Mother-Child Economic Behavior, Family Dynamics, and Tendency toward Obesity

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Abstract

The objective of this study was to relate mother-child economic behavior to their overweight and obesity status. We collected maternal time and risk preference and generosity data as well as children's punitive behavior data from 50 mother-child pairs using economic experiments. Measures of family attitudes and beliefs regarding food, eating and fitness; and standard demographic variables were gathered using a questionnaire. We also obtained clinical health and fitness measures for each mother-child pair. We found mother-child weight and fitness outcomes declined with increased mother-child bargaining conflict. Mother's permissive and controlling generosity behavior was associated with inferior mother-child health. Mothers who were both loss averse and had hyperbolic time preference were also more susceptible to obesity. We also found family meal time was significantly related to mother-child, and especially child, health outcomes. These findings further define the role economic behavior may plays in mother-child interaction processes and health. Officials may use the findings to develop policies and economic incentives to improve mother-child nutrition and fitness.

Keywords: mother-child, family bargaining, loss-aversion, hyperbolic discounting/time preference, punishment, reward, obesity

Introduction

Decision-making regarding food purchasing at the family level is complex as it encompasses individual and family-level desires and demands (De Bourdeaudhuij & Van Oost, 1998; Young, 2003). Children are not directly market participants, but they are active participants in family decision-making and they do influence family food purchases (Noorgaard, Bruns, Christensen, & Mikkelsen, 2007; Pettersson, Olsson, & Fjellstrom, 2004; Wilson & Wood, 2004). In fact, children use a variety of strategies vis-à-vis their parents (or the primary food decision-maker) to influence food purchases (Pettersson, et al., 2004; Wilson & Wood, 2004), and they adapt their behaviors and strategies as they gain information about what works in specific situations (Marshall, O'Donohoe, & Kline, 2007). What works vis-à-vis a parent may depend on the parent's own economic attitudes and behavior. Understanding these "behavioral economic family dynamics" may provide important keys to developing economic incentives and interventions to improve the nutrition and health of parents (mothers, in particular, as they are the focus of this study) and their children.

Behavioral economic studies offer the opportunity to link observed behavioral economic characteristics to health outcomes. Specifically, we are interested in the economic behavioral measures of loss aversion, hyperbolic time preference, and generosity in assessing a family's weight status. Kahneman and colleagues (1991) showed that individuals vary in risk assessment processes by assigning their own weights to the probabilities of different outcomes. In other words, an individual's "internal" risk assessment does not always follow a gamble's probability distribution. In

cases where individuals are 'loss averse,' the person's preference is to avoid loss even when the odds favor the prospect of substantial financial gain from a lottery or gamble. Recent studies of patients' decision processes regarding health care and interventions, show loss-averse individuals may make inconsistent life and health choices (Neuman & Neuman, 2008; Oliver, 2005). Regarding obesity, randomized field experiment trials, show obese men have a greater ability to achieve weight-loss using incentives designed to control for loss aversion behavior (Volpp, et al., 2008). Such research has not been conducted on our population of interest, mothers and children. In this study, we anticipate mothers who demonstrate loss-averse behavior will find it more difficult to give up the pleasurable but unhealthy eating habits of today for the prospective benefits of healthier habits.

Hyperbolic time preference may also lead to greater risk for overweight and obesity in mothers and their children. Generally, economists assume individuals have consistent time preference regardless of investment amount or time horizon. However, the behavior of individuals displaying hyperbolic time preference violates this assumption because such individuals time preference varies depending on the size or time horizon of the investment (Frederick, Loewenstein, & O'Donoghue, 2002). Bretteville-Jensen (1999) finds these individuals may also be more likely to indulge in unhealthy or even addictive behavior, suggesting the importance of this behavioral characteristic for obesity research. We expect mothers who have hyperbolic discounting tendencies to be less healthy and give their children more money to spend on low-nutrient food.

Generosity, which is seen as caring by some (for example, Browning, Bourguignon et al.(1994)), is an essential part of the parent-child allocation processes.

Children may exercise differing degrees of power over family decision-making depending on their assertiveness and the context of the relationship (Flurry & Burns, 2003). Children may demonstrate punitive behavior (for example, acting out toward a parent or using "pestering power" when they don't get their way) or may offer rewards for favorable allocations (for example, "being good" in return for receiving a treat) (Marshall, et al., 2007).

These economic behavior measures—loss aversion, time preference, and generosity—have been considered individually in previous research on health behaviors. They have not been used in combination, however, to explain mother and child susceptibility to obesity. Our research objective is to use such measures to identify families who have a tendency toward overweight and obesity based on their attitudes and beliefs regarding food, eating and physical fitness, and also their economic behavior. Specifically, we analyze measures of maternal loss aversion, hyperbolic discounting, and generosity, and children's punishment and reward behaviors in relation to the health and fitness of mother-child pairs. We test the following null hypotheses:

H_{N1}: Loss-averse mothers are less likely to be overweight or obese and to have overweight or obese children.

H_{N2}: Mothers displaying hyperbolic discounting behavior are less likely to be overweight or obese and to have overweight or obese children.

H_{N3}: Mothers who are more generous around snack and junk food are less likely to have overweight and obese children.

We also hypothesize these elements of economic behavior may combine to produce greater health risk for both mother and children. For example, women who are both

loss-averse and display hyperbolic discounting behavior may be at greater risk of overweight and obesity than women who only display one of these behaviors. Likewise, punitive children of overly generous mothers will be at greater risk of obesity. We use interaction variables consisting of the various economic behavior measures to measure the correlation of economic behavior profiles with mother-child health outcomes.

Methods

Data for this study were collected from November 2007 through June 2008. Children eight to 10 years of age and their mothers were recruited from local schools and the community with poster advertisements, flyers, community events, e-mail list serves, and referrals. A phone screening was used to determine if interested mother-child pairs were in good general health, not taking medications with heart-rate and weight-related side effects, and to solicit informed consent. The human experiments were reviewed and approved by the Institutional Review Board for Human Research at the university.

Following study admission, each mother-child pair completed a two and a half hour visit to the experimental economics laboratory to participate in a series of economic experiments and to the nutrition and exercise laboratory to complete a questionnaire on family attitudes and beliefs regarding food, eating and physical fitness, and to take a variety of clinical tests to assess their health and physical fitness. We paid the mother $10 cash and the child a $10 Wal-Mart gift certificate as show-up fees.

Economic Experiments

Each mother-child pair participated in four economic experiments (the order of which was randomly assigned) to measure the mother's loss-aversion and hyperbolic

discounting behavior, the mother's generosity, and the child's punishment and reward behaviors. The loss-aversion experiment was based on Charness and Gneezy's (2003) experimental design. Mothers decided how many tokens to invest in a lottery in four different rounds of the game. They began the first round with eight tokens worth one dollar a piece. They decided how many tokens to invest in the lottery. The lottery had two outcomes from the mother's flip of a fair coin. If she flipped heads, the lottery return was 250 percent of her token investment. If she flipped tails, her earnings equaled the amount of money she did not invest in the game. The mother was then allocated 12, 18, and 27 tokens in rounds two, three, and four. Her earnings from this experiment were equal to the sum of her holdings (that is, those tokens not invested in the game) and her lottery return across all rounds.[1] Each token was worth one dollar. The mother is loss-averse if the number of tokens invested into the lottery increased at a lower rate than rate of token allocation increase across rounds of the experiment.

The second experiment measured the mother's hyperbolic discounting behavior using modified methods of Harrison et al. (2002). In the first part of the experiment, the mother was given the choice to delay a relatively short-term gain and, in the second part of the experiment, a longer-term gain. She decided if she wanted a certain amount of money (X) in seven days or X + *i* percent in 14 days. She was asked this question repeatedly as *i* increased from 2.5 to 500 percent. In the second part of the experiment, she was asked whether she would like to have X in 90 days or X + *i* percent in 97 days. A mother displayed hyperbolic discounting if she was less willing to wait for *i* percent in 14 days, but indifferent about waiting 90 versus 97 days. As in the first part of the

[1] In this and the succeeding experiments, earnings were determined after all other experiments were complete. This reduced the likelihood that the outcomes from one experiment would affect the next.

experiment, the interest rate was increased again over these choices. The mother's earnings were determined for each part by drawing a number between one and seven (corresponding to the number of choices) out of an envelope. She was paid according to her decision for the choice pertaining to the questions. Her earnings for both parts of the experiment were mailed to her at a date corresponding to her choice and the selected outcome.

The third and fourth experiments were adaptations of common economic experiments referred to as the 'dictator' and 'carrot-stick' games (Andreoni, Harbaugh, & Vesterlund, 2003; Camerer, 2003). In the dictator game, the mother (the dictator) was endowed with 25 tokens each worth $0.05 (or $1.25 total). She determined how many tokens she would give to the child (the recipient). In the dictator and 'carrot-stick' game she was required to give at least 20 percent of the endowment to the child. In the dictator game, the child could then use the tokens to purchase items from a "snack store" that we stocked with "junk" food similar to that found in a convenience store or vending machine (following experimental design presented by Harbaugh, Krause, & Steven G. Liday, 2003). The mother was told about the store ahead of her giving decision, but was not allowed to accompany her child to the store. From the beginning of the game, the mother and child knew that the child's earnings would have to be spent at the snack store. The mother and child were in separate rooms and conducted their transactions through the experimenter. The mother received her earnings as a cash reimbursement for her final token earnings at the end of all experiments.

For the 'carrot-stick' experiment, the mother was again endowed with $1.25 worth of tokens. The mother was required to pass a minimum of five tokens (20 percent of the endowment) to the child. The child was asked to count the tokens and to decide if

she or he liked the allocation. The child then had three options: 1) accept the allocation, 2) increase the mother's tokens, or 3) decrease mother's tokens. If the child wished to change the number of tokens retained by the parent, then the child paid the experimenter one token and the mother's tokens were increased or decreased by four. For example, if the child wanted to increase the mother's tokens then she or he paid the experimenter one token and the experimenter gave the mother four additional tokens from the experiment bank (not from the child's allocation).The parent received cash earnings at the end of the experiment session, while the child had the opportunity to spend his or her tokens at the so-called snack store (without their mother's supervision). The 'carrot-stick' game was played for four rounds.

Family Eating and Health Questionnaire

We developed a questionnaire to assess family attitudes and behaviors regarding food, food purchasing and decision-making behaviors, home life, and collect demographic information and food security status. All of the items in the questionnaire were adapted from existing scales or developed for this study based on reviews of the literature (Bakir, Rose, & Shoham, 2006; Blake & Bisogni, 2003; Campbell, Crawford, & Ball, 2006; Feldman, Eisenberg, Neumark-Sztainer, & Story, 2007; D. Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003). Assessment of family attitudes and behaviors regarding food included five separate scales. The first scale consisted of 12 items assessing family attitudes and practices regarding family meals (Neumark-Sztainer, Story, Ackard, Moe, & Perry, 2000). The second scale was designed to capture food choices made by the food provider in the family based on results from Blake and Bisogni (2003). The third scale solicited information on the mother and child's consumption frequency of certain foods (vegetables and fruits, fruit juice, soda

pop/sugared drinks, snack foods, sweets). Additional items were used to assess the frequency of family meals and meals eaten in front of the television. With the fourth scale, we asked mothers to indicate the degree to which that have to monitor their child's intake of food including sweets, high fat, or other "favorite" foods, offer sweets or favorite foods as rewards or in exchange for good behavior, and regulate or hide particular foods (Campbell, et al., 2006). We asked mothers to record their concerns about their child eating too much, maintaining a desirable weight, or becoming overweight in the final scale.

Questions regarding family food purchasing behavior included information the family considers when purchasing food (e.g., taste, pleases children, price, health concerns), as well how often the mother is responsible for feeding the child, deciding portion sizes, and determining if the right kinds of foods have been eaten. Decision-making behavior was reflected in mothers' responses to questions regarding the role of the child and parent in food product, toiletry, clothing, toy, and electronic game/television purchases (Bakir, et al., 2006).

Questions assessing home life were used to measure hours per day the child watches television or plays video games, the presence of a television/video games in the child's bedroom, and the use of dietary or exercise restrictions in the household. Mothers were asked to provide information on the types of exercise or other activities that she or another adult does with the child, if the child is rewarded for exercising with candy or food, if she or another adult talks with the child about exercise and health, and if the family gets adequate exercise. Mothers were also asked how often the family gets adequate exercise and if she enjoys exercising.

We used the survey to gather additional data about the family's food security and their demographic information. The household food security was assessed using the USDA's Food Security Supplement (FSC) (Cohen, Nord, Lerner, & Yang, 2002). The questionnaire begins with basic questions about food shortage in the household. If the mother indicates food scarcity exists, follow-up questions measured the extent and severity of the food insecurity over the last year. Family demographic information was also collected, including the number of household members, mother's marital status, mother's and household income, mother's education level, mother's and child's ethnic identity, and mother's current and past participation in nutrition assistance and education programs.

Health and Fitness Assessment

The mother-child health and fitness assessment included measures of basic body measurements, blood pressure, and fasting lipids, and an estimate of aerobic fitness using the six-minute walking test (Enright & Sherrill, 1998; Li, et al., 2007). Specifically, we measured each subject's body mass and height without shoes using standardized procedures; waist circumference was measured at the level of the navel, and blood pressure was measured following five-minutes of seated rest. The body mass index (BMI) was calculated to assess the healthfulness of the weight status of the mother and the child. We used the CDC BMI-for-age growth charts (for either girls or boys) and percentile ranking for the child (Centers for Disease Control and Prevention, 2007). The six minute walk test was performed on a small track (approximately 10 laps per mile), and we measured the distance covered during the six minute test (following Enright & Sherrill, 1998; Li, et al., 2007). We also measured the subject's heart rate response to the exercise and the rate of perceived exertion. Heart rate was measured continuously

using a portable heart rate monitor (Polar S610i, Kempele, Finland) and perceived exertion was measured using the Borg Scale (Borg, 1982). Serum cholesterol, HLD, LDL and triglycerides were evaluated from the screening blood draw by an external laboratory using standardized procedures.

Analysis

Analysis consisted of three main stages. At stage one, the family questionnaire and the health and fitness assessment data were used to develop factors describing mother and child health. At the second stage, correlation coefficients were estimated for the economic experiment, physical assessment and survey data to test for significant relationships between and within measures. At the third stage, ordinary least squares (OLS) regression models were formulated in order to test the relationships between mother and child economic behavior, other types of family behavior, and mother and child health outcomes. We estimated additional Probit models to examine the relationships between survey factor and economic behavior and mother and child health, separately.

Results

Fifty mother-child pairs were recruited into the study from November 2007 to September 2008. The demographic characteristics and health and fitness data subjects are shown in Table I. The subjects represent approximately seven percent of the qualifying local population.

Factor Analysis

Using data drawn from the family questionnaire and from the clinical assessment of mother and child health and fitness, exploratory factor analysis was used to develop

factors describing the health status of our study subjects. Because our study included only 50 mother and child observations, no more than 10 variables could be loaded for each factor (for example, parent's body mass index, child's body mass index, parent's distance covered during the walk test, etc.) (Hatcher, 1994). The factors were estimated using SAS (Version 9.3, SAS, Cary, NC). Two types of factors were calculated, and the estimations resulted in six factors based on the answers to the family questionnaire and one factor based on the clinical health and fitness assessments. The seven factors and their interpretations are presented in Table II.

Correlations

Pearson correlation coefficients were calculated among these factor measures and mother-child demographic variables, mother-child health measures, and measurement variables from the economic experiments. The measurement variables from the economic experiments included two dummy variables, LA and HD, measuring whether the mother was loss-averse (LA = 1 when the mother is loss-averse and 0 otherwise) or had hyperbolic timer preference (HD = 1 when the mother has hyperbolic time preference and 0 otherwise). Measurement of mother giving and child taking in the 'carrot-stick' game as well as overall, average game statistics where included. The dictator game measurement was excluded as it is closely correlated with mother's giving in the first round of the 'carrot-stick' game.

There were not significant correlations among economic experiment measures. Generally low levels of correlation were found among economic experiment measures and demographic and survey factor variables. Hispanic participants were less likely to have hyperbolic time preference (ρ=-0.27, p=0.06). Also, mothers who had hyperbolic time preference were more likely to be using or have used food stamps (ρ=0.25,

p=0.07). Low-income children took less from their mothers in the third round of the 'carrot-stick' game (ρ=-0.27, p=0.06). Mothers who had and enjoyed regular family meal times gave their children less in the last round of the 'carrot-stick' game (ρ=-0.24, p = 0.10).

More correlations are found among demographic and behavioral variables. Low-income families have fewer family meals together (ρ=0.27, p=0.06), but more likely to have participated in the state-wide Family Nutrition Education Program (FNEP) (ρ=-0.24, p=0.09). The child's obesity status was inversely related to family meal time (ρ=-0.35, 0.01). At the same time, older mothers were less likely to have used food stamps (ρ=-0.29, p = 0.04) or FNEP (ρ=-.027, p = 0.06). There were multiple correlations among factors measuring the mother's control over family food purchasing and shopping, family mealtime tendency, mother's control over child/family health, and the presence of junk food in the household. The Pearson correlation coefficients for these relationships are presented in Table III.

Interaction Variables

We developed two interaction variables to test the hypothesis that combinations of these economic behaviors influence mother-child health and fitness. The first interaction variable, LAHD, is a product of the dummy variables measuring the mother's loss aversion and hyperbolic discounting tendencies. Thirty six and 34 percent of mothers were loss-averse and displayed hyperbolic time preference, respectively. Fourteen percent of mothers displayed both hyperbolic time and loss-averse risk preferences. The GIVEPUN3 is a sum of the mother's giving and child's punishment (e.g., the proportion of the original endowment allocation they paid to remove from their mother) in round 3

of the 'carrot-stick' game.[2] The average sum of mother giving and child punishment in round three was 119 percent of the original endowment.

Model Estimation and Results

We estimated four OLS models to test our research hypotheses. The dependent variable in each model was the factor measure of mother-child health, GOODHEALTH. In Model 1, the independent variables included dummy variables representing the mother's loss-aversion or hyperbolic time preference status, the mean giving by the mother across all rounds of the 'carrot-stick' game, a low-income indicator dummy variable, and the family mealtime and shopping factor measures. Model 2 was like the first, but includes the LAHD interaction variable instead of the loss-aversion and hyperbolic discounting dummy variables. We also replace the low-income dummy variable with the Hispanic dummy variable. The Hispanic dummy variable was not correlated with the LAHD interaction variable while it was with the hyperbolic discounting dummy variable. Further, it improves model fit compared to the low-income dummy variable. Model 3 uses the sum of mother giving and child taking in round three of the 'carrot-stick' game to replace the mother's generosity in round 3. The final model, Model 4, uses both interaction variables and also the Hispanic dummy variable to account for demographic variance instead of the low-income indicator variable.

The model estimation results are presented in Table IV. The results from the first model do not support our first three hypotheses. The loss-aversion, hyperbolic discounting, and mother generosity measurements are not significant. Mode 1 results

[2] We focus our attention on round three of the 'carrot-stick' game for two reasons. First, the mother and child will be closer to their equilibrium playing behavior, but this round does not suffer from "last round" effects like round four does. Second, round three play is directly correlated with higher child BMI (ρ=0.27, $p < 0.10$)

indicate families with few or no family meals are less healthy. The interaction variable, LAHD, was significant in Model 2, but the overall model did not explain the variation in the dependent variable (i.e., the Model's F-statistic is not significant). The interaction variable measuring mother giving and child taking in round 3 of the 'carrot-stick' game was significant in Model 3. The Few Family Meals factor variable was also significant. Mother-child health decreases with both measures. Still, the overall explanatory power of the model was not significant for Model 3. The explanatory power of the model was significant when both interaction variables are included. Mother-child pairs tended to be less healthy when the mother was both loss-averse and had hyperbolic time preference. The power of this variable and model fit improve when mother-child bargaining behavior was also included. Mother-child health was negatively associated with a net increase in mother giving and child taking in round three of the 'carrot-stick' game. Finally, the Few Family Meals factor measure coefficient was also significant and negative in Model 4. These results support our hypothesis that a combination of family economic behaviors influence health and fitness outcomes in the household.

We estimated three more probit models to measure the consequences of these findings for the mother and child, individually. These marginal effects from these models are presented in Table V. The first probit model uses the HealthyM dummy variable as the dependent variable and the same independent variables as the final OLS analysis. The HealthyM dummy variable was equal to one of the mother's BMI is less than 26 or healthy and was zero otherwise. The coefficient associated with the LAHD dummy variable indicates the likelihood a mother had a healthy weight was significantly lower if she was both loss-averse and displayed hyperbolic time preference.

Surprisingly, low-income mothers were more likely to have a healthy weight. Mothers were more likely to be overweight or obese, however, if they were single.

The second probit model used similar explanatory variables to explain the child's weight status, but also included the dummy variable, HealthyM, to account for the mother's weight status. The HealthyC dummy variable was the dependent variable. It was equal to one if the child is within the 85th BMI percentile or not at risk of overweight and obesity and was zero otherwise. According to this model estimation, the mother's loss-aversion and hyperbolic time preference tendencies improved the probability the child had a healthy weight by 22 percent. The likelihood the child had healthy weight decreased though with the measure of mother generosity and child punishment, GIVEPUN3. The child's health appears to be more closely tied to healthy meals than the mothers. Children in families with few or no family meals were 50 percent more likely to be overweight or obese. Unsurprisingly, mother's weight status is closely related to the child's. A child was nearly 70 percent more likely to be within the 85th BMI percentile category if their mother was healthy. Children of single mothers were also less likely to be at risk of overweight or obesity.

The final probit model measures the role of the child's punitive behavior in their weight outcomes. All of the explanatory variables in the second model are like those in the first except the one measure mother-child generosity and punishment. In the final model, we replace PUNGEN3 with the direct measure of child punishment in round three of the 'carrot-stick' game (e.g., what percentage of the endowment did the child take from his/her parent in the third round of the 'carrot-stick' game). We find the inclusion of this variable indicates punitive children are at greater risk of overweight

and obesity. Other relationships in this final model are similar to the prior model of HealthyC.

Discussion

Behavioral economic profiles can enhance our understanding of mother and child overweight and obesity. We hypothesized that mothers and children are at increased risk of overweight and obesity when the mother is loss-averse and has hyperbolic time preference. The mother-child pair may also experience higher weight status if the mother is overly generous or strict with 'junk' food resource allocation or has a punitive child. Combinations of these economic behavior measures do partially explain mother-child weight-based health status. Mother-child health declines when mothers are loss averse and have hyperbolic time preference. The mother-child pair may also experience higher weight status if the mother is overly generous or has a punitive child in snack food related resource allocation. Our findings constitute a new contribution to the existing literature because they indicate how four measures of economic behavior affect mother-child health.

Children's power in retail purchases for food and other products is documented in the marketing literatures (for example Pettersson, et al., 2004; Shoham & Dalakas, 2005). Our research shows how this power extends beyond store shelves. Through laboratory measures, using an extended 'carrot-stick' game experiment, we found that some children do punish their mothers substantially (during the experiments) when the mother is less than generous. Children who acquire more money to spend from their mothers and punish their mother by taking tokens away from her are more likely to be overweight and obese. The finding indicates children in more conflicted bargaining

relationships with their mother are more likely to be at risk of overweight and obesity. This finding is interesting because it shows not only the ill effects of excessive parental control on child health as others have (for example Birch & Fisher, 1998; Davison & Birch, 2002; Lee, Mitchell, Smiciklas-Wright, & Birch, 2001; Savage, Fisher, & Birch, 2007), but also how mother-directed punishment can result in poorer mother-child health.

These results also support the importance of family meal time to promote healthy eating habits in the household. They provide a link between traditional non-economic research investigating family food and fitness-related behavior and economic policy. In order to design effective tools to improve household diets, it is important to understand the different family dynamics and the amount of power some children may exercise in family purchasing decisions. It may be important to increase parents' awareness of child negotiating power through nutrition education programs geared at parents and children. As children play a key role and exercise their power in food purchase decisions, they should also be educated about the nutritional outcomes of their decisions.

This research is limited by the sample size, and has limited generalization beyond the population sampled. The current results indicate that the economic behavior of mother and child may play an important role when assessing childhood overweight and obesity and overall family health. Future research will be needed to increase the explanatory power of the findings from this study and produce policy recommendations for a greater population. We believe this is important and shows the need for more in-depth analysis of family economic behavior. Previous studies which find socio-economic variables to be important over general population groups lack explanatory power with regard to explaining the higher prevalence of obesity in low-income households. Our

study suggests income may be a proxy for other important economic behavior dynamics in the family which result in different health outcomes.

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Table I. Summary of family demographic and health data

Variable	N	MIN	MAX	MEAN	STD
Parent BMI	50	20.22	48.26	28.75	6.57
Mother BMI < 26	50	0.00	1.00	0.44	0.50
Child BMI Percentile	50	6.60	99.00	70.83	23.84
Child BMI Percentile < 85th	50	0.00	1.00	0.62	0.49
Parent Cholesterol Ratio	49	1.86	5.86	3.25	0.92
Children with High Cholesterol[a]	50	0.00	1.00	0.24	0.43
Parent Distance	50	438.70	846.10	641.45	77.99
Child Distance	50	419.55	765.80	606.79	75.62
Hispanic	50	0.00	1.00	0.12	0.33
Income lower than 185% of poverty	50	0.00	1.00	0.62	0.49

[a]The ratio of total cholesterol to HDL cholesterol is greater than 3.5.

Table II. Factors developed from family questionnaire and physical health and fitness measurements

Factor Number	**Factor Name**	**Interpretation**
Family Questionnaire Factors: Attitudes and beliefs regarding food, eating, and physical fitness		
1.	Few Family Meals	Families are often too busy to eat together. Family mealtime is not common.
2.	Shopping	Mother controls household purchase decisions.
3.	Maternal Diet Control	The mother is controlling and restrictive of the child's eating.
4.	Exercise	Mother actively plays with the child.
5.	Maternal Diet Concern	The mother is concerned about the child's dietary intake.
6.	Fruit and Vegetables	The mother encourages fruit and vegetable consumption.
Mother and Child Health and Fitness Factors		
7.	Good Health Factor	Higher score for low mother BMI, lower child waist circumference and BMI percentile, and more distance walked by the mother

Table III. Pearson Correlation Coefficient Estimations for Survey Factor Measures

	Few Family Meals	Shopping	Maternal Diet Control	Exercise	Maternal Diet Concern	Fruit and Vegetable
Few Family Meals	1.00	-0.13	-0.15	-0.21	0.06	-0.19
Shopping		1.00	0.36**	-0.04	0.02	-0.23
Maternal Diet Control			1.00	0.20	0.29**	0.03
Exercise				1.00	0.29**	0.30**
Maternal Diet Concern					1.00	-0.08
Fruit and Vegetable						1.00

* > 90% significant, **>95% significant, *** > 99% significant

[a]Standard errors are presented below the coefficients in parentheses.

Table IV. Ordinary Least Squares Regression Estimates to Explain Mother-Child Health Status

Independent Variables	Coefficient Estimates[a]			
	Model 1	Model 2	Model 3	Model 4
Intercept	-0.20	-0.17	0.39	0.50
	(0.27)	(0.23)	(0.38)	(0.34)
Loss Averse	-0.11		-0.04	
	(0.28)		(0.27)	
Hyperbolic Discounting	-0.14		-0.10	
	(0.29)		(0.28)	
LAHD		-0.70*		-0.73**
		(0.37)		(0.36)
Mean Mother Giving	0.40	0.45		
	(0.32)	(0.30)		
GIVEPUN3			-0.34*	-0.36**
			(0.19)	(0.18)
Few Family Meals	-0.26*	-0.24	-0.29*	-0.26*
	(0.15)	(0.15)	(0.15)	(0.14)
Shopping	0.12	0.11	0.02	0.00
	(0.17)	(0.15)	(0.16)	(0.15)
Hispanic		-0.75*		-0.63
		(0.39)		(0.38)
Low Income	0.18	0.29	0.04	0.14
	(0.29)	(0.27)	(0.29)	(0.28)
Single Mother	0.56	0.47	0.36	0.22
	(0.42)	(0.40)	(0.40)	(0.38)
R-Square	0.12	0.23	0.16	0.26
F-Statistic	0.80	1.73	1.08	2.05*

* > 90% significant, **>95% significant, *** > 99% significant

[a]Standard errors are presented below the coefficients in parentheses.

Table V. Probit Model Estimates of Mother and Child Weight Outcomes

Independent Variables	Marginal Effects Estimates[a]		
	Mother Probit[a]	Child Probit I[b]	Child Probit II[b]
LAHD	-0.05***	0.26**	0.22*
	(0.09)	(0.02)	(0.12)
GIVEPUN3	-0.07	-0.18*	
	(0.07)	(0.09)	
Child Taking Round 3			-0.26*
			(0.14)
Few Family Meals	0.14	-0.50***	-0.47***
	(0.10)	(0.14)	(0.13)
Shopping	-0.09	-0.09	-0.08
	(0.10)	(0.10)	(0.10)
Hispanic	-0.26	-0.28	-0.35
	(0.18)	(0.35)	(0.34)
Low-Income	0.32**	-0.16	-0.15
	(0.14)	(0.16)	(0.16)
Healthy Mother		0.69***	0.62***
		(0.12)	(0.12)
Single Mother	-0.42***	0.39***	0.38***
	(0.12)	(0.10)	(0.09)
Log-Likelihood Ratio	13.84***	19.11***	31.28***

* > 90% significant, **>95% significant, *** > 99% significant

[a]Standard errors are presented below the coefficients in parentheses.

[b] The dependent variable, HealthyM, equals one when the mother's BMI is less than 26 and is zero otherwise.

[c] The dependent variable, HealthyC, equals one when the child is within the 85th BMI percentile and is zero otherwise.