were lowest in the underweight and overweight status categories, with higher scores reported for children in the healthy and obese weight status ranges; however, differences were not significant. Pressures Child to Eat scores increased as child weight status increased. Mothers of underweight children pressured children less frequently than those in higher weight status groups. However, there was no significant difference in this scale by child weight status group.

Similarly, the scores on the Restricts Child Food Intake also increased as child weight status increased with mothers of underweight and healthy weight children restricting child food intake less often than those who had children in the overweight or obese weight status group. No significant difference was noted for this scale.

The Rewards Child with Food, Controls Child Food Access, and Controls Child Food Intake scales were similar across weight status categories and did not show a clear trend among differing weight status categories. These scales did not differ significantly by child weight status.

When comparing children’s eating behaviors, Food Neophobia and Child Self-regulation these tended to increase from underweight to overweight status. Obese children showed a slightly lower scores on the Food Neophobia and Child Self-regulation scales, with children in the obese weight status scoring significantly lower on Child Self-
regulation than their overweight counterparts. Emotional Eating score followed a different pattern and tended to decrease from underweight to obese weight status children, but the differences were not significant.

**China Sample**

Caregivers of children enrolled in five kindergartens in urban and suburban areas of Xi’an and Jinan City were recruited to participate. A total of 912 primary caregivers completed survey questionnaires. Primary caregivers were defined as the person responsible for the majority of the child’s care, such as activities, diet, and sleep. Participants not meeting all the inclusion criteria were eliminated. The exclusion criteria were caring for children with a history of constipation, chronic gastritis, or other chronic diseases that could influence eating behavior over the last 2 months and/or being a participant who was unwilling to participate or had a communication disorder. Thus, the analytic sample was 768 caregivers who fit all inclusion criteria including caring for at least one child age of 3 to 6 years.

**Sociodemographic Characteristics of Caregivers in China.** Table 7 reports the sociodemographic characteristics of study participants. Nearly two-thirds of participants 62% were between 30-39 years old. They were primarily normal weight, defined as BMI of 18.5 to 24 using the Center for Disease Control of China values. More than 80% of participants had at least some college and nearly half were college graduates. Child age averaged 4 years of age. The proportion of male children was 53% and female children was 47%. Two-thirds of children were at a healthy weight status defined as having an age- and sex-specified BMI between the 5th and <85th percentile.
Table 6. Comparison of Maternal Feeding and Child Eating Behaviors by Child Weight Status (N=369)

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Child Weight Status¹</th>
<th>F</th>
<th>ANOVA# df*=3,365</th>
<th>p</th>
<th>Partial Eta-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Underweight (n=27)</td>
<td>Healthy Weight (n=190)</td>
<td>Overweight (n=43)</td>
<td>Obese (n=109)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean±SD (95% CI†)</td>
<td>Mean±SD (95% CI†)</td>
<td>Mean±SD (95% CI†)</td>
<td>Mean±SD (95% CI†)</td>
<td></td>
</tr>
<tr>
<td>Maternal Concerns About Child Weight¹</td>
<td>1.78±1.16 (1.41, 2.15)</td>
<td>1.90±1.01 (1.77, 2.02)</td>
<td>1.85±0.92 (1.61, 2.09)</td>
<td>1.94±1.08 (1.77, 2.12)</td>
<td>0.310 0.818 0.002</td>
</tr>
<tr>
<td>Pressures Child to Eat¹</td>
<td>2.04±0.93 (1.67, 2.40)</td>
<td>2.14±0.92 (2.00, 2.27)</td>
<td>2.30±0.91 (2.02, 2.58)</td>
<td>2.27±1.06 (2.06, 2.45)</td>
<td>0.836 0.475 0.007</td>
</tr>
<tr>
<td>Restricts Child Food Intake¹</td>
<td>3.61±0.76 (3.31, 3.91)</td>
<td>3.79±0.86 (3.67, 3.91)</td>
<td>4.07±0.78 (3.83, 4.31)</td>
<td>3.90±0.95 (3.72, 4.08)</td>
<td>2.030 0.109 0.016</td>
</tr>
<tr>
<td>Rewards Child with Food¹</td>
<td>3.07±0.84 (2.74, 3.41)</td>
<td>2.85±0.88 (2.72, 2.97)</td>
<td>3.00±0.87 (2.73, 3.27)</td>
<td>3.03±0.95 (2.85, 3.21)</td>
<td>1.280 0.281 0.010</td>
</tr>
<tr>
<td>Controls Child Food Access¹</td>
<td>3.76±0.75 (3.46, 4.06)</td>
<td>3.75±0.83 (3.63, 3.87)</td>
<td>3.80±0.84 (3.54, 4.06)</td>
<td>3.54±0.99 (3.35, 3.73)</td>
<td>1.694 0.168 0.014</td>
</tr>
<tr>
<td>Controls Child Intake¹</td>
<td>4.06±0.66 (3.80, 4.31)</td>
<td>3.97±0.65 (3.88, 4.06)</td>
<td>4.07±0.66 (3.87, 4.27)</td>
<td>3.97±0.71 (3.83, 4.10)</td>
<td>0.392 0.759 0.003</td>
</tr>
<tr>
<td>Food Neophobia²</td>
<td>3.06±0.94 (2.69, 3.44)</td>
<td>3.20±1.10 (3.05, 3.36)</td>
<td>3.20±1.08 (2.87, 3.54)</td>
<td>3.24±1.08 (3.04, 3.45)</td>
<td>0.197 0.898 0.002</td>
</tr>
<tr>
<td>Child Self-Regulation²</td>
<td>3.39±0.89 (3.04, 3.74)</td>
<td>3.62±0.90 (3.49, 3.74)</td>
<td>3.85±0.95 (3.56, 4.14)</td>
<td>3.36±1.13 (3.14, 3.57)</td>
<td>3.279 0.021 0.026</td>
</tr>
<tr>
<td>Emotional Eating²</td>
<td>1.94±0.79 (1.63, 2.26)</td>
<td>1.70±0.79 (1.59, 1.81)</td>
<td>1.55±0.79 (1.30, 1.81)</td>
<td>1.72±0.78 (1.57, 1.86)</td>
<td>1.432 0.233 0.012</td>
</tr>
</tbody>
</table>

¹ 5-point scale (strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree) scored 1 to 5, respectively. Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.

² 5-point scale (never, seldom, half of the time, most of the time, and always) scored 1 to 5, respectively. Items were reverse scored; scale score is an average of item responses.

³ Child BMI percentile category calculated using child height and weight; Underweight BMI <5th percentile, Healthy weight BMI between 5 to <85th percentile, Overweight between 85 to <95th percentile, and Obese BMI ≥95th percentile.

*df= Degrees of Freedom
† CI=Confidence Interval
Analysis of Variance (ANOVA) indicate significant (p<0.05) main effects among Child Weight Status groups. Tukey post-hoc tests indicate significant (p<0.05) between group differences of: A Underweight and Healthy Weight, B Underweight and Overweight, C Underweight and Obese, D Healthy Weight and Overweight; E Healthy Weight and Obese; F Overweight and Obese.
Comparisons of Sociodemographic Characteristics of Mothers United States and Caregivers in China. Sociodemographic data for U.S. mothers were organized into categories to permit comparison to published data for the Chinese Caregivers. This comparison indicates that both groups had more than half of participants in the 30- to 39-year age category (see Table 7). Compared to U.S. mothers, there were fewer China caregivers in the age group 20 to 29 years (33% vs 12%) and a greater number aged 50 years and older (19% vs 0%), which was significantly different. The lack of older U.S. mothers is reflective of the eligibility criteria which excluded mothers over age 45 years.

The proportion with a BMI in the healthy range was nearly identical for both groups, accounting for about 45% of all caregivers. In addition, the proportion of those who were overweight or obese was comparable at 46% and 52% for China caregivers and mothers in the United States, respectively. BMI category was significantly higher in U.S. mothers than China Caregivers.

U.S. mothers were more likely to have completed some college than the China caregivers (82% vs 47%). The education levels differed significantly, with U.S. mothers having more education than China Caregivers. However due to the differences in educational structure in the two countries, the importance of this difference cannot be determined. Although not directly comparable, more China Caregivers have significantly lower household incomes than U.S. mothers.

Child age distribution in the China and United States study was similar and fairly evenly distributed across the age range and did not differ significantly. Child sex was nearly evenly divided for both the U.S. and China. More children in the US had BMI
percentiles in the overweight and obese range than children in China (38% vs 23%). U.S. children had significantly higher average BMI category than those in the China study.

As shown in Table 8, Chinese Caregivers’ scores for Concern about Child Weight Status were low. Forced Feeding score of Chinese Caregivers indicated they often got children to eat by persuading, playing with, praising, and offering food even when children expressed that they were not hungry. The Content Restricted Feeding score indicated caregivers tended to restrict child access to high fat foods, sweets and “junk foods”. The Encourages Healthy Eating scale score indicated that caregivers often offered fruits and veggies, fish, and new foods. The Supervised Feeding score indicated that caregivers often limited children’s exposure to juice, soda, snack foods such as chips and sweets, and limited high fat and fried foods.

A comparison of U.S. mothers and China caregivers regarding concerns about child weight indicates Chinese Caregivers worry more about children’s weight than U.S. mothers. These differences were significant with a large effect size. Comparison of the China Forced Feeding Scale with the U.S. Pressures Child to Eat scale also revealed that Chinese Caregivers pressured children significantly more than U.S. mothers. The effect size was large. Comparison of the China Content Restricted Feeding scale with the U.S. Restricts Child Food Intake scale showed Chinese caregivers were significantly more likely to restrict what children eat than U.S. mothers. This difference had a large effect size. Similarly, comparisons of the China Encourages Healthy Feeding scale and Controls Child Food Access scale indicates that China caregivers were more significantly more
Table 7. Comparison of Sociodemographic Characteristics of Chinese Caregivers and US Mothers^{21}

<table>
<thead>
<tr>
<th>China Characteristic</th>
<th>China Characteristic</th>
<th>U.S. Characteristic</th>
<th>t (df=1178)</th>
<th>Cohen's D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean±SD or N (%)</td>
<td>Mean±SD Or N (%)</td>
<td></td>
<td>P*</td>
</tr>
<tr>
<td><strong>Primary Caregiver Age Categories</strong></td>
<td>2.34±0.91 (1.89, 2.04)</td>
<td>1.83±0.67 (1.76, 1.90)</td>
<td>-10.012, &lt;0.001</td>
<td>0.611</td>
</tr>
<tr>
<td>20 to 29</td>
<td>88 (11.5%)</td>
<td>20 to 29</td>
<td>134 (32.5%)</td>
<td></td>
</tr>
<tr>
<td>30 to 39</td>
<td>478 (62.2%)</td>
<td>30 to 39</td>
<td>214 (51.9%)</td>
<td></td>
</tr>
<tr>
<td>40 to 49</td>
<td>57 (7.4%)</td>
<td>40 to 49</td>
<td>64 (15.5%)</td>
<td></td>
</tr>
<tr>
<td>&gt;50</td>
<td>145 (18.9%)</td>
<td>&gt;50</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td><strong>Primary Caregiver BMI Category</strong></td>
<td>2.48±0.80 (2.43, 2.54)</td>
<td>2.79±0.91 (2.70, 2.87)</td>
<td>6.043, &lt;0.001</td>
<td>-0.369</td>
</tr>
<tr>
<td>Underweight</td>
<td>67 (8.7%)</td>
<td>Underweight</td>
<td>12 (2.9%)</td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>346 (45.1%)</td>
<td>Normal weight</td>
<td>187 (45.4%)</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>273 (35.5%)</td>
<td>Overweight</td>
<td>90 (21.8%)</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>82 (10.7%)</td>
<td>Obese</td>
<td>123 (29.9%)</td>
<td></td>
</tr>
<tr>
<td>**Primary Caregiver Education Level¹</td>
<td>1.72±0.44 (1.69, 1.76)</td>
<td>1.82±0.38 (1.79, 1.86)</td>
<td>3.898, &lt;0.001</td>
<td>-0.238</td>
</tr>
<tr>
<td>High school or less</td>
<td>407 (53%)</td>
<td>High school or less</td>
<td>73 (17.7%)</td>
<td></td>
</tr>
<tr>
<td>College/ University or Above</td>
<td>361 (47%)</td>
<td>Some College, College graduate or higher</td>
<td>339 (82.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Total Monthly Household Income²</strong></td>
<td>1.65±0.66 (1.60, 1.70)</td>
<td>2.21±0.59 (2.16, 2.27)</td>
<td>14.408, &lt;0.001</td>
<td>-0.880</td>
</tr>
<tr>
<td>&lt;$750</td>
<td>350 (45.6%)</td>
<td>Low</td>
<td>38 (9.2%)</td>
<td></td>
</tr>
<tr>
<td>$750-$1500</td>
<td>336 (43.8%)</td>
<td>Moderate</td>
<td>248 (60.2%)</td>
<td></td>
</tr>
<tr>
<td>&gt;$1500</td>
<td>82 (10.7%)</td>
<td>High</td>
<td>126 (30.6%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean ± Standard Deviation</td>
<td></td>
<td>t-Test Statistic</td>
<td>P-value</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------</td>
<td>----------------------</td>
<td>------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Child Age Categories</strong></td>
<td>2.03 ± 0.81 (1.97, 2.09)</td>
<td>1.97 ± 0.79 (1.89, 2.04)</td>
<td>-1.223, 0.221</td>
<td>0.075</td>
</tr>
<tr>
<td>3</td>
<td>242 (31.5%)</td>
<td>134 (32.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>258 (33.5%)</td>
<td>157 (38.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 and 6</td>
<td>267 (35%)</td>
<td>121 (29.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Child Biological Sex</strong></td>
<td>1.46 ± 0.50 (1.43, 1.50)</td>
<td>1.52 ± 0.50 (1.47, 1.57)</td>
<td>1.965, 0.050</td>
<td>-0.120</td>
</tr>
<tr>
<td>Male</td>
<td>410 (53.4%)</td>
<td>198 (48.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>353 (46.6%)</td>
<td>214 (51.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Child BMI Percentile</strong></td>
<td>2.24 ± 0.77 (2.18, 2.29)</td>
<td>2.67 ± 0.98 (2.57, 2.77)</td>
<td>8.063, &lt;0.001</td>
<td>-0.509</td>
</tr>
<tr>
<td>Category</td>
<td>Underweight 77 (10.0%)</td>
<td>Underweight 23 (5.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Healthy weight 513 (66.8%)</td>
<td>Healthy weight 186 (45.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight 96 (12.5%)</td>
<td>Overweight 48 (11.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obese 82 (10.7%)</td>
<td>Obese 112 (27.2%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Student’s t-test, df=degrees of freedom; P=probability

1 Education level calculated as percentage of junior high school or below, senior high school, or college/university or above.
2 Total family monthly income calculated as a percentage of <$750 monthly, $750-$1500 monthly, or >$1500.
3 Family Affluence includes 4 items that generate scores ranging from 0 to 9; higher scores indicate greater family affluence.
4 Child BMI percentile category calculated using child height and weight; Underweight ≤5th percentile, Healthy weight BMI between 5<85th percentile, Overweight between 85-95th percentile, and Obese BMI ≥95th percentile.
5 Child BMI percentile category sample size 369 df=1178.
likely to encourage healthy eating habits when compared with U.S. mothers. The effect size for this difference was large. Comparison of the China Supervised Eating scale with the U.S. Controls Child Food Intake scale revealed Chinese Caregivers and U.S. mothers were similar regarding control of child food intake.

Table 9 reports Chinese child eating behaviors. Caregivers reported a Food Fussiness score indicative of children who were sometimes fearful of new or unfamiliar foods. Chinese caregivers’ reported children sometimes exhibited food responsiveness during meals and snacks as evidenced by having a good appetite and finishing a meal. Overall, caregivers reported that children were sometimes emotional eaters when angry, worried, or bored.

Comparisons between Chinese and U.S. children indicate some differences among the participants. Chinese children expressed significantly less food fussiness than U.S. counterparts. Similar results were observed when comparing the Food Responsiveness and Child Self-regulation scales in Chinese and U.S. children. Lastly, Chinese children were significantly more likely to engage in emotional eating than U.S. children. All significant differences in child eating behavior scales had large effect sizes.

To determine whether caregivers’ feeding behavior and children’s eating behavior differed by children’s weight status, Chinese children were group by BMI percentile into four weight status categories (i.e., underweight, healthy weight, overweight, or obese). ANOVA and Tukey post-hoc tests were conducted using published means to compare caregiver feeding and child eating behaviors by weight status Table 10). Caregiver concerns about their children’s weight were below the scale mid-point, regardless of
Table 8. Two-tailed Student’s t-test Comparisons of Maternal Feeding Practice Comparisons Between U.S. and China Mothers with Young Children

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean±SD</th>
<th>Characteristic</th>
<th>Mean±SD (CI†)</th>
<th>t (df=1178)*</th>
<th>P</th>
<th>Cohen’s D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight concerns</td>
<td>2.17±0.93</td>
<td>Maternal Concerns About Child Weight</td>
<td>1.91±1.05 (1.81, 2.01)</td>
<td>-5.932</td>
<td>&lt;0.001</td>
<td>0.27</td>
</tr>
<tr>
<td>Forced Feeding</td>
<td>3.51±0.82</td>
<td>Pressures Child to Eat</td>
<td>2.19±0.97 (2.10, 2.29)</td>
<td>-24.696</td>
<td>&lt;0.001</td>
<td>1.51</td>
</tr>
<tr>
<td>Content Restricted Feeding</td>
<td>3.59±0.81</td>
<td>Restricts Child Food Intake</td>
<td>3.86±0.86 (3.78, 3.94)</td>
<td>5.341</td>
<td>&lt;0.001</td>
<td>-0.33</td>
</tr>
<tr>
<td>Encourages Healthy Feeding</td>
<td>3.79±0.65</td>
<td>Controls Child Food Access</td>
<td>3.68±0.88 (3.60, 3.77)</td>
<td>-2.439</td>
<td>0.015</td>
<td>0.15</td>
</tr>
<tr>
<td>Supervised Eating</td>
<td>3.92±0.82</td>
<td>Controls Child Food Intake</td>
<td>3.87±0.53 (3.81, 3.91)</td>
<td>-1.119</td>
<td>0.264</td>
<td>0.07</td>
</tr>
</tbody>
</table>

*Student’s t-test, df=degrees of freedom; P=probability
† CI=Confidence Interval
1 5-point scale (never, seldom, sometimes, often, and always, scored 1 to 5, respectively). Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.
2 5-point scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly disagree) scored 1 to 5, respectively. Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean±SD</th>
<th>Characteristic</th>
<th>Mean±SD</th>
<th>( t ) (df=1178)*</th>
<th>( P )</th>
<th>Cohen’s D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Fussiness(^1)</td>
<td>2.58±0.54</td>
<td>Food Neophobia(^2)</td>
<td>3.19±1.08 (3.09, 3.30)</td>
<td>12.930</td>
<td>&lt;0.001</td>
<td>-0.79</td>
</tr>
<tr>
<td>Food Responsiveness(^1)</td>
<td>2.43±0.65</td>
<td>Child Self-regulation(^2)</td>
<td>3.50±1.01 (3.41, 3.60)</td>
<td>17.511</td>
<td>&lt;0.001</td>
<td>-1.07</td>
</tr>
<tr>
<td>Emotional Eating(^1)</td>
<td>2.03±0.79</td>
<td>Emotional Eating(^2)</td>
<td>1.74±0.82 (1.66, 1.82)</td>
<td>-5.932</td>
<td>&lt;0.001</td>
<td>0.36</td>
</tr>
</tbody>
</table>

\(^*\)Student’s t-test, df=degrees of freedom; \(P\)=probability

\(^1\) 5-point scale (never, seldom, sometimes, often, and always, scored 1 to 5, respectively). Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.

\(^2\) 5-point scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly disagree) scored 1 to 5, respectively. Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.
child weight status. However, their concerns about their children’s weight steadily increased as child weight status increased from underweight to obese, with caregivers of underweight children having significantly less concern about their children’s weight than all other weight status groups. In addition, caregivers of healthy weight children had significantly less concern than caregivers of overweight and obese children. Effect size was small for significant differences in weight concern.

The Forced Feeding and Content Restricted Feeding scale scores were similar across child weight status groups; however, caregivers of children in the healthy weight range had a significantly higher frequency of content restricted feeding than caregivers of overweight and obese children. Conversely, the Encourage Healthy Eating scale scores decreased as child weight status increased with a small effect size. Caregivers of underweight and healthy weight children did not differ in encouraging healthy eating; however, both groups encouraged healthy eating in children significantly more than caregivers of overweight and obese children. Similarly, caregivers of overweight children encouraged healthy eating more than those caring for obese children. The differences in Encourage Healthy Eating scale scores across child weight status had a medium effect size. The caregivers’ Supervised Eating scale scores generally decreased in frequency as child weight status increased, demonstrating differences in caregiver practices of monitoring child eating by weight status. Caregivers of obese children tended to be significantly less likely to supervise children’s eating than caregivers of underweight and healthy weight children, with a small effect size.

Child feeding behaviors were assessed using the Food Fussiness, Eating Responsiveness, and Emotional Eating scales. Results for the child feeding behaviors
scales showed scores increasing steadily as child weight status increased. The Food Fussiness scale results showed that children in the underweight and healthy weight categories had significantly less frequent food fussiness behaviors than children who were in the overweight, or obese groups, with small effect sizes. Children had greater food responsiveness as weight status increased, with all pairwise comparisons differing significantly with small effect sizes. Regarding emotional eating behaviors, children’s emotional eating increased with increasing child weight status. Children in the underweight and healthy weight status groups reported significantly less emotional eating than children in the overweight and obese weight status groups, with a medium effect size.

**Comparison of Child Weight Status of U.S. Mothers and Chinese Caregivers**

Table 6 and Table 10 compare maternal feeding behavior and child eating behavior by child weight status for U.S and Chinese participants, respectively. U.S. mothers seldom or sometimes showed concern for their child’s weight, but this was not significantly different across child weight categories whereas Chinese caregivers either agreed or strongly agreed that they were concerned about their child’s weight and there was significant difference among concern across weight categories.

Comparisons of pressuring child to eat and force feeding revealed that neither U.S. mother’s nor Chinese caregivers’ behaviors unaffected by child weight status. U.S. mother’s restriction of child food intake did not differ as child weight status increased; similarly, there was little difference in Chinese Caregivers’ content restricted feeding by child weight status. U.S. mothers Controls Child Food Access scores were not related to
Table 10. Comparison of Chinese Caregiver Feeding and Child Eating Behaviors by Child Weight Status (N=768)\(^6\)

<table>
<thead>
<tr>
<th>Behaviors(^1)</th>
<th>Child Weight Status(^2)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Partial Eta-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Underweight (n=77)</td>
<td>Healthy (n=513)</td>
<td>Overweight (n=96)</td>
<td>Obese (n=82)</td>
<td>F df*=766</td>
<td>ANOVA# p</td>
</tr>
<tr>
<td></td>
<td>Mean±SD (95% CI)</td>
<td>Mean±SD (95% CI)</td>
<td>Mean±SD (95% CI)</td>
<td>Mean±SD (95% CI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Concerns</td>
<td>1.73±0.84 (1.54, 1.92)</td>
<td>2.12±0.92 (2.04, 2.20)</td>
<td>2.49±0.94 (2.30, 2.72)</td>
<td>2.56±0.73 (2.40, 2.72)</td>
<td>15.958</td>
<td>&lt;0.001(^{ABCD,E})</td>
</tr>
<tr>
<td>Forcied Feeding</td>
<td>3.40±0.83 (3.21, 3.59)</td>
<td>3.55±0.83 (3.48, 3.62)</td>
<td>3.43±0.70 (3.29, 3.57)</td>
<td>3.48±0.65 (3.34, 3.62)</td>
<td>1.277</td>
<td>0.281</td>
</tr>
<tr>
<td>Content Restricted Feeding</td>
<td>3.50±0.89 (3.30, 3.70)</td>
<td>3.66±0.81 (3.59, 3.73)</td>
<td>3.47±0.86 (3.30, 3.64)</td>
<td>3.45±0.68 (3.30, 3.60)</td>
<td>3.073</td>
<td>0.027(^{DE})</td>
</tr>
<tr>
<td>Encourage Healthy Eating</td>
<td>3.90±0.56 (3.77, 4.02)</td>
<td>3.87±0.62 (3.82, 3.92)</td>
<td>3.63±0.68 (3.49, 3.77)</td>
<td>3.36±0.69 (3.21, 3.51)</td>
<td>18.342</td>
<td>&lt;0.001(^{BCD,E,F})</td>
</tr>
<tr>
<td>Supervised Eating</td>
<td>3.97±0.82 (3.79, 4.15)</td>
<td>3.99±0.77 (3.92, 4.06)</td>
<td>3.81±0.79 (3.65, 3.97)</td>
<td>3.63±0.80 (3.46, 3.80)</td>
<td>5.864</td>
<td>&lt;0.001(^{C,D,E})</td>
</tr>
<tr>
<td>Food Fussiness</td>
<td>2.48±0.55 (2.36, 2.60)</td>
<td>2.56±0.55 (2.51, 2.61)</td>
<td>2.68±0.47 (2.59, 2.77)</td>
<td>2.69±0.48 (2.59, 2.79)</td>
<td>3.427</td>
<td>0.017(^{BC,D,E})</td>
</tr>
<tr>
<td>Eating Responsiveness</td>
<td>2.20±0.55 (2.08, 2.32)</td>
<td>2.38±0.63 (2.33, 2.43)</td>
<td>2.53±0.57 (2.42, 2.64)</td>
<td>2.77±0.68 (2.62, 2.92)</td>
<td>13.619</td>
<td>&lt;0.001(^{A,B,C,D,E})</td>
</tr>
<tr>
<td>Emotional Eating</td>
<td>1.80±0.67 (1.65, 1.95)</td>
<td>1.95±0.75 (1.89, 2.01)</td>
<td>2.28±0.87 (2.11, 2.45)</td>
<td>2.47±0.80 (2.30, 2.64)</td>
<td>16.695</td>
<td>&lt;0.001(^{B,C,D,E})</td>
</tr>
</tbody>
</table>

\(^1\)5-point scale (never, seldom, sometimes, often, and always, scored 1 to 5, respectively). Item scores averaged to create scale score. Higher scores indicate greater expression of the characteristic measured.

\(^2\) Child BMI percentile category calculated using child height and weight; Underweight <5\(^{\text{th}}\) percentile, Healthy weight BMI 5\(^{\text{th}}\) to <85\(^{\text{th}}\) percentile, Overweight 85\(^{\text{th}}\) to <95\(^{\text{th}}\) percentile, and Obese BMI >95\(^{\text{th}}\) percentile.

\(^\text{#}\) Analysis of Variance (ANOVA) indicate significant (p<0.05) main effects among Child Weight Status groups. Tukey post-hoc tests indicate significant (p<0.05) between group differences of: \(^{A}\)Underweight and Healthy Weight, \(^{B}\)Underweight and Overweight, \(^{C}\)Underweight and Obese, \(^{D}\)Healthy Weight and Overweight; \(^{E}\)Healthy Weight and Obese; \(^{F}\)Overweight and Obese.
child weight status whereas Chinese caregivers’ Encourage Healthy Eating scores declined significantly as child weight status increased. U.S. mothers’ control of child intake was not associated with child weight status whereas Chinese caregivers tended to supervise children in the underweight and healthy categories significantly more than children in overweight and obese categories.

Comparisons of child food neophobia and food fussiness revealed U.S. children did not show significant differences across weight status categories; however, Chinese children demonstrated significant increases in food fussiness as weight status increased. Comparisons of the child self-regulation and food responsiveness scales among the U.S. and Chinese children, respectively, showed a significant increase in Chinese children as child weight status increased whereas little difference was noted in U.S. children. Emotional eating significantly increased only for Chinese children as weight status increased whereas in U.S. children emotional eating behaviors were not significantly related to weight status.
CHAPTER FIVE: DISCUSSION

The overall goals of this study were to examine child caregiver feeding behaviors and child eating behaviors and the relationship of these behaviors to children’s weight status. Two specific research questions were explored. The first examined the relationships of child caregiver feeding behaviors and child eating behaviors to child weight status as reported by maternal caregivers of preschool children in the United States. Secondly, this study aimed to determine how child caregivers’ feeding behaviors and child eating behaviors reported by mothers in the United States differed from child caregivers in China. Through examination of these research questions a better understanding of the relationships among specific behaviors of child caregivers on children’s eating behaviors and weight status may inform the development of nutrition education interventions to help parents make more thoughtful choices regarding child feeding.

Child BMI percentiles compare a child’s measurements with other children of the same sex and age. Mothers in the U.S. reported 51% of children had a healthy weight status. However, 30% of the children in this study had an obese weight status (i.e., BMI ≥ 95th percentile). This rate was higher than the prevalence of obesity in U.S. children aged 2-5 years in 2017-2018 which was 13%. China caregivers reported that 67% of children had healthy weight status and 11% were in the obese weight status group, which, when compared to China national statistics (7% obesity rate in 2014), was higher. Worldwide childhood obesity rates were 18% in 2016. National data for both U.S. and China child obesity rates tend to lower than the worldwide average. It is not clear why the U.S.
mothers and China caregivers reported a higher proportion of children had an obese weight status than their national average.  

U.S. mothers perceived their children were at a healthy weight, including mothers of children with obese weight status. These mothers did not recognize their children weighed more than what is considered healthy. In specific, when asked to rate their perception of children’s body size compared to 7 silhouettes of children ranging from very slight frame and continuing to an image of a very husky child, these mothers rated their children an average score of 3.76±0.70 SD, which was slightly below the image of a healthy weight child. This finding demonstrates that maternal perception of child weight and child BMI may be inaccurate. This inaccurate assessment of children’s weight may explain why, overall, U.S. mothers in this study were not concerned about their children’s weight. A study of Australian mothers showed similar results in that, overall, mothers surveyed were not concerned about their children’s weight. These findings further support a study of Pacific Island families which reported parents had a low level of concern for children’s weight status despite a high prevalence of overweight and obesity in their children. The study reported here along with the Australian and Pacific Island studies suggest that mothers do not recognize the importance of keeping children’s weight status healthy, perhaps because of the prevalence and “normalization” of overweight and obesity. However, data from the China caregivers study suggests the opposite. Although Chinese caregivers expressed a level of concern about child weight comparable to that of U.S. mothers, the difference is that China caregivers showed a steady increase in weight concern as child weight status increased. Asian cultures have a tendency to limit the importance of individuals and instead focus on the group. That
could be the family or society as a whole. For that reason Chinese caregivers may be
more aware of physical attributes and at times feel as though a child’s appearance is a
representation of the family.\textsuperscript{100} If the child does not fit the cultural perception of
attractiveness it has a negative reflection on the family.\textsuperscript{100} For that reason it is not
uncommon for Asian families to try to conform to societal norms.\textsuperscript{100} If an individual has a
weight status that does not match the perception of the cultural norm of attractiveness or
health, the family may feel disappointment and try to influence child’s weight status.\textsuperscript{100}

Regarding the feeding practices in the United States, mothers generally did not
they pressure children to eat regardless of the children’s weight status, which differs from
some cultures. For instance, low-income Latina mothers with underweight children were
found to pressure children in multiple ways including pushing children to eat more of the
food offered and eat new foods.\textsuperscript{101} This feeding practice of pressuring children to eat was
associated with the children of the Latinas having increased calorie intake and less
developed self-regulatory eating skills.\textsuperscript{101} Similar to Latina mothers, China caregivers
also pressured or forced children to eat. Similarly, Australian mothers reported that they
pressed children to eat.\textsuperscript{102}

The differences in caregiver tendency to pressure children to eat may be linked to
parenting styles in general. Authoritarian parenting styles commonly practiced in China
may explain greater use of pressuring practices. However, Latina mothers are a very
diverse group with a heterogeneous parenting style profile. Some Latina mothers have
been found to be authoritative while others have been labeled as authoritarian therefore it
is unclear whether parenting style is a contributing factor to pressuring behaviors.\textsuperscript{103} U.S.
mothers predominantly parent with an authoritative parenting style.\textsuperscript{104} Authoritative
parenting is responsive to children and nurturing to physical and emotional needs thus, U.S. mothers would predicably be less likely to use pressuring behaviors.\textsuperscript{104}

U.S. mothers agreed that they do restrict child intake of snack foods like potato chips, popcorn, crackers, and corn chips. Restrictions tended to increase as child weight status increased. China caregivers and Australian mothers similarly sometimes restricted feeding. Chinese caregiver restrictions did not differ by child weight status whereas Australian mothers restriction was significantly positively associated with maternal concern about child overweight; 26\% of children were overweight or obese weight status.\textsuperscript{102} Tendency to restrict child food intake in all three countries may be attributed to parental belief that children’s weight status and overall health is related to dietary intake. Foods with limited nutritional value offer little benefit to enhancing children’s overall health.\textsuperscript{105} Consumption of these foods can affect a child appetite in two ways. First, by increasing the likelihood that children will not eat low nutrient density foods in place of the nutrient dense food needed for normal growth and development. Secondly, when eaten in addition to nutrient dense foods, low nutrient dense foods will give children an excessive energy intake resulting in weight gain and increased weight status.

U.S. mothers were neutral about using food to reward their children, with mothers of healthy weight children being the least likely to reward children with food. Similarly, Australian mothers reported that they tended to not use food as a reward for encouraging their preschool children to eat or be on good behavior.\textsuperscript{36} The prevalence of using food rewards for both eating and good behavior increased as Australian children got older, with use of food rewards being the lowest at 2 years of age and the highest at 5 years of age.\textsuperscript{36} In contrast, a similar analysis with U.S. mothers did not find a significant
difference in use of food rewards by children’s age. The cause of these contrasting findings is not clear. Perhaps as children matured and became more verbal and exhibited understanding of rewards, parents were more likely to utilize this practice as seen in the Australian study. However, that hypothesis is inconclusive given that reward behavior was not linked with children’s age among U.S. mothers. U.S. mothers reported rewarding children with food showed no trend relative to child weight status. There were no comparable data to rewards child with food in the study of China caregivers.

U.S. mothers agreed that they controlled child food access by keeping foods that they wanted children to eat in places that were easy for children to see and reach and keeping foods they did not want preschool kids to eat, like soda and cookies, in places where children cannot see or reach them. The use of this ‘covert’ type of control of children’s food access did not differ by child weight status. A London study of children ages 7-9 years old revealed that British mothers had slightly lower, more neutral, scores than U.S. mothers with regard to covertly restricting child food access, but restrictions rose somewhat and linearly as child weight status increased.106 China Caregivers covertly controlled children’s eating habits by serving foods they wanted their children to eat and encouraging them to try the healthy foods. Australian mothers similarly used covert “non-directive” behaviors, such as monitoring the amount of high-fat foods that their children ate.102 U.S. and Australian mothers as well as China caregivers attempted to influence their children’s eating behaviors through covert control.

The use of overt control of children’s food intake by U.S. mothers, as assessed by the Control Food Intake scale, did not vary by child weight status. In contrast, China caregivers reported less use of covert control (i.e., encouraging healthy eating scores
declined) as children’s weight status increased a finding which seems at odds with their increased concern for child weight which increased as children’s weight status increased. Perhaps this concern translated instead to greater use of overt control of children’s eating. However, the data do not support this supposition. That is, these caregivers did not substitute “overt” control of child food intake, as assessed by the Supervised Eating scale completed by China caregivers, in that scores on this scale were lower for children with an obese weight status than all other leaner counterparts. The lower use of both covert and overt control of child food intake among China caregivers with children in the obese weight status group suggests that these children were allowed the freedom to choose food types and amounts which contributed to their high weight status. This explanation is contrary to the previously noted notion that Asian cultures are very aware of physical appearances that are not mainstream and wish to influence their children to meet societal norms.

Overt restriction has been linked with obesity in children.\textsuperscript{107} Overt restriction was negatively associated with food responsiveness according to research by Ellyn Satter.\textsuperscript{107} Research has shown that when given snack type foods at home, those snacks become routine and children don’t overindulge when sweets and fatty snacks are present because access is not restricted and children are prepared to make decisions on the amount to consume.\textsuperscript{68,107} A review of the results of this study does not support Satter’s research. U.S. mothers use of covert (as measured by the Controls Child Food Access scale) and overt (as measured by the Controls Child Intake scale) control of child feeding did not differ by child weight status. In addition, China caregiver findings are the opposite of those reported by Satter. That is, covert control (assessed with the Encouraging Healthy
Eating scale) and overt control (Supervised Eating scale) were used more frequently used at lower child weights. These contrasting findings may be because of the commonly used authoritarian parenting style in China—which, when not used to control child eating behaviors, may result in children not being able to control themselves resulting overeating and weight gain despite the finding that children had greater food responsiveness as weight status increased.

In this study, 19% of U.S. mothers reported their children exhibited slight food neophobia whereas 50% and 31% exhibited moderate and severe food neophobia, respectively. A study involving Saudi Arabian mothers with children aged 1-7 years had somewhat similar results in that 10% reported their children exhibited slight food neophobia, whereas 52% and 37% reported children exhibited moderate and severe food neophobia, respectively.\textsuperscript{108} Although percentages of slight, moderate, and severe food neophobia were not reported for children in the China caregiver study, using mean values and standard deviations and assuming the data were normally distributed, less than 1% of the children were at either extreme, i.e., achieving a mean score or <1 or >4 on the 5-point Food Fussiness scale calculated at 3 standard deviations above/below the mean (i.e., 2.58±0.54SD). These differences in severity are reflected in the significantly lower food fussiness scores reported by China caregivers than their U.S. comparators.

Children’s neophobic eating behaviors in the study of U.S. mothers reported here increased slightly, but not significantly, as child weight status increased. These results mirrored findings of Swedish children whose food fussiness was not associated with their weight status.\textsuperscript{109} China caregivers reported that food fussiness increased as child weight status increased. These differing results reported for children in China may suggest that
despite the commonly used authoritarian parenting style, children who resist this style and/or caregivers who do not apply the parenting style used with other behaviors to child eating may inadvertently allow children to express greater freedom and control of food intake which contributes to fussy children’s increased weight status. Alternatively, the fussiness of the child may result in caregivers exerting less control over child eating to avoid negative interactions with the child.

U.S. mothers felt their children demonstrated eating self-regulation half to most of the time, with obese weight status children having the lowest eating self-regulation scores which is consistent with Hughes and Wood’s findings.\textsuperscript{110} This finding for children with obesity makes logical sense. However, the finding that U.S. children in the overweight group had the highest self-regulation score was unexpected. While the exact reasons for this unexpected result cannot be determined from this cross-sectional study, it may be that overweight children are more aware that eating self-regulation behaviors can help them control their body weight and resist moving into the obesity weight status group; however, given the young age of these children, this explanation needs verification through research.

U.S. mothers assessment of children’s self-regulation was similar to data reported by Australian mothers.\textsuperscript{102} A comparison of the Eating Responsiveness scale completed by China caregivers, which is analogous to the Child Self-Regulation scale completed by U.S. mothers, indicated that Chinese children demonstrated self-regulation behaviors significantly less than U.S. comparators. Additionally, unlike the U.S. children, child self-regulation increased with child weight status in children in China. This finding
Figure 1. Factors Affecting Child Weight Status in China
contrasts with the work others. For instance, Jans et al found a lack of self-regulation leading to overeating was associated with higher child BMI.\textsuperscript{36}

U.S. children in this study seldom exhibited emotional eating behaviors. Underweight status U.S. children had the most frequent emotional eating behaviors whereas overweight status children had the least frequent emotional eating tendencies, but the differences were not significant. These findings differed from a study of Portuguese children which noted emotional overeating behaviors differed by weight status.\textsuperscript{111} Emotional undereating by Portuguese children decreased as weight status increased whereas emotional overeating increased as child weight status increased.\textsuperscript{111} China caregivers reporting that children seldom ate for emotional reasons, which as similar to U.S. mothers. A Swedish study involving children ages 1-6 years showed similar results to both the Chinese and U.S. studies in that emotional overeating scores were low for all children and were not related to child weight status.\textsuperscript{109}

**Factors Affecting Child Weight Status**

Figure 1 summarizes the findings suggested by the study of China caregivers. That is, the little control over child eating exerted by child caregivers, greater child self-regulation, and greater child food fussiness all were associated with a higher child weight status. These findings are in contrast with Satter’s findings that both greater caregiver use of control over child eating and lower child eating self-regulation are associated with higher weight status in children.\textsuperscript{36} The China study also contrasts with Jansen’s findings.\textsuperscript{36} That is, lower maternal use of control during feeding practices was associated with higher child food responsiveness.\textsuperscript{36,107} Greater food fussiness also was associated with increased weight status in China children which differs from the finding that U.S.
and Swedish children did not differ on food fussiness by weight status. U.S. child emotional eating behaviors were not associated with weight status, which was comparable to the results of the Swedish study. Future research should model these relationships and aim to investigate why the associations in the study of China caregivers tend to differ from research conducted in Western countries.

**Strengths and Limitations**

The findings of this study need to be considered in light of its strengths and limitations. A strength of this secondary analysis study is the recent completion of both the U.S. and China studies in 2017 and 2019, respectively. Recent data is likely to be reflective of current parent feeding behaviors and child eating behaviors. Additionally, the large sample size of each study, 412 and 768 respectively, is a further strength. The diversity of the U.S. sample shows a representation of mothers and children from all 4 regions of the United States as well as a broad representation of various races and ethnic groups. This heterogeneous representation of groups allows for insight into a large cross section of the U.S. population. A further strength is that both studies used valid, reliable instruments that shared many similarities in concepts measured, thereby permitting cross study comparisons. However, one limitation in this cross comparison was the differences in the way that each study was conducted. For instance, U.S. mothers reported on their feeding behaviors as well as their child eating behaviors whereas in the China study, caregivers who were not necessarily the children’s mothers provided data. Differences in perceptions are possible when family members other than mothers, such as fathers or grandparents, are the primary caregiver responsible for feeding. For instance, grandparents tend to be more indulgent and accepting of children’s behaviors and may
underestimate eating fussiness or overestimate child self-regulation and thereby contribute to the findings that seem to contrast with similar child feeding studies conducted elsewhere. Additionally, the specific survey questions asked of U.S. mothers and China caregivers were similar in concept, but not identical and therefore have the potential to be interpreted differently. However, this is difficult to evaluate because the questions asked of China caregivers were translated into English for publication purposes. Lastly, because the original data set for the China study was not available, it was only possible to compare means that were reported in the publication with U.S. data.

Future Research

The results of this study suggest numerous potential studies for the future. The two studies here grouped boys and girls together. However, some research indicates that child caregivers may treat children differently based on their sex. For example, when children in the same weight status group were compared by sex, mothers restricted underweight males and normal weight females significantly more than comparators. Thus, future research should consider how child sex may mediate the feeding behaviors of child caregivers. Additionally, the studies finding suggest that the relationship between Chinese authoritarian culture and restrictive practices compared to authoritative and permissive parenting styles common in Western cultures may hold answers to the effect of child feeding practices on child weight status. For instance, Chinese caregivers tend to place a high level of importance on perfection and relate physical appearance to social acceptance. Future studies should consider how parenting style may influence the feeding behaviors of child caregivers. Based on the unexpected result that U.S. children
in the obese weight category showed the highest self-regulation of all weight status
groups, which was the opposite of previous studies, further research to explain this
phenomenon should be considered.\textsuperscript{110} Another opportunity for future research is
extending the studies reported here beyond preschool aged children. Some research
indicates that child eating behaviors change as children go to school, gain independence,
and interact with other children and adults.\textsuperscript{44} Further research assessing weight status
changes by age may help determine how early child feeding behaviors of mothers and
other caregivers influence lifelong weight status and whether interactions, such as
nutrition education in primary school, provide meaningful opportunities to protect weight
status long term.

\textbf{Conclusion}

The results described here have helped to increase our understanding of the
relationships of specific child feeding behaviors of child caregivers and children’s eating
behaviors to child weight status and how they differ in U.S. mothers and China caregivers
and their children. These findings can be used to inform the development of nutrition
education interventions that help parents make more thoughtful choices regarding child
feeding. For example, educating child caregivers about modeling healthy behaviors such
as regularly eating healthy foods like fruits, vegetables, whole grains, low fat dairy, and
lean proteins at meals and snacks shared with children. Additionally, guiding children to
pay attention to their own internal satiety cues and allowing children to participate in
deciding when and how much to eat has been shown to enable children to have a higher
degree of self-regulation concerning eating behavior.\textsuperscript{83} Finally, tailoring education so that
it is culturally sensitive and respectful of cultural norms is important while also helping
parents understand how their parenting style may affect children’s eating behaviors and ultimately, their health and weight status.
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