The Impact of Family Factors and Household Food Insecurity on Fruit and Vegetable Consumption in Low-Income Children

By

Christina M. Amaro

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Michael C. Roberts, Ph.D., ABPP

Committee Chair

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Ric G. Steele, Ph.D., ABPP

Committee Member

_____

Christopher C. Cushing, Ph.D.

Committee Member

Date Defended: September 10, 2015

The Thesis Committee for Christina M. Amaro
certifies that this is the approved version of the following thesis:

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Michael C. Roberts, Ph.D., ABPP

Committee Chair

Date approved: September 10, 2015

Abstract

Objective: The purpose of the study was to examine the relationships among household food insecurity, family functioning, parental stress, and fruit and vegetable consumption in low-income children. **Methods:** Parents of children from ages 5-10 years were recruited from local farmers' markets implementing a dollar-for-dollar match for individuals using their Supplemental Nutrition Assistance Program (SNAP) benefits. Parents (n = 143) completed questionnaires pertaining to stress, family functioning, household food insecurity, and child fruit and vegetable consumption. Participants also completed a brief demographic questionnaire. **Results:** Family functioning, household food insecurity, and parental stress were not significantly associated with fruit and vegetable consumption in low-income children. Exploratory analyses examined household food insecurity as a moderator between parental stress and fruit and vegetable consumption; findings were not significant. **Conclusions**: Family factors and household food insecurity were not significantly related to fruit and vegetable consumption in low-income children in the current study. As farmers' markets with match programs for SNAP users continue to expand across the United States, researchers may consider to continue to expand studies in this area.

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The Impact of Family Factors and Household Food Insecurity on Fruit and Vegetable Consumption in Low-Income Children

Although eating fruits and vegetables is part of a balanced diet, many youth are not meeting the United States Department of Agriculture (USDA) recommended daily serving amounts (Epstein et al., 2001; Guenther, Dodd, Reedy, & Krebs-Smith, 2006; Lorson, Melgar-Quinonez, & Taylor, 2009). Unhealthy eating habits developed in childhood and adolescence may negatively impact their current health and quality of life, and these poor habits may persist into adulthood (Roberts, 1991). A poor diet, along with other unhealthful behaviors (e.g., decreased physical activity, poor sleep), may increase the risk of preventable chronic illnesses such as obesity, diabetes, cardiovascular diseases, and cancer (e.g., Lorson, Melgar-Quinonez, & Taylor, 2009; Mokdad, Marks, Stroup, & Gerberding, 2004). In addition to physical problems, these diseases are also often associated with psychosocial impairments. For example, pediatric overweight and obesity are associated with reduced quality of life, increased symptoms of depression and anxiety, peer victimization, and lower self-esteem (e.g., Griffiths, Parsons, & Hill, 2010; Sawyer, Harchak, Wake, & Lynch, 2012; Zeller & Modi, 2008). Pediatric overweight and obesity are particularly concerning in low-income youth, who are at greater risk for developing these medical problems (Lawman & Wilson, 2012; McCurdy, Gorman, & Metallinos-Katsaras, 2010), and financial limitations may make it more challenging to afford nutritious food options and maintain a healthy lifestyle (Fuemmeler, Moriarty, & Brown, 2009). Given that increased fruit and vegetable consumption lowers the risk for these chronic illnesses (e.g., Lorson et al., 2009), greater attention should be allotted to

understanding the mechanisms involved in improving this behavior in youth, especially among low-income families.

Indeed, more resources and attention have been dedicated to promoting better pediatric health behaviors, such as nutrition, at national and state levels. For example, one of the objectives of *Healthy People 2020,* a program developed by the United States government for health promotion and prevention of diseases, is to increase children's fruit and vegetable consumption (U.S. Department of Health & Human Services, 2014). In 2010, First Lady Michelle Obama launched the *Let's Move!* program, a campaign to decrease pediatric obesity through promotion of healthy eating and physical activity, with a specific focus on low-income families (The White House, 2010). Moreover, individual organizations within states have started to encourage healthy eating especially among low-income families. For example, a program in the Kansas City area called Beans&Greens provides a dollar-for-dollar match for individuals using their Supplemental Nutrition Assistance Program (SNAP) benefits at farmers' markets (Swan, 2014). Programs like Beans&Greens have emerged across the United States, and strive to make locally grown and healthy foods more affordable and accessible for low-income individuals and families. Some states have also started to pass legislation in favor of piloting state-level programs similar to this match program at farmers' markets (e.g., Missouri House Bill No. 1879, 2014).

Within pediatric psychology, health promotion, and nutrition in particular, can be conceptualized using an ecological systems approach (e.g., Wilson & Lawman, 2009). Although more recent interventions and research studies have focused on individual characteristics of the child, work is needed to extend to other areas of the model, such as

microsystemic factors (e.g., family, social support; Wilson & Lawman, 2009). Indeed, extant research has examined the importance of the family environment and food consumption in children and adolescents. Family factors, such as parental modeling and parental food intake, have been positively associated with healthy eating behaviors in children and adolescents (e.g., Neumark-Sztainer, Story, Resnick, & Blum, 1996; Pearson, Biddle, & Gorely, 2008; Young, Fors, & Hayes, 2004). Similarly, youth dietary behaviors may be influenced by family rules and limit setting, parental encouragement, and home availability of fruits and vegetables (e.g., Alia, Wilson, St. George, Schneider, & Kitzman-Ulrich, 2013; Ding et al., 2012; Neumark-Sztainer, Wall, Perry, & Story, 2003; Pearson et al., 2008). However, according to a recent review on obese youth who were at-risk for developing type 2 diabetes, some of these factors (e.g., parenting monitoring) have demonstrated more consistency than others (e.g., parental role modeling), which may be due to a variety of factors (e.g., age and gender differences; Lawman & Wilson, 2012). While more attention has been dedicated to examining the relationship between specific family environment factors and youth fruit and vegetable consumption, less research has been conducted on family functioning, parental stress, and household food insecurity and child food consumption, particularly in low-income families.

Family functioning is a complex concept that refers to the interpersonal relationships between family members as well as properties of the family as a whole, which may include problem solving skills and communication (Epstein, Baldwin, & Bishop, 1983). Although family functioning has been well examined in conjunction with areas such as youth's psychosocial functioning (e.g., academic functioning,

psychopathology; Berge, Wall, Larson, Loth, & Neumark-Sztainer, 2013) and pediatric illness (e.g., diabetes, cystic fibrosis; Cohen, Lumley, Naar-King, Patridge, & Cakan, 2004; Janicke, Mitchell, & Stark, 2005), less research has focused on the relationship between family functioning and children's nutrition. Previous studies have suggested the importance of family functioning (e.g., family connectedness, family cohesion) in adolescent dietary behaviors (e.g., Ambrosini et al., 2009; Berge et al., 2013; Neumark-Sztainer et al., 1996; Welsh, French, & Wall, 2011). Specifically, Berge and colleagues (2013) found gender differences, such that better general family functioning (as measured by the McMaster Family Assessment Device; Epstein et al., 1983) was positively related to fruit and vegetable consumption and lower body mass index z scores in adolescent girls and less fast-food consumption as well as more family meals in adolescent boys. Although several studies have examined the relationship between family functioning and adolescents, fewer studies have examined this relationship in school-age children. Renzaho and colleagues (2010) inspected general family functioning (as measured by the McMaster Family Assessment Device; Epstein et al., 1983) and fruit and vegetable consumption in low-income elementary school children and their families in Australia. Family factors, such as higher financial stress and poorer family functioning, were negatively related to boys' and girls' fruit and vegetable intake; however, few other studies have examined this link in elementary school children (Renzaho et al., 2010). Therefore, research in this area is needed to provide additional support for the relationship between family functioning and fruit and vegetable consumption particularly in low-income children.

Parental stress also may influence youth food consumption in multiple ways. Parents experiencing higher levels of stress may find it more challenging to purchase, prepare, and cook healthy foods; thus, choosing more prepared food (i.e., carry out, fast food) options and potentially having less fruits and vegetables in the house as well as fewer balanced meals (e.g., Bauer, Hearst, Escoto, Berge, & Neumark-Sztainer, 2012; Lohman, Stewart, Gundersen, Garasky, & Eisenmann, 2009; Parks et al., 2012). Similarly, parents may choose fast food restaurants or dining out options as a means of treating themselves after a challenging work day as well as a rewarding way to spend time with their families (Bauer et al., 2012). Additionally, parents who perceive higher levels of stress may spend less time with their children; thus, not being available to model healthy eating habits as well as limiting the ability to oversee their children's food choices (Bauer et al., 2012; Lohman et al., 2009; Parks et al., 2012). Despite several reasons for parental stress to potentially impact child food consumption, research in this area is limited. In a study focusing on parents of adolescents, researchers found that parental work-life stress was related to the increased promotion of an unhealthy family food environment (e.g., less time spent on meal preparation, fewer family meals; Bauer et al., 2012). While the study did not directly measure adolescent food intake, parents reported increased fast food consumption and decreased fruit and vegetable intake, which could have implications on children's dietary behaviors. In another study examining child and adolescent food consumption (e.g., fruit and vegetable intake, fast food consumption), researchers found that parental perceived stress was related to child fast food consumption but did not influence child fruit or vegetable intake (Parks et al., 2012). Furthermore, parent-report of multiple stressors, rather than parental perceived stress,

was an important factor in child obesity (Parks et al., 2012). This result is contradictory to other findings, which do not demonstrate a direct nexus between maternal stressors and adolescent obesity risk (Lohman et al., 2009). Given the limited research on parental stress and child food consumption, further research is needed to provide a better picture of the situation particularly in low-income families, who may experience increased levels of stress.

In addition to perceived stress, household food insecurity is another important factor to consider in relation to youth fruit and vegetable consumption. For low-income families, it may be particularly challenging to maintain a sufficient food supply, which can be made even more difficult by the prices of fresh produce in comparison to other types of foods. Household food insecurity refers to inadequate or limited availability and inaccessibility to healthy foods in socially acceptable ways (Casey et al., 2005; McCurdy, Gorman, & Metallinos-Katsaras, 2010), and according to the USDA, 14.3% of households in the United States in 2013 were characterized as food insecure (United States Department of Agriculture, 2014). While multiple studies have agreed that a nexus exists between food insecurity and child food consumption, the existing literature has not come to a consensus on how significant of an impact financial stress plays on fruit and vegetable consumption in youth. For example, Lorson and colleagues (2009) did not find statistically significant differences between vegetable and fruit intake in children and adolescents living in food insecure homes compared to food secure homes. On the other hand, Lohman and colleagues (2009) found that food insecurity combined with maternal stressors increased the risk of childhood obesity, and Canter and colleagues (under review) discovered that household food insecurity was associated with vegetable

consumption in low-income children. Similarly, poorer household food insecurity has been associated with less fruit and vegetable access and presence of unhealthy food options (Nackers & Appelhans, 2013). Given that the association between household food insecurity and eating behaviors of children is not well established (e.g., Pearson et al., 2008), further investigation of this relationship is warranted.

The current study examined the role of family factors (i.e., family functioning, parental stress) and household food insecurity on low-income children's fruit and vegetable intake. It was expected that higher family functioning and lower parental stress would be associated with increased fruit and vegetable consumption. Although the studies in the literature presented inconsistent findings, it was hypothesized that lower household food insecurity would be associated with increased child fruit and vegetable intake.

Methods

Participants

Parents of children from ages 5-10 were recruited from local farmers' markets. To participate in the current study, parents needed to meet the following inclusion criteria: (1) had a child age 5-10 years; (2) received services through Beans&Greens, a weekly match program (up to $25 per week) at farmers' markets designed for low-income families (e.g., receiving government provided food assistance, SNAP); and (3) possessed the ability to speak and read English. During recruitment, 150 parents provided consent to participate, but 4 of those individuals did not meet inclusion criteria, 2 decided not to complete the questionnaire, and 1 family had completed two

questionnaires; therefore, the final sample included 143 participants. An additional 283 individuals were approached at markets but were not eligible to participate in the study because they did not have a child age 5-10 years old. However, these individuals completed a separate survey for a Beans&Greens program evaluation.

There were 77 boys in the study (53.8%) and 66 girls (46.2%). The majority of children were 7 years old (*n* = 36, 25.2%), followed by 5 years old (*n* = 25, 17.4%), 8 year olds (*n* = 24, 16.8%), 9 year olds (*n* = 24, 16.8%), 6 years old (*n* = 22, 15.4%), and 10 years old (n = 12, 8.4%). Twenty-one percent of children (*n* = 29) had recently completed 2nd grade. The remaining grades reported were 1st (*n* = 28, 20.3%), 3rd (*n* = 25, 18.1%), preschool (*n* = 24, 17.4%), kindergarten (*n* = 17, 12.3%), and 4th (*n* = 12, 8.7%). The majority of children were identified as Caucasian (*n* = 91, 65%). The remaining races reported were African American (*n* = 21, 15.0%), Asian (*n* = 2, 1.4%), American Indian/Native Alaskan (*n* = 2, 1.4%), Native Hawaiian/Pacific Islander (*n* = 1, 0.7%), and other (*n* = 23, 16.3%).

Sixty-eight percent of parents and caregivers had previously used Beans&Greens services. Ninety percent (*n* = 129) of participants identified themselves as the child's parent. The remaining participants reported that they were the child's grandparent (*n* = 5, 3.5%), step-parent (*n* = 3, 2.1%), aunt or uncle (*n* = 4, 2.8%), or other (*n* = 2, 1.4%). Parent ages ranged from 21 to 69 years old, and the majority of parents were female (*n* = 131, 92.3%). The majority of participants identified as Caucasian (*n* = 101, 71.1%). The remaining races reported were African American (*n* = 20, 14.1%), Asian (*n* = 2, 1.4%), American Indian/Native Alaskan (*n* = 2, 1.4%), Native Hawaiian/Pacific Islander (*n* = 1, 0.7%), and other (*n* = 16, 11.2%). Fifty-one participants (35.7%) indicated that they were

married at the time of data collection. The same number of participants (*n* = 51, 35.7%) reported that they were single, followed by in a relationship (*n* = 23, 16.1% living with partner; *n* = 11, 77% not living with partner) and marital status as other (e.g., divorced; *n* = 7, 4.9%). The majority of families lived in a house (*n* = 84, 58.7%), whereas some families rented (n = 42, 29.4%). Other families identified that they lived with extended family (*n* = 7, 4.9%), in a shelter (*n* = 2, 1.4%), stayed from place to place (n = 1, 0.7%), or other (*n* = 7, 4.9%).

Procedure

The study was approved by the university-based Institutional Review Board. From the end of June through October, individuals were recruited at farmers' markets in a large Midwest city. During SNAP transactions at farmers' markets, eligible individuals were approached to participate in the current study. Participants provided informed consent to participate and completed a brief set of questionnaires. If the parent had more than one child between the ages 5-10, they were asked to pick one child at random about whom to answer the survey questions. Individuals received monetary compensation for participation ($6 voucher to be used at the farmers' market).

Measures

Demographics. Parents completed a brief demographic questionnaire, which included questions regarding their child's age, gender, ethnicity, and race. Parents also provided information on items such as marital status, family annual income, and family size. Individuals also reported on their usage of the match program (i.e., "*Is this your first time using Beans&Greens?*").

Household Food Insecurity. The U.S. Household Food Security Survey Module (Economic Research Service, 2012), an 18-item questionnaire, was used to assess household food insecurity and hunger within the past 12 months. The survey asks household questions such as "*we couldn't afford to eat balanced meals,"* which were rated as "often true," "sometimes true," or "never true." Additionally, the survey provides adult-referenced items (e.g., "*In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?"*) and child-referenced questions (e.g., "*In the last 12 months, did your child ever not eat for a whole day because there wasn't enough money for food*?"). Consequently, the U.S. Household Food Security Survey Module provides three separate index scores, which include household food security status, adult food security status, and child food security status. Higher scores indicate higher levels of food insecurity. Previous research has indicated that the U.S. Household Food Security Survey Module demonstrates good reliability (Cronbach's α = 0.74 - 0.81; Keenan, Olson, Hersey, & Parmer, 2001).

Parental Stress. Parents completed the Perceived Stress Scale-10 (Cohen & Williamson, 1988), a 10-item questionnaire assessing parents' perception of life situations as stressful. Individuals were asked to report on how they have felt in the past month. Items (e.g., *How often have you felt nervous and "stressed?"*) were rated using a 5-point Likert scale (0 = "never," 1 = "almost never," 2 = "sometimes," 3 = "fairly often," 4 = "very often"). Four positively stated items are reversed scored, and a perceived stress score is created by summing all items. Although the PSS-10 does not have cut-off classifications, as it is not a diagnostic measure, higher scores are indicative

of greater levels of stress. The measure is widely used and demonstrates good reliability (Cronbach's α = 0.78 - 0.91; Cohen & Janicki-Deverts, 2012).

Family Functioning. The McMaster Family Assessment Device (FAD; Epstein et al., 1983) was used to assess family functioning. Items are rated on a 4-point Likert scale (1 = "strongly agree," 2 = "agree," 3 = "disagree," 4 = "strongly disagree"). The complete FAD, which consists of 53-items, provides subscales on general family functioning, problem solving, communication, roles, affective responsiveness, and behavior control (Epstein et al., 1983). Given the setting of data collection, shorter, valid, and reliable measures were needed for administration; therefore, the 12-item general functioning scale of the FAD, which includes items from each of the other scales, was used in the current study. Six items are reversed scored, and the general functioning scale is generated by summing all items and dividing the sum by the number of items within the scale, which is 12. Higher scores are indicative of greater problems within family functioning. The FAD general functioning scale is strongly correlated with longer measures of family functioning (i.e., Family Environment Scale, Family Adaptability and Cohesion Evaluation Scale IV; Olson, 2011), is widely used, and has demonstrated good internal consistency (Cronbach's α = 0.89 - 0.92; e.g., Epstein et al., 1983; Renzaho et al., 2010).

Child Food Consumption. Parents completed an adapted version of the What Foods Did You Eat measure (Weber Cullen et al., 1999), which is a fruit and vegetable screener. Parents provide information on the servings of a wide range of fruits and vegetables that their child ate within the past week. Although the measure was originally created and used in a sample of African-American children ages 9-14 years old, this

measure has been adapted for parents in a previous study examining low-income families and demonstrated excellent internal consistency (Cronbach's $\alpha = 0.95$; Canter et al., under review).

Data Analyses

All analyses were conducted in Mplus 7th Edition using structural equation modeling (Muthén & Muthén, 1998-2012). Although there were little missing data, full information maximum likelihood (FIML) techniques was used to account for data that were missing. First, a confirmatory factor analysis (CFA) was conducted in order to specify and fit a measurement model. Parcels were created for fruit and vegetable variables, such that one latent construct containing three parcels was created for fruit and one for vegetables (Little, Cunningham, Shahar, & Widaman, 2002). For latent constructs reflecting parental stress and family functioning, total scores were calculated based on the scoring rules of the corresponding measures. The household food insecurity latent construct was created using two indicators (i.e., child insecurity status indicator, adult insecurity status indicator); these indicators were calculated using the scoring rules from the U.S. Household Food Security Survey Module.

Although the chi-square test is used as a fit statistic, it is sensitive to sample size. Therefore, model fit was assessed using other commonly utilized fit indices, including Root Mean Square Error of Approximation (RMSEA; e.g., compares fit to a perfect model), Standardized Root Mean Square Residual (SRMR; e.g., standardized difference between the observed and model-implied covariances), Comparative Fit Index (CFI; i.e., indexes the superiority of the target model over the null model), and Tucker-Lewis Index (TLI; i.e., indexes how much better the target model fits the data relative to the null

model). Commonly accepted guidelines suggestive of acceptable fit for RMSEA and SRMR range from 0.05 – 0.08, whereas 0.90 – 0.95 demonstrates acceptable fit for CFI and TLI (Hu & Bentler, 1999). Cut-off scores for factor loadings vary; according to Comrey and Lee (1992), a factor loading of 0.55 is considered good, whereas a loading of 0.71 or above is considered excellent. After the CFA was completed, a structural model was conducted to examine the hypothesis of the current study where gender and age were examined as covariates (e.g., Rasmussen et al., 2006; see Figure 1).

Results

The reported average household food security total was 6.66 (*SD* = 4.17; range = 0 - 18), which is categorized as low food security (see Table 1). On average, adults reported their food security as 4.81 (*SD* = 3.03; range = 0 - 10); this score corresponds to low food security (Economic Research Service, 2012). The average child food security was 1.81 (*SD* = 1.65; range = 0 - 8), which corresponds to high or marginal food security (Economic Research Service, 2012). Parents reported a mean score of 18.60 (*SD* = 5.67) on the Parental Stress Scale and a mean score of 2.41 (*SD* = 0.32) on the Family Assessment Device.

Measurement Model

Given problematic kurtosis with the family functioning indicator (kurtosis = 7.91), a robust maximum likelihood estimator (i.e., MLR) was used for the model to correct for this non-normality in the data. The fixed factor method was used for model identification. All parameters were allowed to freely estimate, and the variance for all latent variables was fixed to one. Since parental stress and family functioning factors

were comprised of only one indicator, the variance of these indicators were fixed to zero for parental stress and family functioning. Given that the household food insecurity construct was comprised of only two indicators, the factor loadings were equated. The measurement model obtained a RMSEA of 0.04, CFI of 0.98, TLI of 0.97, and SRMR of 0.04; all indices suggested close model fit (see Table 2 for parameter estimates). Additionally, the chi-square test of model fit was 47.785 ($p = 0.13$, $df = 38$).

In order to determine which model had the best fit to use for the structural model, the measurement model with fruit and vegetable parcels was compared to a fuller measurement model, which contained all fruit and vegetable items, rather than parcels, as indicators. The parceled model demonstrated better fit than the full model. Specifically, the full measurement model obtained a RMSEA of 0.07, CFI of 0.77, TLI of 0.75, and SRMR of 0.07; all indices suggested poor model fit. Furthermore, the chi-square test of model fit for the full measurement model was 727.727 ($p < 0.01$, $df = 448$). Therefore, the more parsimonious model (i.e., measurement model with fruit and vegetable parcels) was used for the structural model.

Structural Model

The structural model was specified using similar techniques as the measurement model, and child gender and age were included in the model as covariates. Similar to the measurement model, the structural model demonstrated close fit; it obtained a RMSEA of 0.05, CFI of 0.98, TLI of 0.96, and SRMR of 0.05. The analyses did not support any significant pathways (see Table 3 for parameter estimates). Parental stress was not significantly related to fruit consumption ($p = 0.47$) or vegetable consumption ($p = 0.18$). Similarly, family functioning was not significantly associated with fruit consumption ($p =$

0.80) or vegetable consumption ($p = 0.93$). Finally, household food insecurity was not significantly related to fruit consumption ($p = 0.71$) or vegetable consumption ($p = 0.71$) in low-income children. Please refer to Table 4 for more information regarding the latent regression estimates.

A post-hoc power analysis was conducted using a Monte Carlo simulation. Estimates from the literature were used within the simulation, and results from the Monte Carlo suggested that over 200 participants were needed to have the ability to detect an effect if it was present. This higher number of participants may be needed given weak or mixed estimates from the literature.

Exploratory Analysis

In the structural model, parental stress and household food insecurity were significantly related ($p = 0.002$). Exploratory moderation analyses were conducted to determine if household food insecurity moderated the relationship between parental stress and fruit and vegetable consumption in low-income children. Two separate moderations were conducted; one model contained an observed variable for child household food insecurity status, and the second model contained an observed variable for adult household food insecurity status. Within these models, parental stress was examined as an observed variable. Latent constructs for fruit and vegetable intake were specified using similar techniques as the measurement and structural models. The moderation models did not yield significant findings. Specifically, the interaction of child household food insecurity status and parental stress was not significantly related to fruit ($p = 0.67$) or vegetable ($p = 0.62$) consumption in low-income children. Similarly, the interaction of

adult household food insecurity status and parental stress was not significantly associated with fruit ($p = 0.84$) or vegetable ($p = 0.71$) consumption in children.

Discussion

The study examined the relationship between parental stress, family functioning, household food insecurity, and fruit and vegetable consumption in low-income children. It was hypothesized that higher family functioning and lower parental stress would be associated with increased fruit and vegetable consumption. Furthermore, it was hypothesized that lower household food insecurity would be associated with increased child fruit and vegetable intake. Analyses demonstrated that family functioning, parental stress, and household food insecurity were not significantly related to fruit and vegetable consumption in low-income children. Further exploratory analyses were conducted to determine if household food insecurity moderated the relationship between parental stress and fruit and vegetable intake; these relationships were also not significant.

Per the Monte Carlo power analysis, the sample was underpowered, which may have resulted in the inability to detect significant findings. Recruitment problems may have occurred due to a variety of issues. Several farmers' markets were held on the same day and at the same time, which made it challenging to recruit in multiple locations simultaneously. Additionally, many families in the sample were repeat users of the Beans&Greens services, suggesting that they often returned to the market and were not eligible to participate in the study more than once. Although unanticipated, the study recruitment may have exhausted the potential number of participants. Given the high number of farmers' markets across the nation that implement a match program,

researchers in the future may consider multi-city collaboration to expand the sample size to fully evaluate these relationships.

Another limitation of the current study was that child fruit and vegetable consumption was measured only through parent-report. Although parents may be able to provide a general estimate of their child's fruit and vegetable consumption, it may not be the most accurate depiction of the child's diet. Future studies should use a multi-method approach using a mix of self-report and objective measures to examine the relationship between family factors and fruit and vegetable consumption in low-income children. The current study also did not include a broader measure of food consumption, but rather specifically examined fruit and vegetable consumption. Future research would benefit from including broader measures of food consumption to enable a more in-depth analyses of predictors of diet in low-income children.

Despite the limitations, the current study had a strength in the unique population that it examined. All families who participated in the study were using Beans&Greens services, a match program at farmers' markets, which sought to make healthy foods more affordable and accessible for low-income families using SNAP benefits while also promoting buying locally. Few studies have examined factors related to pediatric health behaviors, such as nutrition, with families who are utilizing similar match programs. Additionally, data related to fruit and vegetable consumption in low-income youth have typically been collected through phone-interviews with parents (e.g., Parks et al., 2012; Renzaho et al., 2010) or in school questionnaires with adolescents (e.g., Berge et al., 2013). The current study utilized a different method of data collection in the natural environment by providing questionnaires to parents at farmers' markets. Data collection

at farmers' markets may overcome some problems (e.g., issues with incorrect phone numbers) and may be more accessible for low-income families accessing a match program, but onsite participation may limit what can be asked and answered.

Low fruit and vegetable consumption in children continues to be problematic in the United States. National initiatives, such as *Healthy People 2020* and *Let's Move!* (The White House, 2010; U.S. Department of Health & Human Services, 2014), have been developed and implemented in an attempt to tackle this issue. However, many youth, especially low-income children, are still not meeting the USDA recommended daily serving amounts (e.g., Epstein et al., 2001; Koh, Blakey, & Roper, 2014). Research should continue to be conducted in this area especially given the recent Affordable Care Act, which emphasizes health promotion and prevention of diseases, such as obesity (Janicke, Fritz, & Rozensky, 2015; Rozensky & Janicke, 2012).

Overall, family functioning, parental stress, and household food insecurity were not significantly related to fruit and vegetable consumption in low-income children in the current study. However, as farmers' markets with incentive programs for SNAP users continue to expand across the United States (e.g., Olsho et al., 2015), future research should continue to be conducted in this area. Studies may consider examining families who utilize these services in comparison to SNAP users who do not shop at farmers' markets. Furthermore, researchers may also examine other potentially influential factors related to fruit and vegetable consumption in low-income children, such as more salient family factors (e.g., social support, parental executive functioning or self-regulation) and neighborhood factors (e.g., "food deserts"). Finally, farmers' markets offering a match program for families using SNAP benefits may also be an advantageous setting for

interventions targeting positive behavior changes, such as increasing fruit and vegetable consumption, to improve health in low-income children.

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Table 1. Means, Standard Deviations, and Ranges

Variable	**Mean**	**Standard Deviation**	**Range**
Household Food Insecurity (Child)	1.81	1.65	0-8
Household Food Insecurity (Adult)	4.81	3.03	0-10
Parental Stress Scale	18.60	5.67	0-33
Family Assessment Device	2.41	0.32	1-4

Table 2

Loading and Intercept Values, Residuals, and R^2 Values for Indicators, and Estimated Latent Variance from Measurement Model

Indicator	Equated Estimates		Standardized		
	Loading (SE)	Intercept (SE)	Loading (SE)	Theta	R^2
Fruit Intake					
Parcel 1	0.66 (0.06)	1.33 (0.33)	0.85 (0.03)	0.27	0.73
Parcel 2	0.70 (0.06)	1.17 (0.35)	0.88 (0.03)	0.23	0.77
Parcel 3	0.62 (0.07)	0.91 (0.31)	0.84 (0.04)	0.28	0.72
Vegetable Intake					
Parcel 1	0.57 (0.05)	1.15 (0.29)	0.84 (0.03)	0.30	0.70
Parcel 2	0.68 (0.07)	1.58 (0.34)	0.87 (0.04)	0.25	0.75
Parcel 3	0.61 (0.07)	1.02 (0.31)	0.83 (0.04)	0.32	0.68
Food Insecurity					
Child Insecurity Status	1.57 (0.13)	1.64 (0.84)	0.96 (0.06)	0.08	0.92
Adult Insecurity Status	1.57 (0.13)	4.59 (0.87)	0.53 (0.04)	0.72	0.28
Family Functioning					
Total Score	0.31 (0.05)	2.61 (0.16)	1.00 (0.00)	0.00	1.00
Parental Stress					
Total Score	5.45 (0.41)	16.69 (2.80)	1.00 (0.00)	0.00	1.00

Table 3

Loading and Intercept Values, Residuals, and R^2 Values for Indicators, and Estimated Latent Variance from Structural Model

Indicator	Equated Estimates		Standardized		
	Loading (SE)	Intercept (SE)	Loading (SE)	Theta	R^2
Fruit Intake					
Parcel 1	0.65 (0.06)	1.32 (0.34)	0.85 (0.03)	0.28	0.73
Parcel 2	0.71 (0.06)	1.16 (0.36)	0.88 (0.03)	0.23	0.77
Parcel 3	0.62 (0.07)	0.90 (0.32)	0.85 (0.03)	0.28	0.72
Vegetable Intake					
Parcel 1	0.56 (0.05)	1.12 (0.29)	0.84 (0.03)	0.30	0.70
Parcel 2	0.66 (0.06)	1.54 (0.34)	0.86 (0.04)	0.25	0.75
Parcel 3	0.61 (0.07)	0.99 (0.31)	0.83 (0.04)	0.32	0.68
Food Security					
Child Insecurity Status	1.58 (0.13)	1.85 (0.14)	0.96 (0.07)	0.07	0.93
Adult Insecurity Status	1.58 (0.13)	4.81 (0.25)	0.53 (0.04)	0.72	0.29
Family Functioning					
Total Score	0.32 (0.04)	2.42 (0.03)	1.00 (0.00)	0.00	1.00
Parental Stress					
Total Score	5.64 (0.41)	18.61 (0.50)	1.00 (0.00)	0.00	1.00
Gender*	-	-	-	-	-
Age*	-	-	-	-	-

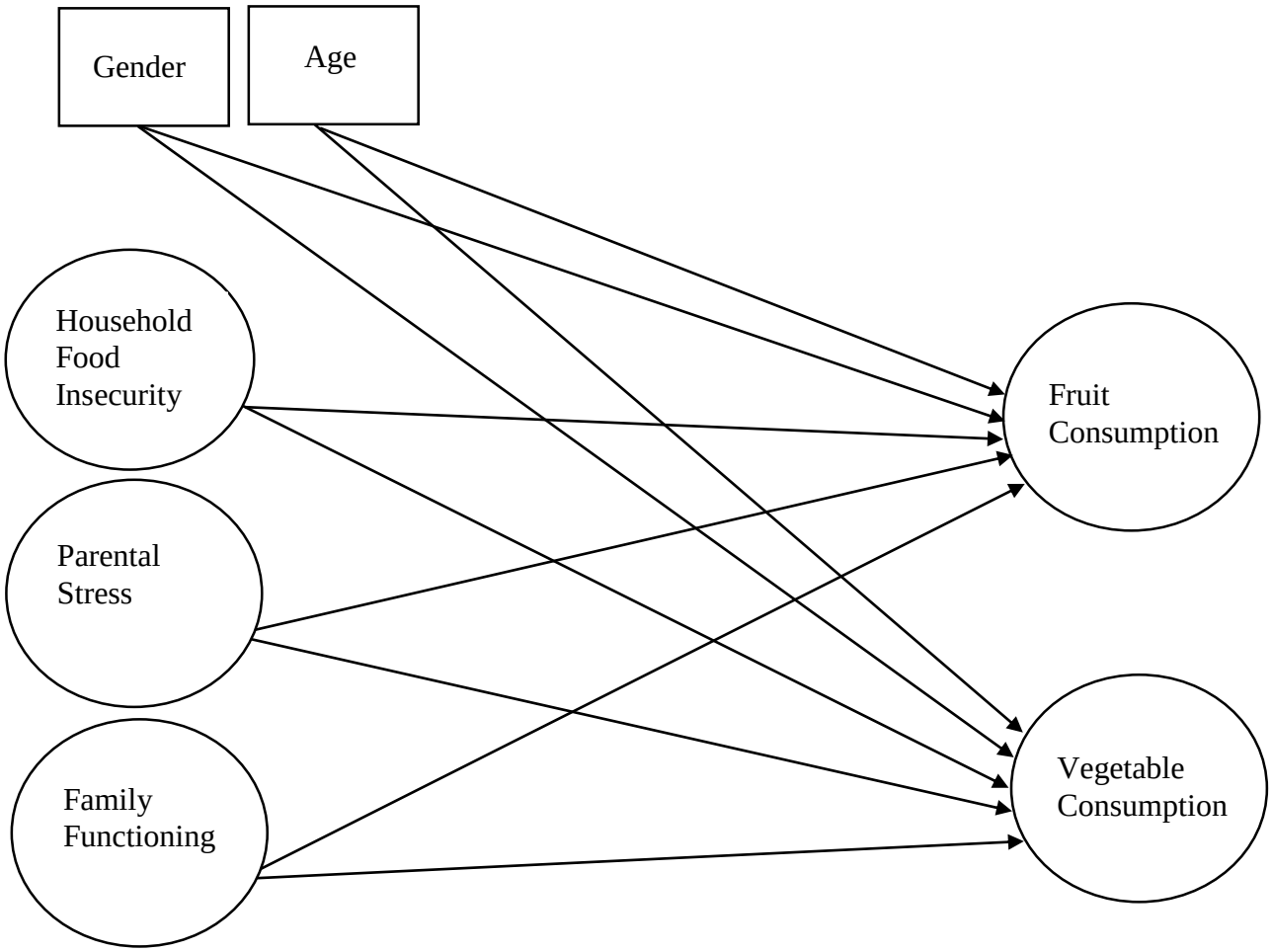
Note. * = included in model as covariate

Table 4

Standardized Latent Regression Estimations of Latent Variables in Structural Model

Indicator	Latent Regression Estimate (SE)	Standardized Latent Regression Estimate (SE)
Fruit Intake		
Household Food Insecurity	0.04 (0.11)	0.04 (0.11)
Family Functioning	-0.03 (0.10)	-0.03(0.10)
Parental Stress	-0.08 (0.11)	-0.08 (0.12)
Gender	-0.05 (0.19)	-0.03 (0.10)
Age	0.03 (0.06)	0.04 (0.09)
Vegetable Intake		
Household Food Insecurity	0.04 (0.12)	0.04 (0.12)
Family Functioning	0.01 (0.09)	0.01 (0.09)
Parental Stress	-0.17 (0.11)	-0.17 (0.11)
Gender	-0.15 (0.19)	-0.08 (0.09)
Age	0.04 (0.06)	0.06 (0.09)

Figure 1
Structural Model



Note. Circle = latent variable, square = observed variable