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ORIGINAL ARTICLE

Low-income African-American adults share weight status, food-related psychosocial factors and behaviours with their children

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Summary

Objective

This study aims to examine the extent to which low-income African-American children's weight status, psychosocial characteristics and food-related behaviours are associated with that of their adult caregivers.

Methods

Cross-sectional data from baseline evaluation of B'More Healthy Communities for Kids obesity prevention trial were used. Outcomes of interest were children's overweight and/or obesity status, food-related self-efficacy, knowledge, intentions and healthier/less healthy food acquisition scores. The primary exposures were adult caregiver's overweight and/or obesity status, their psychosocial factors and food acquisition scores. Multiple logistic regression analyses were used to assess associations.

Results

Children had higher odds of overweight or obesity if they had an overweight/obese caregiver (odds ratio [OR] 4.04, 95% confidence interval [95%CI] 1.59–10.28) or an obese caregiver (OR 2.50, 95%CI 1.39–4.51). Having a caregiver in the highest quartile of self-efficacy, food intentions and healthy food acquisition patterns was associated with higher odds of their child also having a higher score on these factors (self-efficacy: OR 3.77 [95%CI 1.76–8.04]; food intentions: OR 1.13 [95%CI 1.01–1.27]; and healthy food acquisition: OR 2.19 [95%CI 1.05–4.54]).

Conclusions

Child and adult caregiver weight status and psychosocial characteristics were positively associated in this low-income, urban population. These findings may help inform obesity treatment or prevention programmes and interventions aimed at parents and families.

Keywords: Adults, African-American, BMI, childhood obesity.

Introduction

The public health burden of childhood obesity in the United States has risen dramatically during the past decades, with 31.8% of children aged 2 to 19 years overweight and 16.9% obese (1). The prevalence of obesity is disproportionately greater among African-American (AA) children (1,2) compared with Caucasian youth. Child weight status can lead to higher risk of adulthood obesity and is a risk factor for later chronic conditions such as diabetes, heart disease and hypertension (3).

Based on Social Cognitive Theory, for prevention and behaviour modification strategies, children's psychosocial

factors can be determinants of their obesity status by affecting food-related behaviours (4–7). Long-term, sustained improvement of food-related psychosocial factors such as self-efficacy, knowledge and intentions for healthy eating may be one of the first steps necessary to improve healthy behaviours such as increasing fruit and vegetable intake or healthful food purchasing (8,9), which may result in prevention of excessive weight gain among children.

Engaging parents and adult caregivers in childhood obesity prevention is increasingly emphasized in the literature (7,10–15). The home environment is an important setting that shapes children's eating behaviours (10,13,14). However, little research has reported direct associations between children's and caregivers' psychosocial factors, food-related behaviours and obesity status. Prior research in AA populations suggests that caregiver self-efficacy is associated with their children's likelihood of home food preparation (9). Likewise, caregiver food knowledge is associated with AA adolescents' Body Mass Index (BMI) and healthier food preparation methods (5). Consequently, this suggests that multiple additional adult caregiver characteristics such as BMI, self-efficacy, knowledge and intentions of healthy eating may be associated with children's food-related behaviour and their BMI (6,9). However, whether these constructs are associated with child weight status within the same household among low-income AA families has not been extensively studied.

The present study was conducted to investigate the association between overweight or obesity among low-income AA children and their adult caregiver's weight status, food-related psychological factors and behaviours. In addition, we investigated the association of food-related psychological factors and behaviours among children and adults.

Methods

Sampling

We present baseline data from an ongoing childhood obesity prevention trial, the B'More Healthy Communities for Kids, in Baltimore City (16). The study sample was drawn from 14 low-income, predominantly AA neighbourhoods from June 2013 to June 2014.

Participants were identified through community venues such as recreation centres, libraries, swimming pools, grocery stores and back-to-school events. A list of potential child–adult caregiver dyads was created, and participants were screened for eligibility. Eligibility criteria included are (i) a child between the ages of 10 and 14 years when recruited and a willing caregiver; (ii) residence within a mile and a half radius of the recreation centre in the neighbourhood; and (iii) no intention to move within the next 2 years. If a dyad was unable to complete the survey, then the next eligible dyad was chosen from the recruitment list. A total of 299 dyads were sampled from the recruitment list of 2,250. Among the 299 dyads, 16 were excluded because they did not meet the age criteria. We could obtain a final analytic sample of 283 dyads. In the majority of cases, the caregiver and child were interviewed on the same occasion, but separately. Interviews lasted approximately for 90 min. Prior to each interview, adult caregivers provided consent for themselves and their children, and then children assented to their interview. Adults and children received gift cards as a token of appreciation for their participation. Data collectors were public health students and staff that underwent an extensive training and certification on each of the data collection instruments. Errors and missing data were initially checked by the interviewer and by a second party following the interview. The data were entered by a third party and finally cleaned. This study was approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board (IRB no. 00004203).

Instruments

The survey consisted of two instruments – a Child Impact Questionnaire of 79 questions and an Adult Impact Questionnaire of 176 questions – pertaining to sociodemographic information, food purchasing locations, food preparation, breakfast consumption and constructs based on Social Cognitive Theory (17). Measured or self-reported anthropometric data were collected, including participants' weight and height. The questionnaires are from the literature and have been used with similar populations (5,9,18). Detailed descriptions of the questionnaires are published elsewhere (9).

Scale construction

To measure psychosocial and behavioural constructs, a series of scales were developed and assessed for internal consistency reliability using Cronbach's α. Food-related behaviours were measured by constructing food acquisition scores of healthier or less healthy foods.

Children psychological factors

The child data on psychosocial factors were derived from 60 questions about their food intentions, self-efficacy, food-related knowledge in the Child Impact Questionnaire. To measure food-related self-efficacy, children were asked 12 different questions on how easy

or difficult it would be to perform certain healthier eating behaviours. Answer choices were all the same, and scores ranged from 0 (the lowest self-efficacy) to 3 (the highest self-efficacy). Total scores ranged from 7 to 36 with a mean of 28.4 (standard deviation [SD] = 5.3, $\alpha = 0.69$). To measure food-related knowledge, children were asked 14 different questions regarding which food is a better option for healthy eating, with four answer choices for each question. Correct choices were scored with one point or zero point, otherwise. The score ranged from 3 to 14 with a mean of 9.1 (SD = 2.5, $\alpha = 0.63$). To measure food intentions, children were asked what they will choose to eat, given 12 different questions with three answer choices. Each question had a different set of answer choices. The healthiest choice was given one point and zero point, otherwise. Scores ranged from 0 to 11 points with a mean of 3.6 (SD = 2.0, $\alpha = 0.43$).

Child food acquisition scores

A child's food acquisition pattern was determined based on how often a child acquired selected foods for themselves over the past 7 d. One or more purchases per week were scored as '1', and no purchase was scored as '0'. The child healthier food acquisition (HFA) score was a sum of frequency of obtaining 40 healthy food items for each participant in the last 7 d, with the highest possible score of 40. The actual scores ranged from 0 to 19 with a mean of 2.4 (SD = 3.0, $\alpha = 0.97$). Similarly, a child's less healthy food acquisition (LHFA) score was the sum of scores for 22 less healthy food items for each respondent during the same recall period. The score ranged from 0 to 18 with a mean of 4.4 (SD = 3.5, $\alpha = 0.79$). All child weight status, psychosocial and behavioural variables were dichotomized using a median split to represent and model the odds of having higher versus lower values on each of these factors.

Adult caregiver psychological factors

Caregiver data on psychosocial factors were derived from 28 questions about food-related self-efficacy, intentions and knowledge in the Adult Impact Questionnaire. To measure self-efficacy, caregivers were asked about their confidence in performing 10 different behaviours to promote healthy eating in their households. Each question had a same set of answer choices, and score ranged from 0 (the lowest self-efficacy) to 3 (the highest self-efficacy) for each question. The score ranged from 11 to 30 with a mean of 24.8 (SD = 3.8, $\alpha = 0.68$). To measure food-related knowledge, caregivers were asked 11 questions about food preparation and food purchasing with four answer choices for each question. Each question had different answer choices (one point if correct; zero if incorrect). The score ranged from 2 to 11 with a mean of 7.1 (SD = 1.7, $\alpha = 0.42$). To measure food intentions, caregivers were asked how they would prepare foods and how they would purchase foods for the household on 10 different questions with three answer choices. Each question had a different set of answer choices and was scored from the healthiest intention (two points) to the least healthy intention (zero point). The score ranged from 2 to 20 with a mean of 11.3 (SD = 4.1, $\alpha = 0.72$). The list of questions measuring children's and caregivers' psychosocial factors is presented in the Supporting Information Table S1.

Adult caregiver food acquisition scores

The adult caregiver's HFA score was calculated based on caregiver report on frequency of acquisition of selected foods over the past 30 d. The HFA score summed the frequency of obtaining 27 healthy foods for each respondent. Similarly, the LHFA score was a sum of the frequency of acquiring 27 less healthy foods during the same recall period. High scores indicated that healthier/less healthy foods were obtained more frequently. For the adult caregiver HFA score, the mean score was 39.5 (SD = 31.1, range 2 to 315, $\alpha = 0.79$). Adult caregiver LHFA scores had a mean of 53.7 (SD = 37.0, range 6 to 269, $\alpha = 0.80$). The list of healthier and less healthy food items for children and for adult caregivers is presented in the Supporting Information Table S2. We have constructed and used similar scores of Healthier or Less Health Food Acquisition Scores in our previous studies (19,20) and have shown associations with food-related psychosocial factors and related behaviours.

Anthropometric assessment

Height and weight were measured from both the caregiver and the child, using a Seca 213 Portable Measuring Rod stadiometer and a Tanita BF697W Duo Scale. To insure accuracy, measurements were taken in duplicates, and a third measure was taken if the first two measures were more than 0.2 lb, or 0.25 in. different. Repeated measures were averaged. For participants who declined to have their height and weight measured, self-reported data were collected. BMI-for-age percentiles were calculated using measured height and weight and were compared with the age and sex-specific Centers for Disease Control and Protection (CDC) growth charts (21). Weight status of the study sample was categorized as normal weight, overweight or obese and obesity using CDC categorization (22). Overweight or obese was defined as BMI-for-age $\geq$85th percentile for the child and

BMI $\geq$ 25 kg/m^2 for the caregiver (21,22). Obesity was defined as BMI-for-age $\geq$95th percentile for child and BMI $\geq$ 30 kg/m^2 for adult caregiver (21,22).

Statistical analysis

STATA/IC version 13 (Stata Corp., College Station, TX, USA; 23) was used for statistical analyses. In our primary models of child weight status as the outcome, we ran separate logistic regression models to assess the association between each independent variable and the outcomes of interest. In our secondary models, we used separate logistic regressions to assess the association between each child psychosocial or food purchasing variable as the outcome and each corresponding adult psychosocial or food purchasing behaviour as the independent variable of interest. Confounders were defined as variables hypothesized to influence both the exposure and the outcome in each model and not lie on the causal pathway between exposure and outcome. Adult age (continuous), adult sex, child sex, child age (continuous) and household income ($0–10,000, $10,001–$20,000, $20,001–$30,000, $30,001–$40,000 and $40,001+) were identified as confounders and included in all models. Additionally, the full set of confounders varied based on our framework in Figure 1 and the above criteria. Food intention of adult caregiver was selected to be a representative covariate of psychosocial factors and was used to control for adult psychosocial factors in models where these were hypothesized to influence both the exposure and the outcome. AIC statistics were also assessed to find the best model for each exposure. As a result, (i) models with a psychosocial factor exposure included child age and gender, responding adult caregiver's age and gender, and household income as covariates; (ii) models with healthier/less healthy food purchasing behaviour exposure included child age and gender, responding adult caregiver's age and gender, household income, and caregiver's food intention as covariates; (iii) models with overweight and/or obesity exposure included child age and gender, responding adult caregiver's age and gender, household income, caregiver HFA score, child LHFA score and caregiver's food intention as covariates. Exposure variables were checked for whether they were associated in an approximately linear fashion with each outcome variable of interest by creating quartiles of each variable and modelling them as disjoint indicator variables in adjusted models. If the relationship was approximately linear (the relation of food knowledge between adult caregiver and child and the relation of healthy food intention between adult caregiver and child), we used the continuous version of the variable. In cases where the relationship did not increase in a linear fashion, we kept the variable specification as indicator variables for each quartile (caregiver self-efficacy, HFA and LHFA scores in both the primary and secondary models). Logistic regression analysis was performed to examine (i) the relationship between the outcome of child overweight/obesity and the exposures of adult overweight/obesity, adult psychosocial factors and adult healthier/LHFA scores; (ii) each of the child psychosocial factors as the outcomes (using the dichotomous version of the variables using a

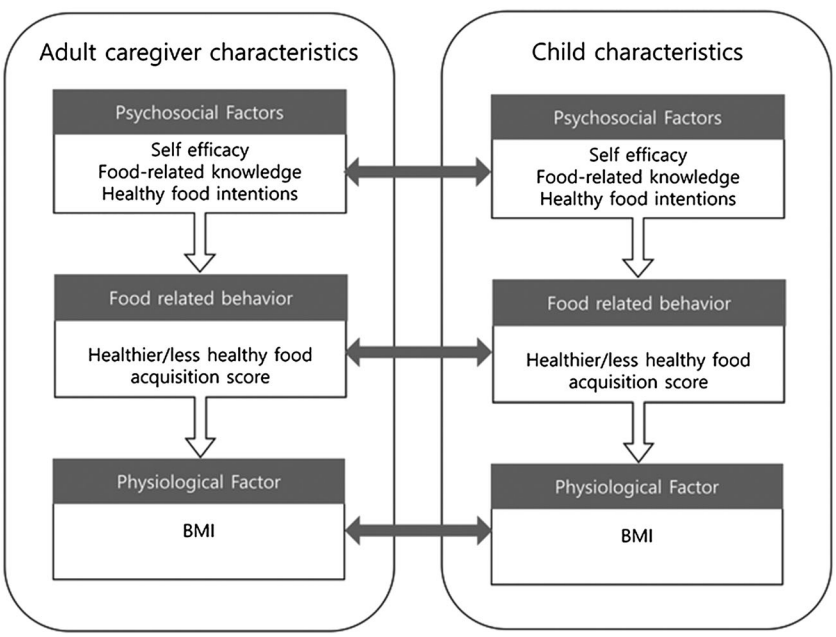

Figure 1 Conceptual framework of within-household association between child and adult caregiver affecting childhood obesity.

median split to define high versus low values) and adult psychosocial factors as the exposures; and (iii) child healthier/LHFA scores as the outcome and adult healthier/LHFA scores as the exposures. Robust standard errors were used in all models to correct for heteroscedasticity. Statistical significance was set at the $p < 0.05$ level.

Results

Demographic characteristics

Mean age of child participants was 12 years, and 53.7% were female (Table 1). Among the adult caregivers, mean age was 39 years. Of the caregivers' sample, 87.3% were female, 76.6% were single and 79.1% were mother of the child. Of all the adult caregivers, 81.5% had equal to or more than 12 years of education. In 71.5% of all families, annual household income was equal to or below $30,000. Of the caregiver sample, 53.2% were employed, either full time or part time.

Table 1 Demographic characteristics of Baltimore children and their primary caregivers dyad ($n = 283$) in the B'More Healthy Community for Kids*

	N (%)
Child characteristics	
Female	152 (53.7)
Age (years)	Mean (SD) = 12.4 (1.4)
Caregiver characteristics	
Female	246 (87.3)
Age (years)†	Mean (SD) = 39.0 (9.7)
Household characteristics	
Household size‡	Mean (SD) = 4.7 (1.7)
Number of children‡	Mean (SD) = 2.8 (1.5)
Marital status‡	
Never married	166 (58.9)
Married	61 (22.0)
Separated, widowed or divorced	51 (17.7)
Relationship to child (mother)	224 (79.1)
Employed (full time or part time)‡	150 (53.2)
African-American‡	258 (91.5)
Education†	
Less than high school	52 (18.5)
High school or GED	119 (42.4)
Some college or associates	76 (27.1)
Bachelor's or graduate school	16 (5.7)
Vocational school or others	18 (6.4)
Household income§	
$0–10,000	75 (28.1)
$10,001–$20,000	59 (22.1)
$20,001–$30,000	57 (21.3)
$30,001–$40,000	41 (15.3)
$40,001+	35 (13.1)

*Missing values made each *n* different.
†$n = 281$.
‡$n = 282$.
§$n = 267$.

Weight status of study sample

In our study, 42.8% of participating children were overweight or obese (BMI-for-age percentile ≥85th) and 21.2% were obese. Among adults, 87.8% were overweight/obese (BMI ≥ 25 kg/m^2), and 67.4% were obese (BMI ≥ 30 kg/m^2; Table 2).

Association of child weight status and adult caregiver characteristics

In adjusted logistic regression models, adult caregiver's overweight/obesity and obesity status were each associated with significantly higher odds of overweight–obesity among their children (odds ratio [OR] 4.04 [95%

Table 2 Comparison of adult and child weight status, psychosocial factors and food acquisition scores in the B'More Healthy Community for Kids study sample

	Caregiver ($n = 279$)	Child ($n = 283$)
Weight status	*N* (%)	*N* (%)
Normal weight*	35 (12.5)	159 (56.2)
Overweight/obese†	245 (87.8)	121 (42.8)
Obese‡	188 (67.4)	60 (21.2)
Psychosocial factors	Mean (SD)	Mean (SD)
Self-efficacy	24.8 (3.8)**	28.4 (5.3)***
Food knowledge	7.1 (1.7)††	9.1 (2.5)***
Food intentions	11.3 (4.1)‡‡	3.6 (2.0)***
Food purchasing behaviour	Mean (SD)	Mean (SD)
HFA score§	39.5 (31.1)§§	2.4 (3.0)***
LHFA score¶	53.7 (37.0)¶¶	4.4 (3.5)***

*BMI-for-age percentile ≥5th and <85th (child), BMI ≥ 18.5 kg/m^2 and ≤24.9 kg/m^2 (adult).
†BMI-for-age ≥85th percentile (child), BMI >25 kg/m^2 (adult).
‡BMI-for-age >95th percentile (child), BMI > kg/m^2 (adult) (BMI-for-Age Growth percentiles calculation and BMI categorization from Centers for Disease Control and Protection).
§HFA score was created by summing frequency for the past 30 d of purchasing 27 healthful food items promoted for B'More Healthy Community for Kids intervention.
¶LHFA score was created by summing the frequency for the past 30 d of purchasing 27 less healthful food items promoted for B'More Healthy Community for Kids intervention.
Missing values made each *n* different.
**$n = 282$.
††$n = 276$.
‡‡$n = 277$.
§§$n = 280$.
¶¶$n = 278$.
***$n = 283$.
BMI, Body Mass Index; HFA, healthy food acquisition; LHFA, less healthy food acquisition; SD, standard deviation.

confidence interval (95%CI) 1.59–10.28] and OR 2.50 [95%CI 1.39–4.51], respectively; Table 3). Unexpectedly, caregivers with higher intentions of healthier eating had higher odds of their children being overweight/obese (OR 1.15, 95% CI 1.02–1.30) and obesity (OR 1.2, 95%CI 1.03–1.41). No associations were found between caregiver self-efficacy, food knowledge, HFA scores and LHFA scores and childhood overweight/obesity or obesity.

Adult caregiver and child psychosocial and food acquisition associations

Higher levels of caregiver self-efficacy was associated with greater odds of high child self-efficacy ($OR_{quartile\ 4}$ 3.77, 95%CI 1.76–8.04; Table 4). Higher adult food intentions was positively associated with children's higher food intentions (OR 1.13, 95%CI 1.01–1.27). Higher caregiver HFA scores were associated with greater odds of high child HFA scores ($OR_{quartile\ 4}$ 2.19, 95%CI 1.05–4.54). No associations were found between higher levels of adult LHFA scores or adult knowledge and the scores of their children.

Discussion

The present study is one of the first to focus on how adult caregiver food-related characteristics are associated with that of their children among low-income urban AA families (5,9,16). In this study, we build on existing work by examining adult self-efficacy, food knowledge, intentions for food and healthier/less healthy food purchasing behaviour in relation to these characteristics in their children. We found that overweight/obesity among children was significantly associated with their caregiver's overweight/obesity and obesity. This is consistent with results from other studies, with ORs ranging from 2.38 to 3.50 (24–27). Overweight/obesity prevalence is extremely high in our majority AA sample. Given that 91.5% of our adult participants were AA, this is consistent with previous research that reported that 87.1% of AA adults were overweight or obese in lower-income US population (18). This implies that future obesity prevention interventions targeted to low-income AAs might need to focus on a comprehensive approach to reduce caregiver's overweight or obesity status as a proximal way of intervention.

Table 3 Multiple logistic regression analysis for child weight status and adult caregiver characteristics ($n = 283$)*

Caregiver characteristics	Obese (BMI ≥ 95th percentile)			Overweight or obese (BMI ≥ 85th percentile)		
	OR	95%CI	*p*	OR	95%CI	*p*
Obese†,‡	1.98	0.94–4.19	0.07	2.50	1.39–4.51	0.002‡‡
Overweight/obese†,‡	2.06	0.68–6.29	0.20	4.04	1.59–10.28	0.003‡‡
Self-efficacy§ (very low)		Reference			Reference	
Low (second quartile)	2.23	0.94–5.26	0.07	1.68	0.81–3.49	0.16
Medium (third quartile)	1.06	0.46–2.43	0.89	0.99	0.53–1.87	0.98
High (fourth quartile)	1.64	0.67–4.01	0.28	1.07	0.51–2.24	0.86
Food knowledge§	1.14	0.92–1.41	0.24	1.14	0.92–1.41	0.24
Food intentions§	1.20	1.03–1.41	0.02‡‡	1.15	1.02–1.30	0.02‡‡
HFA score¶,** (very low)		Reference			Reference	
Low (second quartile)	0.88	0.36–2.14	0.78	1.12	0.53–2.37	0.76
Medium (third quartile)	1.04	0.45–2.42	0.92	1.47	0.73–2.94	0.28
High (fourth quartile)	0.85	0.35–2.02	0.71	1.20	0.60–2.39	0.61
LHFA score††,** (very low)		Reference			Reference	
Low (second quartile)	0.80	0.34–1.85	0.59	0.82	0.41–1.66	0.58
Medium (third quartile)	0.57	0.22–1.45	0.24	0.87	0.42–1.81	0.71
High (fourth quartile)	0.87	0.37–2.05	0.75	0.97	0.48–1.96	0.93

*Each row represents a separate model.
†Obese: BMI ≥ 30 (kg/m^2); overweight/obese: BMI ≥ 25 (kg/m^2) (CDC).
‡Adjusted for child age and gender, caregiver age and gender, household income, caregiver HFA score, and child LHFA score.
§Adjusted for child age and gender, caregiver age and gender, and household income.
¶HFA score was created by summing the frequency for the past 30 d of purchasing 27 healthful food items promoted for B'More Healthy Community for Kids intervention. **Adjusted for child age and gender, caregiver age and gender, household income, and caregiver food intention.
††LHFA score was created by summing the frequency for the past 30 d of purchasing 27 less healthful food items promoted for B'More Healthy Community for Kids intervention.
‡‡*p*-value ≤ 0.05.
BMI, Body Mass Index; HFA, healthier food acquisition; LHFA, less healthy food acquisition; OR, odds ratio; 95%CI, 95% confidence interval.

Table 4 Multiple logistic regression analysis of child psychosocial and behavioural characteristics and adult caregiver characteristics*

Caregiver characteristics	Higher child self-efficacy†			Higher child food knowledge†			Higher child food intentions†			Higher child HFA‡,§			Higher child LHFA‡,¶		
	OR	95%CI	*p*	OR	95%CI	*p*	OR	95%CI	*p*	OR	95%CI	*p*	OR	95%CI	*p*
Self-efficacy (very low)	Reference			—	—	—	—	—	—	—	—	—	—	—	—
Low (second quartile)	2.05	0.97–4.34	0.06	—	—	—	—	—	—	—	—	—	—	—	—
Medium (third quartile)	1.61	0.83–3.10	0.16	—	—	—	—	—	—	—	—	—	—	—	—
High (fourth quartile)	3.77	1.76–8.04	<0.01§§	—	—	—	—	—	—	—	—	—	—	—	—
Food knowledge**	—	—	—	1.13	0.95–1.35	0.16	—	—	—	—	—	—	—	—	—
Food intentions**	—	—	—	—	—	—	1.13	1.01–1.27	0.04§§	—	—	—	—	—	—
HFA score†† (very low)	—	—	—	—	—	—	—	—	—	Reference			—	—	—
Low (second quartile)	—	—	—	—	—	—	—	—	—	1.70	0.81–3.55	0.16	—	—	—
Medium (third quartile)	—	—	—	—	—	—	—	—	—	1.72	0.82–3.63	0.15	—	—	—
High (fourth quartile)	—	—	—	—	—	—	—	—	—	2.19	1.05–4.54	0.04§§	—	—	—
LHFA score‡‡(very low)	—	—	—	—	—	—	—	—	—	—	—	—	Reference		
Low (second quartile)	—	—	—	—	—	—	—	—	—	—	—	—	1.89	0.92–3.87	0.09
Medium (third quartile)	—	—	—	—	—	—	—	—	—	—	—	—	1.33	0.64–2.77	0.45
High (fourth quartile)	—	—	—	—	—	—	—	—	—	—	—	—	2.02	0.97–4.19	0.06

*Each row represents a separate model. All child psychosocial and behavioural outcomes were dichotomized with a median split to compare the odds of having higher versus lower levels of these characteristics.

†Adjusted for child age and gender, caregiver age and gender, and household income.

‡Adjusted for child age and gender, caregiver age and gender, household income, and caregiver food intention.

§HFA score for children was created by summing the frequency for the past 7 d of purchasing 40 healthful food items promoted for B'More Healthy Community for Kids intervention.

¶LHFA Score for children was created by summing the frequency for the past 7 d of purchasing 22 less healthful food items promoted for B'More Healthy Community for Kids intervention.

**Exposure variable with linearity was not converted into quartiles.

††HFA score was created by summing the frequency for the past 30 d of purchasing 27 healthful food items promoted for B'More Healthy Community for Kids intervention.

‡‡Caregiver LHFA score was created by summing the frequency for the past 30 d of purchasing 27 less healthful food items promoted for B'More Healthy Community for Kids intervention.

§§p-value ≤ 0.05.

HFA, healthier food acquisition; LHFA, less healthy food acquisition; OR, odds ratio.

Parental obesity has been identified as a predominant risk factor for childhood obesity, probably owing to a combination of genetic, epigenetic, social and environmental factors (26). Counter to our hypotheses, healthier/less healthy food purchasing behaviour among caregivers was not associated with child overweight or obesity in our sample. Unexpectedly, higher healthy food intentions among caregivers were positively associated with increases in child overweight/obesity. This association could reflect reverse causation, in which excessive weight status of a child might lead to their caregiver wanting to improve the home food environment, thereby having healthier food intentions for their households. We did not find any associations between other adult psychosocial and behavioural factors and child overweight/obesity. This is consistent with other literature that did not find statistical significance between caregiver's psychosocial factors and child overweight/obesity (5) but is inconsistent with a study that found association between lower parental self-efficacy and child weight gain (28). Although parent behavioural factors such as healthier cooking method and more frequent consumption of home meals were associated with lower child BMI (5,29), results from this study implies that food purchasing might not be a direct predictor of childhood obesity.

However, we did find that adult psychosocial factors were associated with child psychosocial factors. Based on the results from this study and the conceptual framework (Figure 1), we hypothesized a pathway through which caregiver improved psychosocial factors can positively influence children's psychosocial factors to prevent childhood obesity. Healthy food intention and self-efficacy were positively associated between children and their adult caregiver. Children of adults with the highest self-efficacy had greater odds of having high self-efficacy themselves. Self-efficacy has been previously associated with healthy behaviour among individuals (2,4,7,18,29,30) and has been hypothesized that such psychosocial factors can influence children's healthy eating (31). However, few studies have evaluated whether parent's self-efficacy is associated with child's self-efficacy. Exceptions are Whitbeck and Ardelt *et al.* who looked at this relationship among school aged adolescents and found association between parental self-efficacy and child self-efficacy, which are consistent with our findings (32,33).

Children of adults with the healthiest food purchasing patterns had greater odds of having high healthy food purchasing scores for themselves. On the other hand, adult unhealthy food purchasing was not associated with child unhealthy food purchasing. We speculate that the modelling of healthy food purchasing by adults is more overt and therefore salient influence on child food purchasing habits. Perhaps unhealthy food purchasing reflects autonomous decision-making by children in this setting. The relationship between healthy food purchasing among youth and parental characteristics of caregiver self-efficacy has been explored (9), but to our knowledge, no other studies have assessed the relationship between parental healthy food purchasing and child healthy food purchasing. It could also be that unhealthy food purchasing is ubiquitous in this population (16), making it difficult to detect an association. Another explanation might be that peer pressure, potentially friend's unhealthy food purchasing rather than caregiver's could lead to the purchase unhealthier food items, which has been discussed in other studies (29,34).

Limitations of this study should be noted. It is possible that the lengthy surveys led to a reduced willingness to participate in the evaluation; however, once initiated, all study participants completed the surveys. The design is cross-sectional, and for this reason we present descriptive analyses and refrain from suggesting that these be interpreted as causal. We created a number of scales to assess psychosocial and behavioural factors. We used modified versions of previously validated measures (5,9,16,18,31) where possible, but in some cases, these did not exist. Most of our scales had acceptable-to-good Cronbach's α ranging from 0.60 to 0.97. However, in the case of adult food knowledge and child food intention, the α was lower and might indicate that the items in the scale are not capturing a single or uniform construct. All data except weight status were self-reported and therefore subject to social desirability bias and misreporting. We suspect that these reporting biases would not be systematically different, as we have a fairly demographically homogenous sample, and would therefore result in non-differential misclassification. Furthermore, our measure of food purchasing queried the frequency of purchasing different foods over the previous 30 d for adult and 7 d for child. It is possible that this would not reflect usual purchasing or, in the case of adults, may not reflect consumption because purchases may be made for the whole household. In addition, foods were classified as unhealthy or healthy. and some foods could arguably belong to either category. For example, in this study, granola bars were categorized as less healthy, based on the assumption that purchasing granola bar falls into the category of having additional snacks, which is considered to be less healthy.

Conclusion

We found that some adult caregiver and child psychosocial and behavioural characteristics were significantly associated. Higher self-efficacy and HFA scores of adult caregivers were associated with their children's self-efficacy and healthy food purchasing. Study findings could inform the design of a comprehensive multi-level

intervention involving household members. As it has been emphasized in the literature (2,16,33), prevention programmes should combine multidisciplinary expert knowledge and take into consideration the important role of the family food environment.

Conflict of Interest Statement

No conflict of interest was declared.

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