Author Manuscript

HHS Public Access
Author manuscript
Socius. Author manuscript; available in PMC 2018 December 16.

Published in final edited form as:
Socius. 2018 ; 4: .

Gender, Socioeconomic Status, and Diet Behaviors within Brazilian Families

Rachel Donnelly[1] and **Leticia J. Marteleto**[1]

[1]University of Texas at Austin, Austin, TX, USA

Abstract

Existing literature documents the key role that parents play in transmitting diet behaviors to their children; however, less is known about differences by parent and child gender within families, especially with attention to household socioeconomic status (SES). We use nationally representative household data from Brazil and ask how parent-child associations of diet behavior differ by gender within lower- and higher-SES households. Results indicate that both maternal and paternal diet behaviors are associated with sons' and daughters' diet behaviors, but the strength of these associations differs depending on the gender of both the parent and the child. Moreover, gender differences in parent-child diet resemblance exist primarily in lower-, but not in higher-SES households. These findings are important for understanding health processes that occur within families and lead to disparities across generations, especially in a middle-income country undergoing sharp economic and nutritional changes.

Keywords

family health; family roles; diet; obesity

In light of the sharp increase worldwide in obese children, adolescents, and adults (Wang et al. 2008), recent research has moved toward understanding intergenerational relationships between parents and their children as an essential part of this trend (Classen 2010; Whitaker et al. 2010). Diet is a primary determinant of obesity and a key mechanism in the transmission of obesity from parent to child (Koplan, Liverman, and Kraak 2005). For example, parents may model healthy eating and control the food available in the household (Patrick and Nicklas 2005), thus exerting considerable influence over the child's diet. Moreover, sharing family meals is an important family process associated with healthier dietary intake and well-being among children (Gillman et al. 2000; Musick and Meier 2012; Neumark-Sztainer et al. 2003).

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

Corresponding Author: Rachel Donnelly, University of Texas at Austin, 305 E 23rd St., Stop G1800, CLA 2.622A, Austin, TX 78712, USA., redonnelly@utexas.edu.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Past research on the transmission of diet from parent to child has focused primarily on the role of mothers (Cameron et al. 2011; Classen 2010; Gibson, Wardle, and Watts 1998; Pollard, Rousham, and Colls 2011), overlooking the ways in which both mothers and fathers may have differential influences on their sons and daughters. Of the studies that include mothers and fathers (e.g., Beydoun and Wang 2009), none test for differences in all possible parent-child dyads within the same household (e.g., mother-son, mother-daughter, father-son, and father-daughter). Drawing on the literature of gender differences in household allocations of time and resources, including traditional gendered household division of childcare, parental preferences, and shared gender dynamics between parent and child (e.g., Raley and Bianchi 2006), we posit that gender structures diet transmissions within families. For example, mothers may have stronger dietary resemblance with their children than do fathers, or mothers may have stronger dietary resemblance only with their daughters compared to sons. This is an important step for garnering a more complete understanding of the transmission of health within families and the reproduction of health inequalities in childhood and adulthood.

Moreover, the parent-child transmission of diet behaviors likely differs in lower– and higher–socioeconomic status (SES) households because of differences in constraints and resources (Conley and Glauber 2008), time allocation (Sayer, Gauthier, and Furstenberg 2004), weight status (Van Hook, Altman, and Balistreri 2012), nutrition (Watts et al. 2014), and the frequency of family meals (Neumark-Sztainer et al. 2003) by SES. However, this possibility has not been empirically tested in prior studies of diet behavior patterns within families. Examining parent-child associations of diet behaviors within lower- and higher-SES households is particularly important in light of the ongoing epidemiological and nutrition transitions occurring in Brazil, alongside the country's persistently high levels of inequality. This socioeconomic context makes Brazil an interesting theoretical and empirical place to examine patterns of diet resemblance within families.

We use unique data from the 2008–2009 *Pesquisa de Orçamentos Familiares* (POF)—Brazilian Expenditure and Income Household Survey—and the supplemental Food Consumption Survey to examine the associations between parental diet and adolescent diet, with attention to differences across gender and SES. The Food Consumption Survey includes a dietary recall diary for each family member, allowing us to better understand gender differences in parent-child diet resemblance within families. Two primary research questions guide this study: (1) How do parent-child associations in diet behavior differ by parent gender and child gender? (2) How do gender differences unfold in lower- and higher-SES households? Overall, examining gendered diet behaviors within lower- and higher-SES families contributes to the theoretical understanding of health processes that occur within families and lead to health disparities across populations.

Background

The Context of Brazil

Like many middle-income countries, Brazil is experiencing rapid changes in nutrition and obesity alongside unprecedented socioeconomic growth. For example, the individual- and country-level increase in income has resulted in greater consumption of processed food and

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

food outside of the home, which are often of high energy and low nutrient density (Pereira et al. 2013). Moreover, the consumption of unhealthy food such as processed foods and sugars is not limited to wealthy households and also occurs in poor households (Lignani et al. 2011). In fact, as countries experience economic development and the nutrition transition, the burden of obesity tends to shift toward lower-SES individuals (Monteiro, Conde, and Popkin 2004). Taken together, Brazil is a country experiencing a number of significant changes that likely affect family dynamics related to diet and obesity.

Understanding parent-child associations in diet in Brazil is especially important in light of the rapidly increasing prevalence of obesity and staggering population disparities (Marteleto et al. 2017)—a problem facing many countries. Indeed, massive changes in Brazil's food environment (e.g., Lignani et al. 2011; Pereira et al. 2013) and persistently high levels of social inequality despite unprecedented socioeconomic growth inequality (Alvaredo et al. 2018) pose a significant threat to population health. Information about parent-child associations in diet in Brazil can be used to combat the increasing number of overweight children in Brazil and other low- and middle-income countries under-going a nutrition transition. Yet it remains unclear whether these macro-level contexts have implications for parent-child diet resemblance within lower- and higher-SES households.

Differences in Parent-child Diet Resemblance by Gender

Genetic, social, and environmental factors determine diet behavior, although often more importance is given to social and environmental conditions (Martin 2008; Power et al. 2011; Wells 2011). Parents play a key role in shaping their children's diet through these social and environmental pathways (Patrick and Nicklas 2005; Poti and Popkin 2011; Wang et al. 2011). For example, parents can influence their children's diets directly by controlling what food is available in the house or indirectly by modeling healthy eating behaviors (for a review, see Patrick and Nicklas 2005). Sharing family meals contributes to healthy diet behaviors among children, including consuming more fruits and vegetables and fewer fried foods and less soda (Gillman et al. 2000; Neumark-Sztainer et al. 2003). Indeed, one study based on data from the United States found that children had three times higher odds of having a healthy diet if their parents also had a healthy diet (Beydoun and Wang 2009).

The intergenerational transmission of diet behavior from parent to child is likely stratified by gender within families. Prior research has taken steps to address this question, but the present study fills a critical gap by comparing all possible parent-child dyads within families to test differences by both parent and child gender. Numerous studies documenting the intergenerational transmission of diet behaviors focus on the mother (e.g., Cameron et al. 2011; Gibson et al. 1998; Ramos de Marins et al. 2004), failing to consider the potentially different ways that both mothers and fathers influence their offspring's diet behaviors (Curtis, James, and Ellis 2009; Hall et al. 2011). Often, data are collected from only one parent, precluding the comparison of mother and father within the same family. The few studies that have examined both mothers' and fathers' diet behaviors find evidence of differences in parent-child diet resemblance by parent gender. For example, although both maternal and paternal weight status are correlated with child weight status, the correlation with maternal weight status is stronger than the correlation with paternal weight status

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

(Oliveria et al. 1992; Whitaker et al. 2010). These studies do not account for differences between mothers and fathers separately for their sons and daughters, overlooking an important detail in parent-child diet resemblance.

Indeed, parent-child dietary resemblance may differ between boys and girls for the same parent. In other words, a parent's diet behaviors may be more strongly related to a son's or daughter's diet behaviors (e.g., mother-daughter vs. mother-son and father-daughter vs. father-son). An exploration of differences by child gender directly compares the influences that each parent may have on a same- vs. different-gender offspring. For example, mothers may have a stronger influence on their daughters' diets compared to their sons' diets, whereas fathers may have a stronger influence on their sons' diets compared to their daughters' diets. Indeed, one study found that the correlation between mother's diet and daughter's diet was stronger than the correlation between mother's diet and son's diet (Stanton, Fries, and Danish 2003). However, the study did not include fathers, so we are unable to fully understand the intergenerational transmission processes of diet behaviors within families.

Theory suggests that these gender differences in parent-child associations of diet behavior may occur because of the gendered nature of intrahousehold family dynamics and resource allocation. For example, parents' allocation of time within households tends to vary by parent gender, wherein mothers spend more time than fathers with children (Craig 2006). This difference may be due, in part, to the ideology of intensive mothering—the belief that mothers are required to invest large amounts of time and energy into their children (Hays 1996). These patterns also reflect a gendered division of labor wherein wives are seen as responsible for household chores and childcare—a pattern that also applies to Brazilian households. Notably, fathers' time involvement with children has increased, but disparities between mothers and fathers remain (Bianchi and Milkie 2010; Yeung et al. 2001). However, these differences mean that the mother is more likely to be the parent who provides food to her children and models healthy eating behaviors (Couch et al. 2014; Patrick and Nicklas 2005). Moreover, child gender may determine resource allocation within households. Although parents generally treat sons and daughters similarly, some evidence suggests that fathers invest more resources in their sons compared to their daughters and parents may spend more time with same-sex than opposite-sex children (Raley and Bianchi 2006). This sex-typed investment may occur because parents believe they have gender-specific knowledge for their children or because their children seek out the parent they think is more gender appropriate (Raley and Bianchi 2006). If parents spend more time with their same-sex children (Raley and Bianchi 2006), then parents may have stronger diet resemblance with their same-sex children. Overall, gendered dynamics within families may explain gender differences in the parent-child transmission of diet behavior.

Therefore, the first research question we examine is, (How) do associations of parent-child diet differ by parent gender (see Figure 1; pathways A = C and B = D) and by child gender (see Figure 1; pathways A = B and C = D)?

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Variation in Lower- and Higher-SES Households

Gender and SES likely intersect to shape parent-child diet resemblance within families, but prior research has not tested this possibility. Prior work has, however, documented differences in the strength of the parent-child association in diet behavior across SES. For example, one study found that the parent-adolescent association in fat intake, but not other foods, was strongest among families with the lowest levels of parent educational attainment because many high-fat food items are less expensive and therefore more affordable to low-SES households (Watts et al. 2014). However, much less is known about gender differences in these associations within lower- and higher-SES households.

Past research has not explored gender differences in parent-child diet resemblance within lower- and higher-SES households. The literature on gender differences in time allocation by family SES sheds light on how gender differences in diet behavior may unfold within lower- and higher-SES households. For example, evidence suggests that in higher-SES families, mothers, but not fathers, spend more time with children (Sayer et al. 2004). Thus, because of differential time allocation, mothers may have a greater influence on their children's diet behaviors compared to fathers in higher-SES households, whereas mothers' and fathers' influence may be similar in lower-SES households. However, attention to differences by child gender in lower- and higher-SES households is also essential. For example, some evidence suggests that more educated fathers work less when they have a son than when they have a daughter (Lundberg 2005). When fathers work less, they may be able to spend more of their time at home with their child. Thus, the father-child association in diet behaviors may be stronger for sons compared to daughters in higher-SES households.

The second research question we examine, therefore, asks, How do gender differences in parent-child diet resemblance differ within lower- and higher-SES households? We examine the pathways described in Figure 1 separately by family SES.

An important contribution of the present study is its investigation of the questions we described above for a middle-income country. Brazil is experiencing a rapidly shifting socioeconomic and epidemiological landscape, and this landscape has a number of implications for health. For instance, Brazil's socioeconomic growth has resulted in a shift of the burden of obesity from higher- to lower-SES individuals (Monteiro et al. 2004; Van Hook et al. 2012). As such, examining patterns of parent-child diet resemblance in lower- and higher-SES Brazilian households sheds light on a growing population health problem.

Methods

Data and Analytic Sample

We use data from the 2008–2009 POF to assess parent-child diet resemblance within low- and high-SES households. POF is a nationally representative household survey conducted by the Brazilian Census Bureau that has detailed information about household expenditures, living conditions, and demographic variables. A partnership with the Brazilian Ministry of Health made it possible for trained interviewers to collect anthropometric measures of height and weight for every person in each household surveyed. Two 24-hour dietary recall surveys were administered to all members of a household in a subsample of the surveyed

Author Manuscript
Author Manuscript
Author Manuscript
Author Manuscript

households. Respondents were asked to write in a diary their food intake across each 24-hour period. Household members older than age 10 responded to their own survey questions; another household member (e.g., parent) answered the questions for each child younger than 10 as well as for respondents who could not read or write.

We restrict the analytic sample to households with one mother, one father, and at least two children of different gender between the ages of 10 and 16 (n = 413 households; 1,816 individuals). We focus on this age range for two primary reasons. First, children younger than 10 years old did not fill out their own surveys, and this may bias results. Second, children in this age range (i.e., preadolescents and adolescents) are developing their own independent dietary behaviors, and these behaviors will have long-term consequences for health. For the final analytic sample, we randomly selected one son and one daughter from each household, such that each household includes one mother, one father, one son, and one daughter (n = 413 households; 1,652 individuals). This strategy allows us to test for statistically significant differences in parent-child associations within families by both parent gender and child gender. Finally, we dropped one household that had missing values for the mother, for a final sample of n = 412 households and 1,648 individuals. Table 1 presents individual- and household-level descriptive demographic data on age, education, weight status, work status, diet behavior, household income, household education, and region.

Measures

Diet behavior.—We consider the diet behavior of each member of the household (mother, father, son, and daughter). Diet behavior was assessed using a 24-hour recall survey that captured the types and amounts of any food consumed within the previous 24 hours for each household member. We calculate the proportion of food consumption for five categories of food (in grams) out of the total grams consumed that day: total fruits, vegetables, grains, meats, and eggs. For the measure of diet behavior, we sum these five proportions to indicate how much of each person's total food consumption consisted of fruits, vegetables, grains, meats, and eggs. Previous studies conducted in the United States and abroad have focused on the number of grams or servings consumed with respect to specific nutrients or food groups (e.g., Beydoun and Wang 2009; da Veiga and Sichieri 2006). These categories are adapted from the revised version of the Health Eating Index for Brazilian populations (Previdelli et al. 2011). We do not make claims about whether diet behavior should be considered healthy or unhealthy, especially since the consumption of some of these foods in excess can be considered unhealthy (e.g., meat). Instead, we focus on parent-child associations of diet to better understand family dynamics in a country experiencing rapid nutritional and social change. Important to note, we do not know where the food was consumed. Although food was most likely consumed in the home, both parents and children have the ability to consume food outside the home, such as at school or fast food restaurants.

Household SES.—We use parental education as a proxy for SES. We take the higher value of mother's and father's level of education to stratify by lower-SES (less than 9 years of education) and higher-SES (greater than or equal to 9 years of education) households. Mothers had an average of 5.5 years of schooling, and fathers had an average of 5 years (range: 0 to 15 years). We use 9 years of education as the cut point because this marks the

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

transition to high school, which is currently a key marker of educational progress in light of improvements in levels of schooling in recent decades (Veloso 2009).

Covariates.—We control for covariates that have been associated with diet behaviors, including age (in years), region (1 = *North*, 2 = *Northeast*, 3 = *Southeast*, 4 = *South*, 5 = *Midwest*), log of household income (in Brazilian Reals), child work status (1 = *working*), parent education (in years), child body mass index (BMI) (in kilograms per square meter), and parent weight status (0 = *both parents normal weight*, 1 = *mother overweight/obese*, 2 = *father overweigh/obese*, 3 = *both parents overweight/obese*). Both child and parent BMI were measured by trained interviewers. We categorize both child and adult BMI into weight status categories based on the guidelines suggested by the World Health Organization (2000). Accounting for region is important given extreme social, economic, and demographic differences between regions in Brazil (Diniz 2002).

Analytical Strategy

To examine the pathways linking mother's and father's diet behaviors to their adolescent son's and daughter's diet behaviors in low- and high-SES families, we applied structural equation modeling using Stata 15. This approach is similar to the Actor-Partner Independence Model wherein son's and daughter's diet behaviors are regressed on mother's and father's diet behaviors. As such, we do not include a measurement model because the model is saturated and does not generate model fit indices. Instead, mother, father, son, and daughter diet behaviors were included as observed predictors in the structural model to test parent-child diet resemblance above and beyond the other parent's diet resemblance with the same child. We include the covariance for the errors of the predicted son and daughter diet behavior. A benefit of the structural equation model is the ability to estimate all pathways in the conceptual model (see Figure 1) simultaneously. This approach facilitates statistical comparisons of each parent-child pathway (see Figure 1; pathways A–D) using post-estimation Wald tests. To address the second research question about differences in lower- and higher-SES households, we use the grouping function to stratify results by low SES and high SES. We again use postestimation Wald tests to test for statistically significant differences within low- and high-SES households.

Results

Descriptive Results

Descriptive results for each family member are reported in Table 1. Table 1 shows that more than half of the adult sample was overweight or obese and about 12 percent of the adolescent children were overweight or obese. Of boys, 18 percent were currently working, while 9 percent of girls were working. Surprisingly, parents and their children had a similar level of education (approximately five years), which reflects the overall lower levels of education of the Brazilian population. Table 1 also shows which proportion of each household member's diet consisted of fruits, vegetables, grains, meats, and eggs. Of these five categories, grains accounted for the largest proportion of respondents' diets at 18 percent, and vegetables and eggs accounted for the smallest proportion of total food consumption at only 1 percent each. Parents and their adolescent children ate similar proportions of these main food categories.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

For example, 12 to 13 percent of total parental food consumption consisted of meats, compared to 11 percent of total adolescent food consumption.

Parent-child Diet Resemblance Differences

Table 2 shows the results from structural equation models regressing daughter's and son's diet behaviors on their mother's and father's diet behaviors. Both mother's and father's diet behaviors were significantly and positively associated with both son's and daughter's diet behaviors, net of all covariates ($p < .001$). This suggests that when parents' diet consists of more fruits, vegetables, grains, meats, and eggs, their children's diets consist of more of these foods as well. Compared to girls residing in the Northern region, girls living in the Northeast, Southeast, and South had a smaller proportion of fruits, vegetables, grains, meats, and eggs in their diet. On the other hand, girls ate a greater proportion of these foods when their father or both parents were over-weight or obese. The sociodemographic and weight status covariates were not associated with the diet behavior of boys in this sample.

Parent gender.—We used postestimation Wald tests to compare the strength of the associations of maternal and paternal diet behavior with both daughter and son diet behavior. We first compared the coefficients for mother's and father's diet predicting daughter's diet (i.e., pathways A and C in Figure 1). We found that the coefficient for mother's diet is greater than that for father's diet (coefficient: 0.43 > coefficient: 0.22, $p < .05$), suggesting that mother-daughter diet behavior resemblance was stronger than father-daughter diet behavior resemblance. Turning to sons' diet behavior (i.e., pathways B and D in Figure 1), however, mother-son diet behavior resemblance was statistically similar to father-son diet behavior resemblance (coefficient: 0.41 = coefficient: 0.27). Therefore, although maternal diet behavior might appear to have a stronger association with child diet behavior than paternal diet behavior based on the coefficients presented in Table 2, this is true only for daughters' diet behavior and not sons' diet behavior. Overall, these findings suggest that for girls, an increase in mothers' consumption of fruits, vegetables, grains, meats, and eggs is associated with a greater increase in these foods compared to an increase in fathers' consumption of these foods.

Child gender.—We also used postestimation Wald tests to examine whether the association of parent-child diet behaviors differs by child gender (pathways A = B and C = D in Figure 1). Put differently, within each parent, is the effect size of diet behaviors similar for both son's and daughter's diet behavior? Results suggest that the mother-daughter association in diet was not statistically different from the mother-son association (coefficient: 0.43 = coefficient: 0.41). Moreover, the father-son association in diet behavior was not statistically different from the father-daughter association (coefficient: 0.22 = coefficient: 0.27). Taken together, findings suggest that both maternal and paternal diet behaviors have a similar influence on daughters' and sons' diet behavior.

Differences by Household SES

To address the second research question, we examine whether the associations of parent-child diet within families observed above differ in lower- and higher-SES households. Results from the structural equation models stratified by parent education are presented in

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 3. When we stratified the sample by lower- and higher-SES households, we found that both maternal and paternal diet behavior significantly predicted both sons' and daughters' diet behavior in low- and high-SES households, net of all covariates. However, the strength of the associations between parent-child dyads followed different patterns in lower- and higher-SES households. We used postestimation Wald tests to test for differences by parent and child gender in the same way that was used above.

For lower-SES households, when considering differences by parent gender, we found that the mother-daughter diet association was significantly greater than the father-daughter association (coefficient: 0.46 > coefficient: 0.20, $p < .05$). However, this was not true for sons' diet behavior: The mother-son association in diet behavior was not significantly different from the father-son association (coefficient: 0.36 = coefficient: 0.32). When considering differences by child gender in lower-SES households, we found that maternal diet behaviors had a similar association with both sons' and daughters' diet behaviors (coefficient: 0.46 = coefficient: 0.36). However, father-son diet behavior resemblance was marginally stronger than father-daughter diet behavior resemblance (coefficient: 0.32 > coefficient: 0.20, $p < .10$), suggesting that fathers may have more influence on their same-sex children's diets. Thus, although all four pathways linking parent to child diet behavior were significant in lower-SES households, parent-child diet behavior resemblance differed in strength by both parent gender and child gender. That is, compared to fathers' food, the food that mothers consume is more similar to daughters' food. However, fathers and their sons have more similar diets compared to fathers and their daughters.

For higher-SES households, when considering differences by parent gender, we found that the effect size for maternal diet behavior was not statistically different from the effect size for paternal diet behavior for both daughters' (coefficient: 0.41 = coefficient: 0.20) and sons' (coefficient: 0.43 = coefficient: 0.21) diet behavior. When considering differences by child gender in higher-SES households, we found that the effect size for paternal diet behavior was not statistically different for daughters' diet behavior compared to sons' diet behavior (coefficient: 0.20 = coefficient: 0.21). This was also true for maternal diet behavior: The association with daughters' diet behavior was not statistically different from the association with sons' diet behavior (coefficient: 0.41 = coefficient: 0.43). Thus, although all four pathways linking parent to child diet behavior were significant in higher-SES households, there were no statistical differences in the strength of the association by parent or child gender. Overall, the results indicate that parent and child gender differences in parent-child diet resemblance exist in lower- but not higher-SES households.

Discussion

Previous research shows that diet behaviors are transmitted from parent to child (e.g., Patrick and Nicklas 2005; Poti and Popkin 2011; Wang et al. 2011), and although the associations between parent and child diet can be moderate in strength (Wang et al. 2011), the transmission of diet is a key way that health (dis)advantages can be reproduced within families. We extend prior research to consider gender differences in diet behavior resemblance among all possible parent-child dyads within both low- and high-SES households. We also extend the literature by examining these questions in a middle-income

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

country with an increasing prevalence of obesity and high levels of socio-economic inequality. Findings suggest that parent-child diet resemblance differs by parent and child gender, especially within lower-SES households. We highlight two key themes based on the results from this sample of Brazilian households.

The first theme concerns differences in parent-child associations of diet behavior by gender. Few studies have reported associations for all four parent-child dyads, creating a gap in understandings of the pathways linking parent to offspring diet behavior within families (Wang et al. 2011). Previous research finds evidence that maternal diet behavior may be a stronger predictor of child diet behavior than paternal diet behavior (Beydoun and Wang 2009; Park, Yim, and Cho 2004; Whitaker et al. 2010), yet we extend this finding by comparing and statistically testing maternal versus paternal diet behavior separately for boys and girls within the same family. We find that maternal diet behavior has a stronger association than paternal diet behavior with daughters' diet behavior but not with sons' diet behavior; thus, the stronger mother-child compared to father-child association in diet behavior likely is driven by daughters more than by sons. Notably, we do not find evidence that parents have a greater influence on their same-sex child's diet behaviors compared to their different-sex child's diet behaviors.

The stronger effect size of maternal compared to paternal diet behaviors may be reflective of the greater amount of time mothers spend with their children (Craig 2006) and the greater likelihood that mothers provide food for their children (Couch et al. 2014; Patrick and Nicklas 2005). However, the finding that this difference is true for daughters and not sons suggests that a simple comparison of parent gender without attention to child gender overlooks important differences in intrahousehold diet behavior dynamics. Future studies should examine why the difference by parent gender exists for girls but not boys, considering, for example, differences between boys and girls in the time spent and meals consumed outside of the home. Examining these intrahousehold gender differences informs understandings of the reproduction of health within families. If scholars and policy makers want to improve the diet of young girls, they should aim to improve the diet of their mothers.

The second theme emphasizes the importance of examining diet at the intersection of gender and SES. Previous research finds that the parent-child association in diet is stronger in lower-compared to higher-SES households in a sample of overweight and obese children (Watts et al. 2014), but prior research has not examined gender differences separately for lower- and higher-SES households. We find that parent and child gender differences in diet resemblance exist in lower-SES households but not in higher-SES households. In lower-SES households, maternal diet behaviors had a greater influence than did paternal diet behaviors for daughters' diet behaviors and paternal diet behaviors had a greater influence on sons' compared to daughters' diet behaviors.

These gender differences within lower-SES households may reflect differences in family dynamics, especially regarding how mothers and fathers allocate their time and resources. For example, stronger diet resemblance for same-sex parent-child dyads may reflect a kind of gender specialization that occurs within lower-SES families wherein parents—in this case fathers—spend more time with their same-sex children (Raley and Bianchi 2006). Moreover,

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

the greater influence of mothers' compared to fathers' diet on children's (especially daughters') diets suggests that mothers may have more childcare responsibilities, reflecting a more gendered division of labor. Taken together, these findings contribute to conversations about the growing burden of childhood obesity in Brazil. The shifting of obesity from higher- to lower-SES individuals in Brazil (Monteiro et al. 2004; Van Hook et al. 2012) necessitates an examination of diet behaviors within families. Our findings point to the importance of understanding the gendered nature of food and obesity, especially in lower-SES households, as a way to combat childhood obesity.

This study garners a more complete understanding of the transmission of health within families by simultaneously comparing the associations between all possible parent-child dyads of diet behaviors within families (e.g., mother-daughter, mother-son, father-daughter, and father-son) using unique dietary recall data from all members of the household. Although findings offer important insights into the reproduction of health within families for a country rapidly undergoing the nutrition transition and facing a dual burden of obesity, the framework we use can be applied to intrahousehold health behaviors everywhere. While this study extends the literature in key ways, some limitations should be noted. One possible limitation is that we were unable to disentangle where food is consumed (e.g., at home, at work, at school, or in another location) and that the parent-child diet behavior link may vary when food is consumed outside of the home. At the same time, school in Brazil is offered in shifts, so most children do not eat lunch at school. Nonetheless, our results may be a conservative estimate of the parent-child association in diet behavior as it is capturing food consumed when parents are less likely to play a direct role in what their children eat. In addition, future studies should analyze longitudinal data to better understand issues of causal order and directionality. For example, children likely influence what their parents consume, and this detail may add important contributions to our understanding of the reproduction of health within families. Longitudinal data would also allow scholars to examine trends in parent-child diet behavior resemblance over time— an important endeavor in light of the rapidly changing demographic context in Brazil.

Overall, the findings suggest that gender plays an important part in the intergenerational transmission of diet behavior from parent to child, although the role of gender sometimes depends on parent gender, child gender, and household SES. This focus is important in light of the growing obesity epidemic (Wang et al. 2008), the nutrition transition in Brazil (Doak et al. 2005), and the reproduction of health within families. Understanding the processes and mechanisms influencing the transmission of diet behaviors from parent to child can provide insights into the dynamics of intrahousehold health-related patterns. A careful examination of intergenerational diet behavior patterns within families is essential to understanding the reproduction of inequalities in diet behaviors and health in childhood and adulthood.

Author Biographies

Rachel Donnelly is a doctoral candidate in the Department of Sociology and the Population Research Center at the University of Texas at Austin. Her research focuses on the social determinants of mental and physical health across the life course, with an emphasis on family relationships. In her current research, she examines how pre-carious employment

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

shapes marriage and health in midlife. Recent research also considers how spouses influence each other's health and how this process varies across same-sex and different-sex couples.

Leticia J. Marteleto is an associate professor of sociology and a research associate at the Population Research Center at the University of Texas at Austin. Her research on social demography, stratification, education, and health inequalities has been published in *Demographic Research; Demography, Population and Development Review; Social Forces;* and *Sociology of Education*, among others. In her newest research, funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, she focuses on inequalities in women's reproductive behaviors and outcomes related to the Zika epidemic in Brazil.

References

Alvaredo Facundo, Chancel Lucas, Piketty Thomas, Saez Emmanuel, and Zucman Gabriel. 2018 World Inequality Report World Inequality Lab.

Beydoun May A., and Wang Youfa. 2009 "Parent-child Dietary Intake Resemblance in the United States: Evidence from a Large Representative Survey." Social Science & Medicine 68:2137–44. [PubMed: 19375837]

Bianchi Suzanne M., and Milkie Melissa A. 2010 "Work and Family Research in the First Decade of the 21st Century."Journal of Marriage and Family 72(3):705–25.

Cameron Adrian J., Crawford David A., Salmon Jo, Campbell Karen, McNaughton Sarah A., Mishra Gita D., and Ball Kylie. 2011 "Clustering of Obesity-related Risk Behaviors in Children and Their Mothers." Annals of Epidemiology 21:95–102. [PubMed: 21184950]

Classen Timothy J. 2010 "Measures of the Intergenerational Transmission of Body Mass Index between Mothers and Their Children in the United States, 1981–2004." Economics & Human Biology 8(1):30–43. [PubMed: 20042381]

Conley Dalton, and Glauber Rebecca. 2008 "All in the Family? Family Composition, Resources, and Sibling Similarity in Socioeconomic Status." Research in Social Stratification and Mobility 26(4): 297–306.

Couch Sarah C., Glanz Karen, Zhou Chuan, Sallis James F., and Saelens Brian E. 2014 "Home Food Environment in Relation to Children's Diet Quality and Weight Status." Journal of the Academy of Nutrition and Dietetics 114(10):1569–79. [PubMed: 25066057]

Craig Lyn. 2006 "Does Father Care Mean Fathers Share? A Comparison of How Mothers and Fathers in Intact Families Spend Time with Children." Gender & Society 20(2):259–81.

Curtis Penny, James Allison, and Ellis Katie. 2009 "Fathering through Food: Children's Perceptions of Fathers' Contributions to Family Food Practices." Pp. 94–111 in Children, Food and Identity in Everyday Life, edited by Kjorhold AT, Tingstad V, and James A Basingstoke, UK: Palgrave Macmillan.

da Veiga Gloria Valeria, and Sichieri Rosely. 2006 "Correlation in Food Intake between Parents and Adolescents Depends on Socioeconomic Level." Nutrition Research 26(10):517–23.

Diniz Celio Campolina. 2002 "A nova configuração urbano-industrial no Brasil" [The new urban-industrial configuration of Brazil] Pp. 87–115 in Unidade e fragmentação: A questão regional no Brasil, edited by Kon A São Paulo, Brazil: Perspectiva.

Doak Colleen M., Adair Linda S., Bentley Margaret, Monteiro Carlos A., and Popkin Barry M. 2005 "The Dual Burden Household and the Nutrition Transition Paradox." International Journal of Obesity 29:129–36. [PubMed: 15505634]

Gibson E. Leigh, Wardle Jane, and Watts Carolyn J. 1998 "Fruit and Vegetable Consumption, Nutritional Knowledge and Beliefs in Mothers and Children." Appetite 31:205–28. [PubMed: 9792733]

Gillman Matthew W., Rifas-Shiman Sheryl L., Frazier Lindsay, Rockett Helaine R. H., Camargo Carlos A., Field Alison E., Berkey Catherine S., and Colditz Graham A. 2000 "Family Dinner and

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Diet Quality among Older Children and Adolescents." Archives of Family Medicine 9:235–40. [PubMed: 10728109]

Hall Laura, Collins Clare E., Morgan Philip J., Burrows Tracy L., Lubans David R., and Callister Robin. 2011 "Children's Intake of Fruit and Selected Energy-dense Nutrient-poor Foods Is Associated with Fathers' Intake." Journal of the American Dietetic Association 111(7):1039–44. [PubMed: 21703382]

Hays Sharon. 1996 The Cultural Contradictions of Motherhood New Haven, CT: Yale University Press.

Koplan Jeffrey P., Liverman Catharyn T., and Kraak Vivica I., eds. 2005 Preventing Childhood Obesity: Health in the Balance Washington, DC: National Academies Press.

Lignani Juliana de Bem, Sichieri Rosely, Burlandy Luciene, and Salles-Costa Rosana. 2011 "Changes in Food Consumption among the Programa Bolsa Familia Participant Families in Brazil." Public Health Nutrition 14:785–92. [PubMed: 21129236]

Lundberg Shelly. 2005 "The Division of Labor by New Parents: Does Child Gender Matter?" Institute of Labor Economics, IZA Discussion Paper No. 1787

Marteleto Leticia J., Gama Luiz C. D., Dondero Molly, and Brown Letisha E. C. 2017 "The Weight of Inequality: Socioeconomic Status and Adolescent Body Mass in Brazil." Social Forces 95(4): 1637–66.

Martin Molly A. 2008 "The Intergenerational Correlation in Weight: How Genetic Resemblance Reveals the Social Role of Families." American Journal of Sociology 114(S1):S67–105.

Monteiro Carlos A., Conde Wolney L., and Popkin Barry M. 2004 "The Burden of Disease from Under- and Over-nutrition in Countries Undergoing Rapid Nutrition Transition: A View from Brazil." Bulletin of the World Health Organization 94:433–44.

Musick Kelly, and Meier Ann. 2012 "Assessing Causality and Persistence in Associations between Family Dinners and Adolescent Well-being." Journal of Marriage and Family 74(3):476–93. [PubMed: 23794750]

Neumark-Sztainer Dianne, Hannan Peter J., Story Mary, Croll Jillian, and Perry Cheryl. 2003 "Family Meal Patterns: Associations with Sociodemographic Characteristics and Improved Dietary Intake among Adolescents." Journal of the American Dietetic Association 103(3):317–22. [PubMed: 12616252]

Oliveria Susan A., Ellison Robert C., Moore Lynn L., Gillman Matthew W., Garrahie Ellen J., and Singer Martha R. 1992 "Parent-child Relationships in Nutrient Intake: The Framingham Children's Study." American Journal of Clinical Nutrition 56:593–98. [PubMed: 1503074]

Park Hye S., Yim Kyeong S., and Cho Sung-Il. 2004 "Gender Differences in Familial Aggregation of Obesity-related Phenotypes and Dietary Intake Patterns in Korean Families." Annals of Epidemiology 14:486–91. [PubMed: 15301785]

Patrick Heather, and Nicklas Theresa A. 2005 "A Review of Family and Social Determinants of Children's Eating Patterns and Diet Quality." Journal of the American College of Nutrition 24:83–92. [PubMed: 15798074]

Pereira Rosangela A., Duffey Kiyah J., Sichieri Rosely, and Popkin Barry M. 2013 "Sources of Excessive Saturated Fat, Trans Fat and Sugar Consumption in Brazil: An Analysis of the First Brazilian Nationwide Individual Dietary Survey." Public Health Nutrition 17(1):113–21.

Pollard Tessa M., Rousham Emily K., and Colls Rachel. 2011 "Intergenerational and Familial Approaches to Obesity and Related Conditions." Annals of Human Biology 38(4):385–89. [PubMed: 21671832]

Poti Jennifer M., and Popkin Barry M. 2011 "Trends in Energy Intake among US Children by Eating Location and Food Source, 1977–2006." Journal of the American Dietetic Association 111(8): 1156–64. [PubMed: 21802561]

Power Chris, Pouliou Theodora, Li Leah, Cooper Rachel, and Hypponen Elina. 2011 "Parental and Offspring Adiposity Associations: Insights from the 1958 British Birth Cohort." Annals of Human Biology 38(4):390–99. [PubMed: 21671834]

Previdelli Agatha N., de Andrade Samantha C., Pire Milena M., Ferreira Sandra R. G., Fisberg Regina M., and Marchion Dirce M.i. 2011 "A Revised Version of the Healthy Eating Index for the Brazilian Population." Revista de Saude Publica 45(4):1–5. [PubMed: 21181047]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Raley Sara, and Bianchi Suzanne. 2006 “Sons, Daughters, and Family Processes: Does Gender of Children Matter?” Annual Review of Sociology 32:401–21.

Ramos de Marins Vania M., Almeida Renan Moritz V. R., Pereira Rosangela A., and de Azevedo Barros Marilisa B. 2004 “The Relationship between Parental Nutritional Status and Overweight Children/Adolescents in Rio de Janeiro, Brazil.” Public Health 118:43–49. [PubMed: 14643626]

Sayer Liana C., Gauthier Anne H., and Furstenberg Frank F., Jr. 2004 “Educational Differences in Parents’ Time with Children: Cross-national Variations.” Journal of Marriage and Family 66:1152–69.

Stanton Cassandra A., Fries Elizabeth A., and Danish Steven J. 2003 “Racial and Gender Differences in the Diets of Rural Youth and Their Mothers.” American Journal of Health Behavior 27:336–47. [PubMed: 12882427]

Van Hook Jennifer, Altman Claire E., and Balistreri Kelly S. 2012 “Global Patterns in Overweight among Children and Mothers in Less Developed Countries.” Public Health Nutrition 16(4):573–81. [PubMed: 22583613]

Veloso Fernando. 2009 “15 anos de avanços na educação no Brasil: Onde estamos?” [15 Years of Advances in Brazilian Education: Where Are We?]. Pp. 3–24 in Educação básica no Brasil: Construindo o país do future, edited by Youfa Wang, Beydoun May, Li Ji, Liu Yinghui, and Moreno Luis A. Rio de Janeiro, Brazil: Elsevier.

Wang Youfa, Beydoun May, Li Ji, Liu Yinghui, and Moreno Luis A. 2011 “Do Children and Their Parents Eat a Similar Diet? Resemblance in Child and Parental Dietary Intake: Systematic Review and Meta-analysis.” Journal of Epidemiology and Community Health (1979–) 65(2):177–89. [PubMed: 21051779]

Wang Youfa, Beydoun May A., Liang Lan, Caballero Benjamin, and Kumanyika Shiriki K. 2008 “Will All Americans Become Overweight or Obese? Estimating the Progression and Cost of the US Obesity Epidemic.” Obesity 16:2323–30. [PubMed: 18719634]

Watts Allison W., Masse Louise C., Barr Susan I., Lovato Chris Y., and Hanning Rhona M. 2014 “Parent-child Associations in Selected Food Group and Nutrient Intakes among Overweight and Obese Adolescents.” Journal of the Academy of Nutrition and Dietetics 114(10):1580–86. [PubMed: 24951436]

Wells Jonathan C. K. 2011 “An Evolutionary Perspective on the Trans-generational Basis of Obesity.” Annals of Human Biology 38:398–407.

Whitaker Katriina, Jarvis Martin J., Beeken Rebecca J., Boniface David, and Wardle Jane. 2010 “Comparing Maternal and Paternal Intergenerational Transmission of Obesity Risk in a Large Population-based Sample.” American Journal of Clinical Nutrition 91(6):1560–67. [PubMed: 20375189]

World Health Organization. 2000 Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation. WHO Technical Report Series 894 Geneva: World Health Organization.

Yeung W. Jean, Sandberg John F., Davis-Kean Pamela E., and Hofferth Sandra L. 2001 “Children’s Time with Fathers in Intact Families.” Journal of Marriage and Family 63:136–54.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

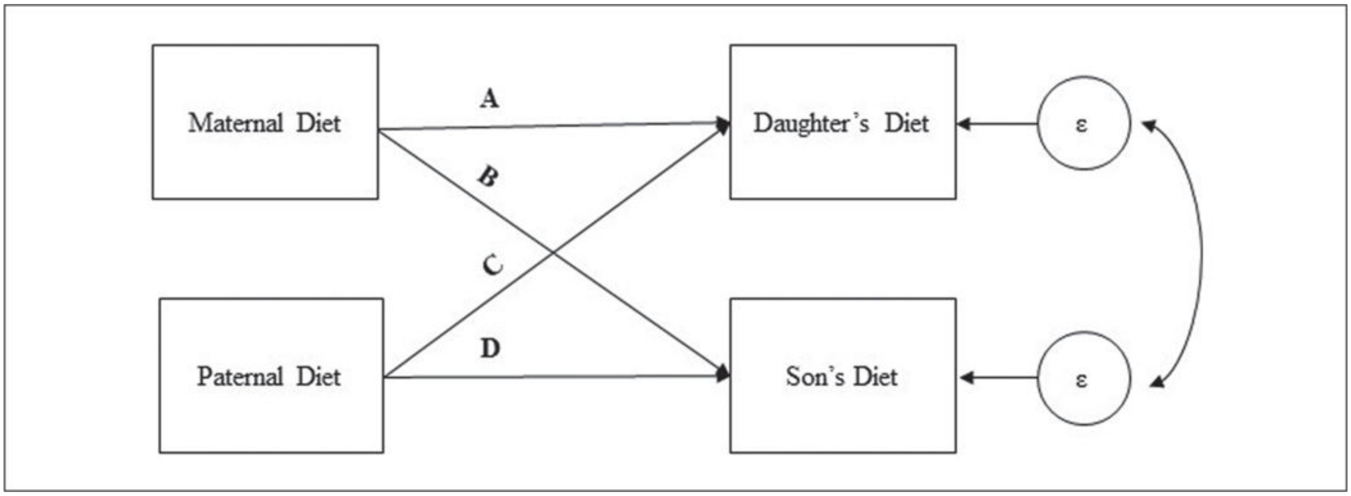

Figure 1.
Conceptual model.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1.

Descriptive Data for the Sample, by Family Member (*N* = 412 families; 1,648 individuals).

	Total	Father	Mother	Son	Daughter
Age (years)	26.87 (15.11)	43.04 (8.94)	38.48 (6.63)	12.95 (1.92)	12.98 (1.92)
Education (years)	5.02 (3.41)	5.02 (4.23)	5.54 (4.24)	4.51 (2.25)	5.01 (2.24)
Body mass index (%)					
Underweight	3.75	1.45	1.94	5.57	6.05
Normal	63.83	47.22	44.07	82.08	81.84
Overweight	20.52	31.23	31.23	10.17	9.44
Obese	11.93	20.10	22.76	2.18	2.66
Working (% yes)	46.42	94.67	61.50	17.43	9.20
Components of diet (average)					
Total fruits	0.11 (0.12)	0.09 (0.12)	0.10 (0.12)	0.11 (0.13)	0.12 (0.13)
Vegetables	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
Grains	0.18 (0.11)	0.18 (0.11)	0.18 (0.10)	0.19 (0.10)	0.18 (0.11)
Meats	0.12 (0.11)	0.13 (0.11)	0.12 (0.11)	0.11 (0.11)	0.11 (0.10)
Eggs	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
Log income (average)	7.16 (0.81)				
Household education (%)					
Lower socioeconomic status	67.80				
Higher socioeconomic status	32.20				
Region (%)					
North	21.31				
Northeast	39.47				
Southeast	17.43				
South	9.44				
Midwest	12.35				
N	1,648	412	412	412	412

Note: Standard deviations are in parentheses.

Author Manuscript

Table 2.

Structural Equation Models Predicting the Effect of Maternal and Paternal Diet Behaviors on Sons' and Daughters' DietBehaviors (n = 412 Families).

	Daughter Diet		Son Diet	
	B	***SE***	***B***	***SE***
Father diet	.22***	(.05)	.27***	(.05)
Mother diet	.43***	(.05)	.41***	(.05)
Region (reference: North)				
Northeast	−.04*	(.02)	−.01	(.02)
Southeast	−.05*	(.02)	−.02	(.02)
South	−.09**	(.03)	−.04	(.03)
Midwest	.01	(.02)	.03	(.02)
Household income	.00	(.01)	−.01	(.01)
Parent education	−.01	(.01)	−.01	(.01)
Parent weight (reference: both parents normal weight)				
Mother overweight/obese only	.02	(.02)	.00	(.02)
Father overweight/obese only	.05*	(.02)	.01	(.02)
Both overweight/obese	.04*	(.02)	.01	(.02)
Son weight status (reference: normal weight)				
Underweight	−.05	(.03)	.00	(.03)
Overweight	−.04	(.02)	.02	(.02)
Obese	.07	(.05)	.04	(.05)
Daughter weight status (reference: normal weight)				
Underweight	.00	(.03)	−.04	(.03)
Overweight	.01	(.02)	−.02	(.02)
Obese	−.01	(.04)	−.02	(.04)
Son age	.00	(.01)	.00	(.01)
Daughter age	.00	(.01)	.00	(.01)
Son working (1 = *yes*)	−.01	(.02)	.01	(.02)
Daughter working (1 = *yes*)	.02	(.02)	.02	(.02)
Constant	.13	(.10)	.19	(.10)

*$p < .05$.

**$p < .01$.

***$p < .001$.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 3.

Structural Equation Models Predicting the Effect of Maternal and Paternal Diet Behaviors on Sons' and Daughters' Diet Behaviors, Stratified by Low– and High–Socioeconomic Status Households (n = 412 Families).

	Low–socioeconomic Status Household				High–socioeconomic Status Household			
	Daughter Diet		Son Diet		Daughter Diet		Son Diet	
	B	***SE***	***B***	***SE***	***B***	***SE***	***B***	***SE***
Father diet	.20**	(.07)	.32***	(.07)	.20*	(.09)	.21*	(.08)
Mother diet	.46***	(.07)	.36***	(.07)	.41***	(.08)	.43***	(.08)
Region (reference: North)								
Northeast	−.04*	(.02)	−.01	(.02)	−.02	(.03)	−.01	(.03)
Southeast	−.04	(.03)	−.02	(.03)	−.06	(.04)	−.01	(.04)
South	−.08*	(.03)	−.04	(.03)	−.08	(.04)	−.02	(.04)
Midwest	.01	(.03)	.04	(.02)	−.01	(.04)	.04	(.04)
Household income	.00	(.01)	.01	(.01)	.00	(.02)	−.03*	(.01)
Parent weight (reference: both parents normal weight)								
Mother overweight/obese only	.01	(.02)	−.02	(.02)	.03	(.04)	.03	(.04)
Father overweight/obese only	.05*	(.02)	−.01	(.02)	.07*	(.03)	.06*	(.03)
Both overweight/obese	.02	(.02)	−.01	(.02)	.05	(.03)	.06*	(.03)
Son weight status (reference: normal weight)								
Underweight	−.08	(.04)	−.03	(.04)	.02	(.07)	.08	(.06)
Overweight	−.02	(.03)	.03	(.03)	−.07	(.04)	.01	(.03)
Obese	.05	(.06)	.11	(.06)	.14	(.09)	−.02	(.08)
Daughter weight status (reference: normal weight)								
Underweight	.00	(.04)	−.07	(.04)	−.01	(.06)	.00	(.05)
Overweight	.02	(.03)	−.04	(.03)	−.01	(.04)	.01	(.04)
Obese	−.05	(.06)	−.10	(.06)	.06	(.07)	.06	(.07)
Son age	.00	(.01)	.00	(.01)	.01	(.01)	.00	(.01)
Daughter age	.00	(.01)	.01	(.01)	.01	(.01)	−.01	(.01)
Son working (1 = *yes*)	.01	(.02)	.02	(.02)	−.11*	(.04)	−.05	(.04)
Daughter working (1 = *yes*)	.03	(.02)	.01	(.03)	−.02	(.06)	−.01	(.05)

	Low–socioeconomic Status Household				High–socioeconomic Status Household			
	Daughter Diet		Son Diet		Daughter Diet		Son Diet	
	B	***SE***	***B***	***SE***	***B***	***SE***	***B***	***SE***
Constant	.12	(.12)	.01	(.12)	.12	(.17)	.33	(.15)

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript