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## Chinese and Korean immigrants' early life deprivation: An important factor for child feeding practices and children's body weight in the United States

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### Abstract

This paper examines the associations between Chinese and Korean immigrant parents' early life material and food deprivation and their concern about their child's diet or weight, preferences for heavier children, and weight-promoting diet and child weight, alongside the moderating role of parents' acculturation toward American culture. In 2010, Chinese and Korean immigrant parents of children ages 3–8 years in the United States ( $N=130$ ) completed interviews which asked about their perceived early life material deprivation and food insecurity, acculturation, child feeding practices, and evaluations of whether their child weighed more or less than the ideal, and child consumption of soda and candy. Independent measures of child and parent BMI were also obtained. Regression analyses revealed that parents' early life food insecurity was associated with the evaluation that their child should weigh more than they do and greater consumption of soda and sweets by their child, among the least acculturated parents. Parental material deprivation was associated with more laissez-faire child feeding practices: less monitoring, less concern about the child's weight or diet, and less perceived responsibility for the child's diet, but only among less acculturated parents. Overall, the results suggest that immigrant parents' child feeding practices and body size evaluations are shaped by material hardship in childhood, but these influences may fade as acculturation occurs.

### Keywords

U.S.A.; Chinese immigrant children; Korean immigrant children; Early life deprivation; Acculturation; Feeding practices; Child weight

### Introduction

Young children of immigrants in the United States are more likely to be overweight and have higher percentile body mass index (BMIs) than children of natives of the same racial-ethnic group (Van Hook & Baker, 2010). BMI is a proxy for human body fat based on an individual's weight and height ( $\text{kg}/\text{m}^2$ ). The Center for Disease Control classifies children with a BMI at or exceeding the 95th percentile as "obese", and those between the 85th and 95th percentiles as "overweight". This finding is counterintuitive because most immigrants come from countries with lower prevalence of obesity than the United States (World Health Organization, 2010).

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This study considers the possibility that the relatively high levels of obesity among children of immigrants may be related to parents' early life deprivation in their countries of origin. Immigrant parents may be unaccustomed to protecting their children from obesity risks if they were socialized in contexts in which food insecurity and material deprivation were common and obesity was rare (Kuyper, Smith, & Kaiser, 2009; Van Hook & Balistreri, 2007; Van Hook & Baker, 2010). Immigrants' children may be particularly vulnerable to unhealthy weight gain if they continue parenting behaviors or beliefs that may promote weight gain, such as being less deliberate or thoughtful about their children's food choices, or favoring plumpness in children.

Our overarching goal was to test this idea using a Maryland-based sample of Chinese and Korean immigrant parents of children ages 3–8 years. Chinese-Americans are the largest and fastest growing Asian American subgroup, increasing 48% during the 1990s and 31% during the 2000s, and Korean Americans are the fifth largest subgroup, showing a 35% increase during the 1990s and 25% during the 2000s (Ruggles et al., 2010). We were interested in whether parents' early life deprivation was associated with their child feeding practices, their evaluations of child's body size (ideal vs. perceived), and their child's actual weight. Immigrants from China and Korea are ideal for testing these associations because both countries only recently experienced extremely rapid economic development (Guthrie, 2008; Kwon, Oh, Park, & Park, 2010), so many Chinese and Korean immigrant parents would have experienced some level of deprivation in childhood despite being comparably well-off in the U.S. (Hernandez, 2004). The contrast in material conditions in childhood versus adulthood permits us to assess whether parents' early life deprivation matters independently of current socioeconomic position. Moreover, certain cultural beliefs regarding healthy weight in children and methods of expressing love shared by these two groups may also play a role in their children's weight (e.g., Bush, 2003).

## Background

In the United States, the prevalence of overweight and obese children has quadrupled during the past 25 years (National Center for Health Statistics, 2004). Among 6- to 11-year-olds, 36.2% are estimated to be overweight or obese, and 18.8% obese (Ogden et al., 2006). Obesity is linked to a number of serious health conditions (Deckelbaum & Williams, 2001; Dietz, 1998) and to difficulties in social adjustment, poor mental health, and lower academic achievement (Datar, 2004; Strauss & Pollack, 2003), and thus has wide-ranging implications for children's quality of life (Swallen, Reither, Haas, & Meier, 2005). This may be particularly true for our study population. Although overweight and obesity are less prevalent in Asian American immigrants than in other ethnic groups, they carry a higher risk of chronic diseases than seen in Whites at the same BMI. Asians usually have a higher percent body fat than Whites of the same age, sex, and BMI. Also, although they have lower BMIs, Asian Americans in the United States are at a higher risk of developing cardiovascular disease and Type 2 diabetes mellitus than Whites, possibly because of genetic differences in body composition, metabolic responses, and epigenetic factors (Cho & Juon, 2006; Tan, Ma, Wai, Chew, & Tai, 2004).

Although childhood obesity is increasing worldwide, the prevalence of overweight and obese children remains extremely high in the United States compared to other countries. For example, 17.4 of children in China (age 6–9) were overweight or obese in the late 1990s compared with 30.3% of all U.S. children and 31% of Chinese-American children ages 6–11 years (Ogden et al., 2006; Tarantino, 2002; Wang, Monteiro, & Popkin, 2002). These contrasts and the direct linkages of obesity to food environments have led researchers to view immigrant obesity with a health acculturation perspective (e.g., Rumbaut & Weeks, 1989), which argues that exposure to the American environment and greater acculturation lead to less-healthy diets, sedentary activity, and obesity (Blumenthal, 2002; Carter, 2002).

The acculturation model is generally supported among adult and adolescent immigrants (e.g., Antecol & Bedard, 2006; Cho & Juon, 2006; Gordon-Larsen, Harris, Ward, & Popkin, 2003; Park, Myers, Kao, & Min, 2009; Yeh et al., 2009). However, there is a lack of a consistent positive relation between parental generational status, acculturation and children's diets and weight. On the one hand, data from ECLS-K and the NHANES clearly shows higher weights in children of immigrants who arrived more recently or had lower English proficiency (Van Hook & Baker, 2010). These findings cut across racial-ethnic groups and persist even after controlling for a broad set of family, school, and neighborhood characteristics. Chen and colleagues reported a negative association between parental acculturation and children's BMI (Chen, 2009; Chen & Wu, 2008). Additionally, Arredondo et al. (2006) found no clear positive associations between children's diets and indicators of parental acculturation. On the other hand, families of more acculturated Korean mothers dined out more frequently than did the families with less acculturated mothers (Park, Paik, Skinner, OK, & Spindler, 2003).

One possible reason the health acculturation model may not explain patterns in childhood obesity is that immigrant parents may be unaccustomed to thinking about or treating obesity as a serious health problem for their children. Many immigrants, including those coming from Asia, originate from countries in which food insecurity and under-nutrition posed significant health risks during childhood (Popkin & Doak, 1998; Van Hook & Balistreri, 2007), so they may be unaccustomed to protecting their children from overeating (Kuyper et al., 2005; Kuyper et al., 2009). In Korea and China, children's weight increases with income (Kwon et al., 2010; Wang, Popkin, & Zhai, 1998), suggesting that overweight among children may be discounted as a major health risk among the less wealthy.

Parents raised outside the United States may even have different perceptions of a healthy childhood weight. Historically, eating disorders have been relatively rare in Chinese and Korean populations, and these cultures have traditionally regarded plumpness as desirable and attractive (Lee, Ho, & Hsu, 1993; Ryu, Lyle, & McCabe, 2003). Even now, Chinese parents believe that obese children are healthier and reflect their love for their children (Bush, 2003). Immigrant parents may take these cultural orientations with them to the United States. Even middle-class Chinese immigrant parents in the United States believe that providing their children basic necessities like shelter, clothing, and especially food, are important ways of expressing their love (Cheah & Li, 2009).

Thus, cultural differences in beliefs about food and healthy weight for children may help explain the relatively high prevalence of obesity among children of immigrants. Importantly, we further argue that these cultural beliefs may be rooted in the material conditions—deprivation and food insecurity—in immigrants' countries of origin. In other words, the threat of food insecurity, feelings of deprivation, or uncertainty about the future may lead parents to prefer children to be plump and develop parenting behaviors that encourage children to eat when food is available. Even *concurrent* perceived food insecurity can affect child weight. Children in Korean households that reported mild food insecurity were more likely to be overweight compared to their peers in secure households (Oh & Hong, 2003). Similarly, food insecure Mexican-American families were found to have more overweight preschoolers (Kaiser et al., 2002). Additionally, growing up poor and with food deprivation was found to be associated with an increased risk of obesity in adulthood (Olson, Bove, & Miller, 2007; Sarlio-Lähteenkorva & Lahelma, 2001).

However, little is known about the association between immigrant parents' early life food and material deprivation in their country of origin and their child's diet and weight several years later. One study that explored the association between low-income Latino immigrants' past experiences with food insecurity and current child feeding practices (Kuyper et al.,

2009) found a significant association between food insecurity and less monitoring of children's diet. However, the association did not hold net of mother's education, possibly because of collinearity between early food insecurity and education in the study's low-income sample.

Using a more diverse sample, Van Hook and Balistreri (2007) found indirect evidence for this association by comparing obesity patterns of children of immigrants across sending countries. Children of immigrants tended to weigh more in kindergarten and gained more weight throughout primary school than children of natives. However, this pattern was found only among children whose parents grew up in very poor countries (i.e., countries with GDPs as low as many countries in Asia and Africa). The pattern among children from richer countries was more consistent with the expectations of the acculturation model (with children of immigrants weighing about the same or less than children of natives). However, this research assumes uniformity among immigrants from the same country. Clearly, not all immigrants from poor countries lived in poverty or experienced food insecurity before moving to the United States. For example, immigrants originating from more developed urban areas may have experienced dramatically different circumstances growing up than their co-nationals from rural areas.

To address these limitations, we assessed immigrant parents' perceptions of early life material and food deprivation rather than using country of origin as a crude proxy. We focus on Chinese and Korean immigrant parents to examine the association between two indices of parents' early life deprivation and their children's weight-related behaviors and outcomes in the United States while controlling for current socioeconomic status (SES). As noted earlier, many Chinese and Korean immigrants are middle-class but were poor as children, so early life deprivation may be less strongly correlated with current SES than in low-income samples.

Another limitation of previous studies is that they do not consider the moderating role of acculturation (Kuyper et al., 2009) or they measure it with crude proxies, i.e., the study participants' birthplace or length of time in the United States (Berry, 1997; Van Hook & Balistreri, 2007). Parents' early life deprivation may be less influential among more acculturated parents. Thus, in our study, we tested this idea and assessed parents' behavioral acculturation toward American culture across three domains, specifically, parents' English language proficiency and use, social activities with American friends, participation in American cultural activities and holidays.

## Hypotheses

The discussion above suggests that parents' early life deprivation in their countries of origin would be associated with parenting beliefs and behaviors that indicate less concern or involvement in children's diets or weight, and/or preferences for heavier children. Our first hypothesis was that immigrant parents' early life material and food deprivation will be associated with: (1) less concern about their child's diet or weight (as indicated by parents being less likely to monitor what their child eats; being less concerned that their child might eat too much or become overweight; perceiving less responsibility for their child's diet); (2) *preferences for plumpness* (as indicated by parents believing that their child weighs less than ideal), and (3) *weight-promoting diet and outcomes* (as indicated by their child consuming more servings of soda and candy; their child weighing more).

To the extent that they originate from the material conditions of the immigrants' country of origin, these beliefs and behaviors are likely to weaken as parents learn about and adapt to the conditions and health risks in the United States. Thus, parents' acculturation toward American culture was expected to moderate the association between their early life

experiences and their weight-related beliefs and behaviors pertaining to their children. Therefore, our second hypothesis was that the associations predicted by Hypothesis 1 would be significantly weaker among parents who are more acculturated toward American culture.

## Methodology

### Data collection procedures

Institutional Review Board approval for the study was obtained from the University of Maryland, Baltimore County. A non-random sample of one hundred and thirty 3- to 9-year-old children (aged 35-116 months) and their parents participated in the study. In all families, both parents identified as being ethnically Chinese or Korean, and migrated from China or Korea, respectively. Announcements regarding the study were made at churches, community centers, preschools and daycare centers serving immigrant Chinese and Korean families throughout Maryland. During the 2-h home visit, the interviewers first obtained parental consent and child assent. The parent who was most responsible for the daily care of the child (93% mothers; 7% fathers) completed the questionnaire packet under the supervision of the interviewers, who were fluent in the family's language/dialect (English, Mandarin, Cantonese, or Korean).

The interviewers also assessed the child's and parents' height and weight using a stadiometer and digital scale. To measure height and weight, we used equipment provided in the QuickMedical Traveling Measuring Kit (<http://www.quickmedical.com/seca/pediatrics/214.html>), including the Charder HM200P Portstad Portable Stadiometer (height range of 14e200 cm with a graduation of 0.1 cm) and the Lifesource UC-321 Precision Health Scale (0.1 pound resolution).

The guidelines provided on the Centers for Disease Control and Prevention website were used during the training session of the research assistants ([http://www.cdc.gov/healthyweight/assessing/bmi/childrens\\_bmi/measuring\\_children.html](http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/measuring_children.html)). The goal of the training session was to standardize all examiners to these procedures for obtaining measurements in order to minimize errors made in measuring technique. We estimated weight as the average of three separate measurements. The within-person ranges across the three measurements were small: less than 0.8 pounds for all children, less than 1.1 pounds for all but 1 mothers, and less than 0.4 pounds for all but 2 fathers (the range was 3.7 pounds for 1 mother, 5 pounds for 1 father, and 10 pounds for another father).

All data were collected between May 2010 and November 2010. All measures were translated and back-translated from English to Chinese (simplified and traditional forms) and Korean by bilingual graduate students in Psychology and Linguistics.

### Measures

**Parents' early life deprivation**—We asked parents a series of standardized retrospective questions about early material and food deprivation when they were about 8 or 9 years old during a structured interview. We selected this age because early- and middle-childhood are critical developmental periods for the formation of food preferences and eating patterns (e.g., Davison & Birch, 2002; Fiorito, Marini, Mitchell, Smiciklas-Wright, & Birch, 2010). We developed three indices that each tap into different aspects of deprivation: First, we measured wealth as the number of the following possessions owned by the respondent's family: sewing machine, washing machine, clothes dryer, dish washer, air conditioner, refrigerator, stove, microwave, food freezer, telephone, radio, television, watch, bicycle, and a car. This list was reviewed by 10 Chinese and Korean individuals to ensure that the items were familiar to and likely owned by "average status" families in China and Korea during

the 1970s and 1980s (the period when the majority of parents in our sample were approximately 8 or 9 years of age). We summed the items owned to create an index ranging from 0 to 15. To be consistent with the other measures of early life deprivation, we reverse coded this measure so that higher values indicate less wealth.

Another measure of low housing quality was used to indicate hazards or deficiencies in the immediate environments in which parents grew up. This index was originally developed to measure an aspect of material hardship other than food insecurity or low-income (Bauman, 1998). Parents were asked whether any of the following conditions were present in the home when they were 8 or 9 years of age: pests, leaking roof, broken windows, exposed electrical wires, plumbing that did not work, holes or cracks in the wall or ceiling, and holes in the floor. We summed the number of problems indicated to create an index ranging from 0 to 7. Because the reversed-wealth and low housing quality indices were strongly correlated ( $r = 0.50$ ) and had very similar associations with the dependent variables, we averaged the two measures (after rescaling the wealth measure to range from 0 to 7), thus creating a single indicator of the level of material deprivation in childhood.

Finally, we developed a retrospective measure of food insecurity, which was adapted from the six-item scale of current household food insecurity developed by the U.S.D.A. (2008). Food insecurity may be more directly related to the development of beliefs about weight and child feeding practices than material deprivation. Parents were asked to assess whether it was often, sometimes, or never true that “My parents worried whether our food would run out before we got money to buy more” and that “The food that we bought just didn’t last, and my parents didn’t have money to get more.” Parents were also asked whether and how often they or their parents “ever cut the size of their meals or skip meals because there wasn’t enough money for food.” We created an index based on these items to indicate the level of food insecurity in childhood and a dummy variable indicating the presence of food insecurity (1 = if the respondent indicated any level of food insecurity on any of the questions; 0 = otherwise). We found stronger relationships between the dependent variables and the presence of food insecurity than the level of food insecurity, perhaps because retrospective measures of food insecurity are not precise enough to distinguish among high, medium, and low levels of food insecurity. Therefore, we used the dichotomous measure for this study.

**Parental acculturation**—We used a modified parent version of the Chinese Children Acculturation Scale (Chen, 1997), to measure the *behavioral* aspects of Chinese and Korean parent’s acculturation toward and participation in American culture with regard to their frequency of engagement in social activities with Americans, English language proficiency (speaking, writing, and listening), and frequency of engagement in American lifestyle, including the celebration of holidays and festivals. We summed the items to obtain an overall score of behavioral acculturation toward American culture ( $\alpha = 0.62$ ).

**Child feeding practices**—Child feeding practices were measured using the Child Feeding Questionnaire (Birch et al., 2001), which asks a set of questions related to child health, nutrition, and mealtime settings. We used three subscales from this questionnaire: (1) the extent the parent monitors or keeps track of what the child eats (range: 1.0–5.0;  $\alpha = 0.97$ ); (2) the extent the parent is concerned about his/her child eating too much or becoming overweight (range: 1.0–5.0;  $\alpha = 0.84$ ); and (3) the extent the parent perceives responsibility for the child’s diet (range: 1.0–5.0;  $\alpha = 0.67$ ). The concern subscale indicates a directional preference by parents to decrease the amount of food consumed or children’s weight. The monitoring and responsibility measures tap into the degree parents are interested or concerned about what the child eats, but do not indicate whether parents

think children should eat or weigh more or less. For the multivariate analyses, we reverse coded the monitoring, concern, and responsibility scales.

**Parents' evaluations of child's body size (ideal vs. perceived)**—To assess parents' evaluations of whether their child weighs more or less than ideal, we used the modified Stunkard Body Rating Scale adapted for children, a visual scale of seven male and female silhouettes representing body images that range from very thin to obese (Collins, 1991). Parents were asked, "Now I would like you to examine these pictures of children. Different children have different body types. This picture shows some examples of different body types. Which picture looks most like the body type of your child?" and "what you would most ideally like your child to look like?" We subtracted the score pertaining to the respondents' child from the score pertaining to the ideal child, yielding a scale ranging from -1 to 3. Positive values indicate that the parent believes his/her child weighs less than is ideal (meaning the child should gain weight), while negative values indicate the opposite.

**Consumption of soda and candy/sweets**—Soda and candy or sweets are particularly important risk factors for obesity in children. Soda and other sugar-sweetened drinks have consistently been found to increase the odds of overweight among children and adolescents and significantly contribute to the calories they consume (Malik, Schulze, & Hu, 2006). Parents were asked to recall the approximate number of servings of non-diet soda and candy or sweets their children consumed over the past seven days. Interviewers provided definitions of serving sizes, and prompted respondents with specific examples of soda and sweets, including Chinese and Korean snacks like jelly, Pocky sticks, and Choco Pie. We summed the separate soda and candy/sweets measures to create an indicator of children's consumption of sugar-sweetened foods (range: 0–35).

**Children's body weight**—We used percentile body mass index (BMI, or weight/height<sup>2</sup>) to measure children's body weight (Must & Anderson, 2006). We weighed children on a digital scale and measured their standing height using a stadiometer. We then converted the height and weight measurements to children's BMI percentile score using algorithms provided by the Centers for Disease Control and Prevention (CDC).

### Control variables

**The family description measure**—The Family Description Measure (Bornstein, 1991) was used to obtain detailed demographic and descriptive information about the child, mother, and father, parents' age, employment, education, and nationality. Our multivariate models controlled for several of these characteristics that may be associated with the key variables of interest. These included the child's age in months, the child's gender (1 = female), parents' country of origin (1 Korean; 0 = Chinese), parents' weight status (1 = one or both parents is overweight, i.e., with a BMI  $\geq 25$ ), and socioeconomic status. Parents' BMI was calculated from height and weight measurements (BMI = weight in kg/height in meters<sup>2</sup>). Socioeconomic status was assessed using the Hollingshead Index, a composite measure based on the educational attainment and occupation of the head of the household in which the child resides (Hollingshead, 1975). Finally, because parents' beliefs and child feeding practices may represent responses to children's weight status, we controlled for children's percentile BMI in the models predicting child feeding practices, parents' evaluations of child's ideal versus perceived body size and soda/sweet consumption.

### Data analysis

We examined the associations between parents' early life deprivation and acculturation with parents' child feeding practices, evaluations of their child's body size (ideal vs. perceived), their child's consumption of soda and candy or sweets, and their child's weight. All of the

dependent variables were coded so that higher values indicate less concern or involvement in children's diet, greater preference for plumpness in children, and a greater risk of obesity for children. The significance value was set at  $p < .05$ .

We first produced descriptive statistics for the variables used in the analysis. For the descriptive statistics, the child feeding practices (i.e., the monitoring, concern, and responsibility subscales) were not reverse coded to allow comparisons with the results reported for the sample of U.S. parents on which the scales were developed (Birch et al., 2001).

Next, we estimated a series of ordinary least squares models to evaluate the hypotheses. To test Hypothesis 1, we estimated six OLS models, one for each of the six dependent variables: child feeding behaviors (less monitoring, less concern about weight, and less perceived responsibility for the child's diet), parents evaluations of their child's body size (ideal vs. perceived), the child's consumption of soda and sweets, and the child's weight. These models estimated the association of parents' early life deprivation and U.S. acculturation with the outcomes, net of current socioeconomic status and other potential confounders. We present both the unstandardized and standardized regression coefficients from these models in Table 2.

To evaluate Hypothesis 2, we tested interactions between parents' early life deprivation and U.S. acculturation. These models include the same set of controls as shown in Table 2. To save space, we present only the unstandardized and standardized coefficients for U.S. acculturation, early life deprivation, and the interaction terms in Table 3.

To help interpret significant interaction effects, we generated and graphed predicted values corresponding with combinations of high (+2 SD), average, and low (-2 SD) values for material deprivation, food insecurity versus no food insecurity, and high (-2 SD) and low (-2 SD) values for U.S. acculturation. We used sample averages as values for all of the other predictors in the model.

## Results

### Sample descriptives

Nearly half (48%) of the children in the study were girls, 38 percent were of Korean origin, and slightly more than half (55%) had at least one overweight parent. The mothers were 39 years old on average (range from 32 to 51 years), and fathers were 41 years old on average (range from 28 to 52 years). Parents were first-generation immigrants, and nearly all (92% of mothers and 91% of fathers) arrived in the United States when they were adults aged 18 or older and thus were socialized as children in China or Korea. All families were two-parent middle-class families. Most mothers were highly educated, with 34.6% having a University degree, and an additional 54.6% having a graduate or professional degree. The average Hollingshead score in our sample was 57.5 (SD = 8.3) and ranged from 25 to 66.

Table 1 provides descriptive information about the key independent and dependent variables used in the analysis. Respondents indicated an average U.S. acculturation of 0.0 but with a wide range from -5.2 to 5.8. Respondents indicated moderate to high levels of perceived early life deprivation. When they were about 8 or 9 years old, their families owned an average of 6.92 possessions out of 15 total possible on the list provided, they indicated the existence of nearly one (0.82) housing quality problem, and the combined material deprivation index averaged 2.3 (SD = 0.95). Additionally, 38% indicated the presence of food insecurity. Not shown in Table 1, early life material deprivation variable was moderately correlated with early life food insecurity ( $r = 0.30$ ;  $p < .001$ ), and Hollingshead



score (current socioeconomic status) was moderately correlated with early life material deprivation ( $r = 0.31$ ;  $p < .001$ .) but not significantly associated with early life food insecurity ( $r = -0.15$ ;  $p = .10$ ).

In terms of child feeding practices, the average monitoring score was 3.1 (SD = 1.5), the average score for concern about the child eating too much or becoming overweight was 1.8 (SD = 1.0), and the average score on perceived responsibility for the child's diet was 3.7 (SD = 1.0). On average, parents indicated their child weighed slightly less than ideal (0.3). In addition, parents in our sample reported their children consumed an average of 6.5 servings of soda and sweets/candy per week, although this ranged widely between zero and 35. Finally, the average child's percentile BMI was 57.6 and ranged widely from 0.8 to 98.8. Only 20% had percentile BMIs in the 85th percentile or higher ("overweight" according to CDC guidelines).

### Parents' early life deprivation and child feeding behaviors, beliefs, and child's weight

The OLS model estimates used to assess Hypothesis 1 are shown in Table 2. Similar to prior research, the results show no significant direct association between parents' acculturation and child feeding practices (concern, monitoring and perceived responsibility), evaluations of their child's body size (ideal vs. perceived), their child's soda/sweet consumption, and their child's weight.

Hypothesis 1 predicted that the indicators of deprivation would be associated with less concern about children's diet and obesity-promoting beliefs and outcomes, with expected positive and significant coefficients. Associations involving food insecurity provided greater support for Hypothesis 1 than those involving early life material deprivation. Parents who experienced food insecurity in childhood perceived less responsibility for their child's diet (beta = 0.17;  $p < .05$ ), and were more likely to evaluate their child as weighing less than ideal, even after controlling for the child's actual percentile BMI (beta = 0.26;  $p < .01$ ). However, early life material deprivation was not associated with any of the outcomes.

### Parents' early life deprivation and Chinese/Korean cultural orientations

Hypothesis 2 predicted that the effects of early life deprivation would be weaker for those with stronger American orientations. To assess this idea, we tested the significance of interaction terms between U.S. acculturation and early life material deprivation and food insecurity (Table 3). Hypothesis 2 would be supported if the interaction effects were negative and significant, signifying a weaker association between deprivation and less concern about diet or obesity-promoting beliefs and child outcomes among those with higher U.S. cultural orientations. Out of the 12 tested, 5 of the interactions were significant and four were negatively signed.

To interpret the results, we graphed predicted values. Figs. 1 and 2 depict the significant interaction effects involving material deprivation and food insecurity, respectively. The findings concerning material deprivation generally support Hypothesis 2. Among less acculturated parents (shown by the solid lines in Fig. 1), those who grew up in poorer households are less likely to monitor what their child eats (Fig. 1A), less concerned about their child eating too much or becoming overweight (Fig. 1B), and perceive themselves to be less responsible for their child's diet (Fig. 1C) than parents growing up in wealthier households. However, for parents who are more acculturated (shown by the dashed lines in Fig. 1), the association between early life material deprivation and these child feeding practices operate in the opposite direction. We found no significant association between early life material deprivation (neither as additive effects nor in interaction with

acculturation) and parents' evaluations of their child's weight, soda/sweet consumption, and weight.

The findings concerning food insecurity provided less consistent support for Hypothesis 2. As expected, parental food insecurity was associated with greater soda/sweet consumption among children of less acculturated parents, but less soda/sweet consumption among children of more acculturated parents (Fig. 2B). Unexpectedly, however, food insecurity was associated with greater perceived responsibility for children's diets among less acculturated parents, but less perceived responsibility among more acculturated parents (Fig. 2A). Additionally, the association of early life food insecurity with four of the six outcomes did not vary significantly by parents' cultural orientation. For example, parents who experienced food insecurity in childhood evaluated their child as weighing less than ideal regardless of acculturation level.

## Discussion

In this study, we attempted to better understand why children of immigrants appear to be particularly susceptible to childhood obesity. In a sample of East Asian children, we tested the idea that early life deprivation and food insecurity among immigrant parents may reduce concern about obesity as a health risk for children and lead to parenting practices that may result in children eating more food or less-healthy food (Kuyper et al., 2009). Specifically, we assessed the association between Chinese and Korean immigrant parents' perceived early life deprivation with evaluations of their children's body weight, and child feeding practices, while controlling for current socioeconomic status. We found evidence that immigrant parents' early life experiences with material and food deprivation have long-reaching impacts on child feeding practices in the United States, in several cases in interaction with lower levels of U.S. acculturation.

We examined two indicators of early life deprivation: material deprivation and food insecurity. Of these, food insecurity had the most straightforward association with obesity-promoting behaviors and outcomes. A large proportion of immigrant parents in our middle-class sample (38%) reported experiencing food insecurity as children in China or Korea, a much higher portion than the 12.1% of children in the United States who live in a food insecure household (U.S.D.A., 2011). Parents who experienced food insecurity evaluated their children as weighing less than ideal. This finding did not vary by level of acculturation. Thus, food insecurity in childhood may have a particularly long-lasting impact on the ways people think about body weight, even continuing to influence immigrants in adulthood and after they are a part of the American middle-class society.

Children of parents who experience early life food insecurity also consumed more servings of soda and sweets, particularly children with the least acculturated parents. This suggests that parents who experienced food insecurity in childhood may fail to recognize the risk of high-calorie foods of low nutritional value and may even favor heavier children. One exception to this pattern was that among less acculturated parents, food insecure parents perceived greater responsibility for their children's diets than food secure parents. However, this perception may be associated with preoccupation with food among parents who once experienced food deprivation; they may try to ensure that their children have enough to eat rather than too much. Supplementary post-hoc analyses supported this idea. Candy and soda consumption was positively associated with perceived responsibility among parents who experienced food insecurity but not among food secure parents.

While food insecurity tended to be associated with outcomes that are closely associated with obesity and a greater concern about their children's diets, early life material deprivation was

associated with less concern or involvement in children's diets. Unlike food insecurity, material deprivation was not associated with thinking children should weigh more or soda/sweet consumption. Instead, it was associated with less monitoring of the child's diet, less concern that the child might eat too much or become overweight, and less perceived responsibility for the child's diet. Thus, immigrants who grew up in poor circumstances may tend to have laissez-faire attitudes and behaviors about their child's diet, but may not necessarily favor plumpness in children. Moreover, this pattern appears to be concentrated among those parents who were the least acculturated. Thus, poverty in childhood may influence the degree to which parents are actively involved in determining their children's diets, but this influence may fade as immigrants become more acculturated into American society.

In summary, the results suggest that different indices of early life experiences (material vs. food deprivation) may indicate different ideas and experiences influencing food-related behavior. We speculate that food insecurity may trigger specific concerns by parents to ensure their children have enough to eat, which may eventually increase the risk of obesity among their children. However, parents who experienced poverty but not food insecurity may be less concerned with (or think about) food in general and give higher priority to other concerns. It is important to consider the possibility that such laissez-faire child feeding practices may not be associated with a higher risk of child obesity. Although permissiveness is associated with the risk of child obesity, over-control of children's diets may also lead to weight gain if children do not internalize healthy eating patterns and preferences (Schwartz & Puhl, 2003). More research is required to assess the association between specific types of child feeding practices and the development of obesity among the children of immigrants.

The results also provide support for a part of the argument advanced by Van Hook and Baker (2010) that children of immigrants may more vulnerable to the risk of obesity because their parents originate from countries with lower food security and are therefore less concerned about this risk or may even prefer their children to weigh more. We do not compare children of immigrants with children of natives, so the results do not help explain nativity differences in weight. Nevertheless, we provide evidence that Chinese and Korean immigrant parents' feeding practices and evaluations of their child's weight are associated with the material conditions in which they grew up, especially the experience of food insecurity. Additional research is necessary to assess whether these associations hold across other immigrant origin groups.

We conclude by noting some of the study's limitations. First, the results are based on a relatively small and homogenous convenience sample of parents and children. Some of the coefficients may not have reached significance because of a lack of power. Second, the children in our sample were particularly lean. Only 20% were overweight, which is lower than Tarantino's (2002) estimate of 31% for Chinese-American children ages 6-11. A sample drawn from a different immigrant community with a different weight distribution may yield different results. Third, the data we use are cross-sectional, so we were unable to assess the causal order of the relationships. For example, longitudinal data are required to assess the effects of parental acculturation on the outcomes. Finally, some of our variables may suffer from measurement error. We used parental recall of children's soda and sweet consumption, but dietary recall measures tend to be inaccurate (Collins, Watson, & Burrows, 2010). In addition, the retrospective measures of perceived early life deprivation may be inaccurate if adults cannot remember or inaccurately remember conditions in their childhood. Thus, future research should utilize cognitive testing to refine the measurement of these constructs.

Clearly, more research is necessary to assess whether the associations explored here can be replicated. If they are robust to these limitations, information about parents' early life circumstances could be used to target vulnerable populations for interventions through the modification of beliefs and practices that increase children's risk for obesity.

## Acknowledgments

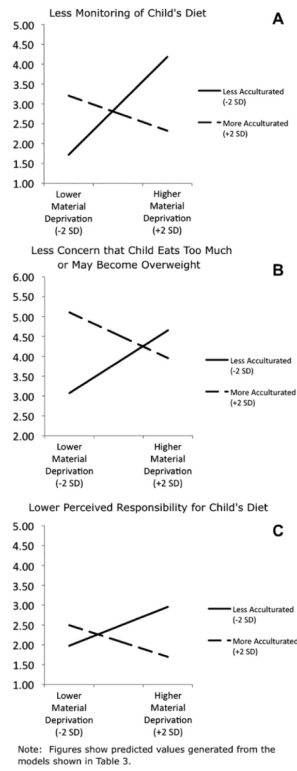
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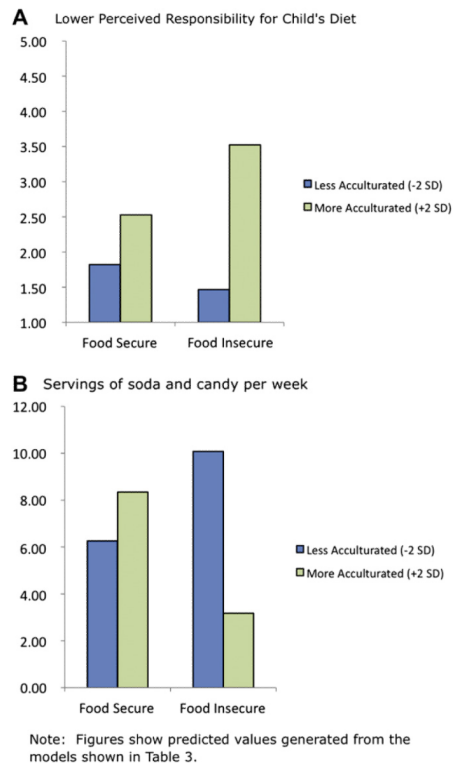
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**Fig. 1.** Child feeding practices by early life material deprivation and U.S. acculturation.



**Fig. 2.** Child feeding practices by early life food insecurity and U.S. acculturation.



Table 1

Sample descriptives for the independent and dependent variables.

Description	Type of variable	Mean or %	SD	Min	Max
<i>Independent variables</i>					
U.S. acculturation	Continuous	0.0	2.3	-5.4	5.8
Parental early life low material well-being	Continuous, higher values indicate low wealth	2.3	0.9	0.0	5.0
Parental early life food insecurity (%)	Dummy (1 = food insecure)	38.5			
<i>Dependent variables</i>					
Parent's evaluation of child's ideal vs. actual weight	Continuous; positive values indicate child weighs less than ideal	0.3	0.8	-1.0	3.0
Parent monitors what child eats	Continuous, reverse coded for models	3.1	1.4	1.0	5.0
Parent is concerned about child eating too much or becoming overweight	Continuous, reverse coded for models	1.8	1.0	1.0	5.0
Parent perceives responsibility for child's diet	Continuous, reverse coded for models	3.7	1.0	1.0	5.0
Servings of soda and candy per week	Continuous	6.5	5.7	0.0	35.0
Child's weight (percentile BMI)	Continuous	57.6	27.1	0.8	98.8

N= 130 children. Means, standard deviations, minimum and maximum shown for continuous variables; percentages shown for dummy variables.

**Table 2**

OLS regression models of child feeding practices, parent's evaluation of child's weight, soda/candy consumption, and child's weight (unstandardized regression coefficients; standardized coefficients shown in parentheses).

	Child feeding practices			Parent evaluates child as weighing less than ideal	Soda & candy (servings per week)	Child's weight (percentile BMI)
	Less monitoring of child's diet	Less concern about weight	Less perceived responsibility for child's diet			
U.S. acculturation	-0.05 (-0.07)	0.05 (0.12)	0.00 (-0.00)	0.01 (0.04)	-0.13 (-0.05)	2.02 (0.17)
Parent's early life deprivation						
Lower maternal well-being	0.16 (0.10)	0.02 (0.02)	-0.01 (-0.01)	-0.13 (-0.15)	1.10 (0.18)	-0.19 (-0.01)
Food insecure	-0.16 (-0.05)	0.13 (0.07)	0.34* (0.17)	0.42** (0.26)	-0.67 (-0.06)	8.57 (0.15)
Controls						
Child's age in months	0.01 (0.08)	-0.01* (-0.17)	0.01* (0.18)	0.00 (-0.04)	-0.02 (-0.08)	-0.22* (-0.18)
Child's gender (girl)	-0.14 (-0.05)	-0.09 (-0.05)	-0.06 (-0.03)	-0.27* (-0.17)	1.33 (0.12)	-8.30 (-0.15)
Korean	-1.74*** (-0.59)	-0.80*** (-0.41)	-1.53*** (-0.75)	-0.24 (-0.15)	4.29** (0.37)	-0.58 (-0.01)
Parent(s) overweight	-0.36 (-0.12)	0.03 (0.02)	0.19 (0.09)	-0.09 (-0.05)	-0.95 (-0.08)	6.24 (0.11)
SES in the U.S.	-0.02 (-0.12)	-0.01 (-0.06)	-0.01 (-0.08)	0.00 (-0.05)	0.03 (0.04)	-0.33 (-0.10)
Child's weight (%BMI)	0.00 (-0.01)	-0.01*** (-0.34)	0.00 (0.05)	-0.02*** (-0.57)	-0.01 (-0.03)	
Intercept	4.38***	6.12***	2.58***	1.97**	2.71	90.66***
Adj R-squared	0.39	0.22	0.45	0.30	0.06	0.07
N	130	130	130	130	130	130

\*\*\*  $p < .001$ ;

\*\*  $p < .01$ ;

\*  $p < .05$ .

Table 3

Interaction effects of U.S. Acculturation and parents' early life deprivation (unstandardized regression coefficients; standardized coefficients shown in parentheses).

	Child feeding practices			Parent evaluates child as weighing less than ideal	Soda & candy (servings per week)	Child's weight (percentile BMI)
	Less monitoring of Child's Diet	Less concern about weight	Less perceived responsibility for child's diet			
U.S. acculturation	0.22* (0.35)	0.23** (0.53)	0.08 (0.18)	0.03 (0.09)	0.21 (0.08)	0.17 (0.01)
Parent's early life deprivation						
Lower material well-being	0.20 (0.13)	0.07 (0.07)	0.02 (0.02)	-0.12 (-0.15)	1.01 (0.17)	-0.44 (-0.02)
Food insecure	-0.20 (-0.07)	0.10 (0.05)	0.32* (0.16)	0.41** (0.26)	-0.67 (-0.06)	8.78 (0.16)
U.S. Acculturation × early life deprivation						
Lower material well-being	-0.09** (-0.43)	-0.08** (-0.58)	-0.05* (-0.35)	-0.01 (-0.06)	0.01 (0.01)	0.61 (0.15)
Food insecure	-0.08 (-0.07)	0.12 (0.17)	0.15* (0.21)	0.00 (-0.00)	-1.00* (-0.24)	0.76 (0.04)

All models include all the control variables shown in Table 2.

\*\*\*

$p < .001$ ;

\*\*

$p < .01$ ;

\*

$p < .05$ .