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***Parents' Diet-Related Attitudes and Knowledge, Family Fast Food Dollars Spent, and the Relation to BMI and Fruit and Vegetable Intake of Their Preschool Children***

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## ABSTRACT

**Background:** Overweight in children has increased to epidemic proportions. A potential contributor to the high prevalence of overweight in children is inappropriate diet. Parents are the primary influence of preschool children's diets. The purpose of this study was to describe diet-related attitudes and knowledge of parents, family fast food dollars spent, fruit and vegetable intake of children, and their relation to their children's body mass index-for-age status.

**Methods:** This study used secondary data analysis of the national datasets, Continuous Food Survey Intake by Individuals (CSFII) and the Diet Health Knowledge Survey (DHKS). Analysis of data used frequencies and means, employment of Chi-Square to test association between parents' diet-related attitudes and knowledge, and children's body mass index (BMI), and Pearson's  $r$  to determine significant correlations. Preschool children (n=447) and their parent (n=447), who were part of a larger 16,103 nationally representative sample, were selected for the present study.

**Results:** We found that 95.5% of preschool children do not eat at least three vegetable servings a day and that consumption patterns for fruit varies between Black and White children. Parents' knowledge and attitudes were not associated with children's fruit and vegetable intake nor with BMI status of their children. Findings indicated a negative correlation between family fast food dollars spent and children's vegetable intake and positive correlation to children's fruit intake.

**Key Words:** *attitudes, knowledge, fast food, fruit and vegetable intake, overweight, obesity, parents, preschool children, nutrition, diet*

## Introduction

Obesity has become a significant yet preventable public health problem of the twenty-first century. Over 10% of American children ages 2-5 years old are overweight (Body mass index (BMI)  $\geq$  95%).<sup>1</sup> Studies have demonstrated that many children's diets are high in fat and calories and low in nutrient-rich fruits and vegetables.<sup>2,3</sup> Many children's dietary intake includes an increasing consumption of fast-food.<sup>4-6</sup> Adult chronic diseases such as type II diabetes and hypertension<sup>7</sup> or their risk factors<sup>8</sup> are now seen in childhood. This trend makes early prevention through lifestyle modification of healthy diet a potentially important public health and primary care prevention strategy. Some researchers have studied overweight in preschool children,<sup>1,9-11</sup> parental diet-related attitudes and knowledge,<sup>12,13</sup> fruit and vegetable,<sup>14,15</sup> and fast food intake of young children.<sup>4,5</sup> No study was located investigating either fast food dollars spent in families and obesity/overweight or all variables together in children ages 2-5 years.

The purpose of this study was to examine preschool children's parents' dietary attitudes and knowledge, and determine the possible correlation of family fast food dollars and/or fruit and vegetable intake with children's body mass index-for-age (BMI). These findings may assist nurses and other health care providers in directing strategies to promote healthy life-long diets.

Obesity has become the second leading cause of preventable deaths in the United States.<sup>16</sup> Overweight (greater or equal to 95% of the gender-specific BMI) in children has increased over the last few decades.<sup>9-11</sup> The National Health and Nutrition Examination Survey (NHANES) 1999-2000 reported the prevalence of overweight children ages 2-5 years old was 10.4%, a 3.2% increase from 1988-1994.<sup>1</sup> Studies found that older preschool children (4-5 years) have a higher overweight prevalence than younger preschool children.<sup>9,11</sup> A recent study found that overweight prevalence in children ages 2-19 years had increased by 182%

between 1971 and 1999-2000.<sup>10</sup> The extent overweight or the average amount that children's BMI goes beyond their age and gender-specific overweight threshold increased to 247% over the past 30 years.<sup>10</sup> These findings suggest that overweight children are becoming heavier.<sup>10</sup> This significant rise in overweight in children has become a major public health concern<sup>17</sup> because it is a risk factor for a myriad of chronic diseases, as well as being a financial burden.<sup>18</sup> Multiple studies link overweight in childhood to subsequent obesity morbidity and mortality in adulthood.<sup>19-21</sup> However, the sequelae of obesity are not limited to adulthood as evidenced by the increasing concomitant conditions in overweight youth.<sup>7,20,22</sup>

Parents are the primary role models of preschool children. Exploring parents' dietary beliefs and behaviors may be important in determining whether these factors influence young children's weight. Parental diet-related attitudes, knowledge and behaviors, and family fast food dollars spent have been explored.<sup>4-6,12,23,24</sup>

Several studies have examined diet-related attitudes, knowledge, and obesity.<sup>12-14, 23-25</sup> However, these studies all tend to take a slightly different perspective, and have not specifically focused on parental diet-related attitudes and knowledge, family fast food dollars spent, and preschool children's fruit and vegetable consumption. In a study by Kuchler and Lin,<sup>25</sup> women who did not believe their weight was predetermined had lower BMI compared to those who believed their weight was predetermined. Higher parental nutrition knowledge was associated with a lower prevalence of overweight in children.<sup>23</sup> While most parents ( $\geq 70\%$ ) know the correct United States Department of Agriculture (USDA) recommended fruit servings per day,<sup>19,24</sup> only 34% of parents know the correct vegetable daily servings.<sup>24</sup> Income level was a determining variable in parental awareness of correct recommended vegetable servings. Only 34% of adults were aware of the correct daily vegetable servings,<sup>24</sup> and low-income adults were significantly less likely to know the correct servings of

vegetables compared to high-income adults.<sup>13</sup> Guthrie and Fulton<sup>24</sup> found the quantity of fruit consumed was negatively associated with increased body mass index. Colavito and colleagues<sup>12</sup> examined the relationship of meal planners' diet-health related attitudes and knowledge to the food intake of children ages 2 to 5 years. Their findings suggested that parents' taste preferences rather than nutritional knowledge may have more of an influence on their fast food choice.<sup>12</sup>

A study investigating the relationship between obesity and the consumption of fruit and vegetables noted that adults and children who consumed diets high in fruits and vegetables were thinner.<sup>15</sup> Lin and Morrison<sup>15</sup> concluded that those with lower BMI's consumed diets high in fruit, but found no consistent correlation between vegetable intake and BMI in a study that included children ages 5-17 years. In another study, Field and colleagues<sup>26</sup> concluded while girls, ages 9-14 years, fruit and vegetable intake was lower than recommendations in a cross-sectional cohort, no significant correlation in BMI z-score change

and fruit and vegetable intake was noted.<sup>26</sup> Their findings suggested that in boys ages 9-14, vegetable intake was inversely related to changes in BMI z-score ( $\beta$  per serving = -0.003).<sup>26</sup> Mother's education level and child's age and gender were suggested by Cooke and colleagues as predictors of children's vegetable intake, while ethnicity was a predictor of fruit consumption.<sup>14</sup> Their findings further suggested that parental fruit and vegetable intake, the early introduction of fruit and vegetables into a child's diet, and breastfeeding are predictors of both fruit and vegetable intake.<sup>14</sup> Brady and colleagues studied the dietary intake of children and the recommended USDA Pyramid Dietary Guidelines; they found only 5% of children met the fruit consumption guidelines and 20% met the recommended vegetable servings,<sup>27</sup> suggesting that children may not consume the recommended servings per day of fruit and vegetables. Kranz and colleagues' found an increase in American preschoolers' fruit and vegetable intake over the last 30 years.<sup>28</sup>

However, their findings suggest that younger preschool children eat higher amounts of fruits and vegetables, with children of age 2-3 years exceeding two servings of fruit, but not, on average, meeting the recommended three servings of vegetables.

*Fast foods.* Over the last few decades, fast food consumption has increased in the United States. Interestingly, two studies indicated that there was not a consistent association between fast food intake and obesity.<sup>15,26</sup> The trend in fast food as a staple in American children's diet in the 1970's has increased from 12% of total calories to 25% in the 1990's.<sup>5</sup> Americans' fast food consumption rose from 3% in 1977-78 to 9% in 1995.<sup>29</sup> Over the last 20 years, there has been a 14% increase in away-from-home food consumption, which includes fast food.<sup>5</sup> Adults' (ages 18 to 39 years) average calorie intake for away-from-home food increased 16% over the time period and was the highest of all age groups.<sup>5</sup> This is significant because most parents of preschool children are in this age group. While preschool children consumed the

least quantity of fast food of any age group, their consumption increased from 12% to 24% of their total caloric intake between 1977-78 and 1994-96.<sup>5</sup> Fast food has been suggested as a determinant of increased BMI by some researchers,<sup>30</sup> while other research has not found a link between the two.<sup>31</sup> French and colleagues<sup>31</sup> studied fast food consumption among Mid-western urban children, examining demographic and behavioral factors. Fast food consumption was directly associated with greater total energy intake and greater percentage of energy from fat than those not consuming fast food during a one week time period.<sup>31</sup> Fast food consumption was associated with a lower daily intake of fruit and vegetables<sup>31</sup> and may adversely effect the quality of dietary intake.<sup>4</sup> A recent study found fast food consumption greater among males, higher income households, and those living in the Southern region.<sup>4</sup>

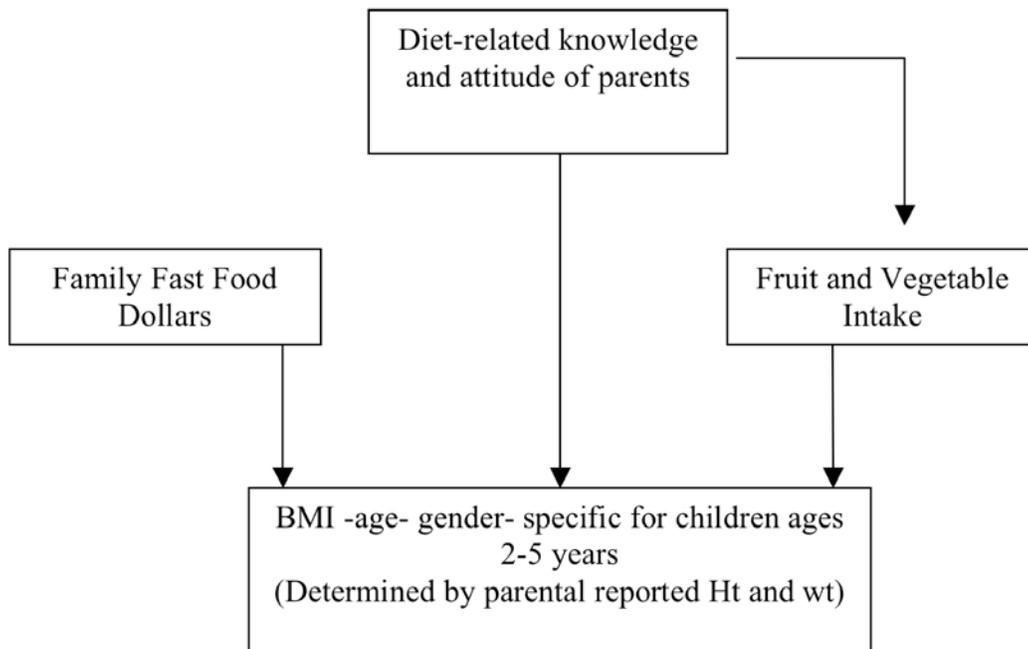
The literature clearly demonstrates that overweight in children is a growing crisis with potential life-long consequences. The increases in adult obesity-associated

mortality and morbidity, as well as the morbidity seen in overweight children and adolescents, have generated a growing public health concern. Limited work has focused on younger children, parental attitudes and knowledge, fruit and vegetable consumption, and fast food intake; no published studies have examined this combination of factors in children 2 to 5 years of age. This study may assist in a better understanding of parental diet-related attitudes and knowledge, and

of family fast food dollars and their correlation to children’s BMI and overweight status. This information may lead to development of nursing and public health strategies aimed at the reduction of overweight incidence and prevalence, especially among children.

Parental diet-related attitude and knowledge provided the conceptual foundation for this study as depicted in Figure 1 based on a review of literature.

**Figure 1**  
**Conceptual Framework**



Studies supported the conceptual links of parental diet-related attitudes and knowledge with the variables of family fast food dollars, children's BMI-age-gender-specific and children's fruit and vegetable intake.<sup>12,14,23</sup> Assumptions for this study were parents as the primary influence and role models for children ages 2-5 years and parents' diet-related attitude and knowledge provide the most significant influence for young children's fast food and fruit and vegetable consumption.

## Methods

*Sample.* The Continuous Survey Food Intake by Interview (CSFII) and Diet Health Knowledge Survey (DHKS) used a nationally representative sample of non-institutionalized adults and children. A stratified, multistage area probability sampling method was used to select subjects. The sampling method used geographic location, socioeconomic status, and urbanization for population stratification. The intricacy of

stratification and multistage probability sampling permits researchers to gain a nationally representative sample in an efficient and cost-effective manner.<sup>32</sup> An over-sampling of low-income persons was performed to provide reliable inferences of that population.<sup>32</sup>

The CSFII and DHKS are conducted by the United States Department of Agriculture (USDA) through a private contractor, Westat, Incorporated, of Rockville, Maryland. Trained interviewers collected CSFII data on 16,103 individuals by in-person interviews between 1994 and 1996. The DHKS sampled 5,765 adults ages 20 years and older. For the purposes of this study, subjects were limited to children ages 2-5 years and the adult household member who completed the follow-up telephone DHKS. All data (demographic, food intake, height, and weight) were self-reported. Height and weight measurements were in the English system. Self-reported height and weights were used to compute the

BMI of children. The following formula was used to calculate the BMI for children ages 2-5 years:

$$\text{Weight in pounds} / \text{height in inches} \times 703 = \text{BMI.}$$

BMI-age-gender-specific was then determined using the Centers for Disease Control (CDC) BMI-age-gender-specific growth charts.<sup>33</sup> The final sample for this study was 447 parent proxies (male and female head of households) and 447 children ages 2-5 years whose parents completed a Day-1 CSFII. Parents 19 years and younger were excluded from this study because of

the DSHK exclusion criteria. There was a 14.7% rate for key missing data, leaving a sample of 381 for parents and children.

Selection of specific demographic data and various questions on parental attitudes and knowledge related to diet and health, as well as food intake of children, was made after a thorough review of the literature. Figure 2 lists the questions chosen from the Diet Health Knowledge Survey related to diet attitudes and knowledge of parents.<sup>34</sup>

**Figure 2.**

**Questions Used from the Diet Health Knowledge Survey (DHKS)**

- How many servings would you say you should eat for good health from the fruit group?
- How many servings would you say you should eat for good health from the vegetable group?
- Do you agree some people are born to be fat?
- Do you agree what you eat can make a big difference in your chances of getting disease?
- Is it important to choose a diet low in saturated fat?
- Is it important to choose a diet with plenty of fruit and vegetables?
- Is it important to maintain a healthy weight?
- Is it important to choose a diet low in fat?
- Have you heard about any health problems caused by being overweight?

The DHKS provides information on adults’ perceived appropriate food

and nutrient intake, awareness of the relationship between diet and health,

perceived significance of nutritional guidance use, comprehension of food labels, and knowledge of recommendations for USDA food servings. The CSFII asked questions such as food and nutrient intake for individuals, sources of food, location of food consumption, and fast food intake. This survey collected data on fruit and vegetable (excluding white potatoes) for Day-1 intake. On two non-consecutive days, trained interviewers administered the CSFII questionnaires by proxy for children ages 2 to 6 years of age. Interviewers collected data for Day-1 intake questionnaires with face-to-face interviews. Three to ten days later, interviewers conducted Day-2 interviews either in person or by telephone. This study used only data from CSFII Day-1. Researchers selected data from Day-1 to ensure a larger sample. Day-2 participation was not a requirement for inclusion in the CSFII or DHKS. Questions used from the CSFII and the Household Survey that provided the socioeconomic demographic data on subjects included the following: age, gender, race/ethnicity, region, parental education level, income

level, and employment status.

Written permission to conduct this study was received from the University of Tennessee Health Science Center's Institutional Review Board. This study's data did not contain any individual-identifying information and no individual-level data analyses were conducted.

*Analysis.* Data analyses used the SPSS version 12.0 statistical software program. Frequency and means of demographic variables were determined. Descriptive correlations of children's BMI-age-specific and fast food dollars, children's BMI (age-specific) and parental DHKS response and children's fruit and vegetable consumption were determined using product-moment correlation coefficients (Pearson's  $r$ ). Chi-Square analysis was used to determine the relationship between parental diet-related attitudes and knowledge and children's BMI status. Weighting of data allowed generalization of findings and compensation for variable probabilities of selection, underrepresentation of specific population groups, and differential non-response rates using SPSS

version 12.0.

The CSFII data provided fruit and vegetables in grams rather than in servings. To convert to serving portions, investigators divided fruit and vegetable total grams by 100 providing the number of servings in both food groups. The BMI-age and gender-specific values were determined by BMI z score for the CDC BMI age- and gender-specific growth charts.<sup>33</sup>

## Results

The respondents consisted of 447 children ages 2-5 years and a parent, who were part of a large, nationally representative study. The study showed that most overweight children live in the urban areas and Southern region of the U.S. Parents of overweight children were typically older, more likely to have some college education, a higher income, and are employed full-time. A table describing the sample follows.

**Table 1.**  
**Demographics of Sample Population**

<b>Children</b>			
Mean age (SD)	3.34 (1.08)	Race/Origin	
		White, non-Hispanic	76.9%
Gender		Black, non-Hispanic	13.9%
Male	50.1%	Other, non-Hispanic	4.5%
Female	49.9%	Hispanic	4.7%
<b>Parent*</b>			
Mean age	33.8	Income, Household	
Median age	33	<\$10,000	7.1%
Modal age	29	\$10,000-19,999	13.6%
		\$20,000-29,999	14.5%
Age groups		\$30,000-39,999	19.6%
20-29	2.1%	\$40,000-49,999	13.4%
30-39	34.9%	\$50,000+	31.8%
40-49	49.2%		
50+	14.0%	Region	
		Northeast	16.3%
Education Level		Midwest	29.0%
11 <sup>th</sup> grade	10.8%	South	39.1%
HS graduate	34.2%	West	15.6%
Some college	55.0%		
		Urban/Rural	
Employment		Urban	28.9%
Full-time	54.5%	Suburban	47.4%
Part-time	10.7%	Rural	23.0%
Unemployed	31.0%		
Other	3.9%		

\*Parent, grandparent, or guardian

The highest rate of overweight was in children age three (11.6%) with two-year-olds having the next highest rate (9.1%) (Table 2). Black preschoolers had the highest overweight rates among the different racial/ethnic groups. The rate of overweight children was highest

among children who resided in the Southern region (37.5%), had a parent with some college education (62.5%), was employed full-time (75.6%), had a household income of at least \$50,000 (33.0%), and whose age was 40-49 years (60.4%).

**Table 2.**  
**Percentage of Overweight Among Children Ages 2-5 by**  
**Demographic Factors**

	<b>% Children BMI &gt;95%</b>		<b>% Children BMI &gt;95%</b>
<b>Children</b>		<b>Parent (con'd)*</b>	
Mean age ( <i>SD</i> )	3.13 (.95)	Income, Household	
Age groups		<\$10,000	10.0
2	9.1	\$10,000-19,999	4.4
3	11.6	\$20,000-29,999	12.4
4	7.7	\$30,000-39,999	7.5
5	4.8	\$40,000-49,999	9.8
		\$50,000+	8.6
Gender		Employment	
Male	9.1	Full-time	11.4
Female	8.2	Part-time	2.3
Race/Origin		Unemployed	18.9
White, non- Hispanic	6.8	Other	4.5
Black, non- Hispanic	22.6	Region	
Other, non- Hispanic <sup>§</sup>	11.8	Northeast	11.2
Hispanic <sup>§</sup>	11.1	Midwest	7.9
		South	7.8
		West	10.3
<b>Parent*</b>			
Age groups		Urban/Rural	
20-29	7.6	Urban	12.8
30-39	7.4	Suburban	6.5
40-49	10.2	Rural	8.1
50+	6.3		
Education Level			
11 <sup>th</sup> grade	6.7		
HS graduate	8.1		
Some college	9.4		

<sup>§</sup>These numbers should not be considered representative due to high rates of missing values (57% Hispanic, 23% Other)  
 Weighted N = 17,579,271; all p-values<.001

Over 90% of the adult sample agreed that at least two servings of fruit and three servings of vegetables are needed for good health and that a diet high of fruits and vegetables and maintaining a healthy weight were

important. Almost all of the overweight children’s parents (97.2%) were aware of health problems associated with being overweight. However, the parents of the overweight children were more

likely to express a belief that a diet low in fat or saturated fat was not important. Parents of children whose BMI was at or exceeded 95% were almost twice as likely to disagree with the statement: “what you eat makes a difference in your chances of getting disease.” Statistical analysis indicates that there is a relationship between parental diet-related attitudes and knowledge and children’s BMI status, suggesting that parental diet-related attitudes and knowledge are not the same in all groups.

As shown in Table 3, while most parents of overweight children knew the correct number of fruit and vegetable servings, parental knowledge tended to vary somewhat from group to group. Table 3 also shows that regardless of whether children were overweight, most parents could correctly state the required three vegetable servings for good health. All differences were statistically significant ( $p = .001$ ). Table 3 presents children’s BMI status compared to their parents’ diet-related attitudes and knowledge.

**Table 3.**  
**Relationship between parental diet-related attitudes and knowledge, and children’s BMI status**

	Children BMI < 95%**	Children BMI ≥ 95%**	Total**
How many servings a day would you say you should eat for good health from the fruit group? ≥ 2	88.6	93.2	90.4
How many servings a day would you say you should eat for good health from the vegetable group? ≥ 3	92.2	92.0	92.1
Have you heard about any health problems caused by being overweight? Yes	96.3	97.2	96.6
<b>Question: “I’m going to read you some statements about what some people eat. Please tell me if you strongly agree, agree, disagree, or strongly disagree.”</b>			
Some people are born to be fat and some thin. Agree*	37.5	32.9	35.7
What you eat can make a big difference in your chances of getting a disease. Agree	93.3	88.8	91.6
<b>Question: “To you personally, is it very important, important, or not important to ...”</b>			
Choose a diet low in saturated fat. Important*	83.5	80.6	82.4
Choose a diet low in fat. Important	90.6	86.2	88.9
Choose a diet with plenty of fruits and vegetables Important	92.5	92.9	92.7
Maintain a healthy weight. Important	96.5	96.4	96.5

\*Note: The categories “strongly agree” and “agree” were collapsed into one category: “agree.” The “very important” and “important” categories were collapsed into one category: “important.”

\*\* Percentage of children with parents responding “agree” or “important”  
 $p < .001$ ,  $df = 1$  for all variables

Table 4 shows the percentages of children not eating the recommended fruit and vegetable intake by demographic category. The

data indicate clearly that most preschool children do not consume the recommended three servings of vegetables per day. The mean serving of vegetables per day for all children was 0.875. By contrast, the

mean number of fruit servings indicated more than half of children (60.4%) eat two or more servings a day. However, almost three-fourths (74.5%) of overweight children eat fewer than two fruit servings a day.

**Table 4.**  
**Children’s Characteristics by Fruit and Vegetable Servings and BMI Status**

Children	Fruit < 2		Vegetable < 3	
	BMI<95%	BMI ≥ 95%	BMI<95%	BMI ≥ 95%
2-5 years	55.4	74.5	98.2	91.5
2-3 years	58.0	74.1	98.8	100.0
4-5 years	56.6	74.4	98.5	94.3
White, non-Hispanic*	54.8	74.5	98.4	89.8
Black, non-Hispanic	68.5	76.0	97.9	100.0

\* Hispanic and Other were not included because of the high rate of missing data in these groups.  $p < .001$ ,  $df = 1$  for all variables

Table 5 illustrates the correlation of fast food dollars (FFD) with reported number of fruit and vegetable servings consumed by children. A negative correlation was determined for family fast food

dollars (FFD) with children’s servings of vegetables. There was a small positive correlation between fast foods dollars and fruit servings, but we do not believe that it is clinically significant.

**Table 5.**  
**Correlation between Children’s (2-5 years) Monthly Family Fast Food Dollars (FFD) and Fruit and Vegetable Serving, Pearson’s *r***

	Vegetable	Fruit	FFD
Vegetable	1	.042**	-.050**
Fruit		1	.012**
FFD			1

\*\* $p = 0.01$ , 2-tailed

Table 6 shows the relationship between fast food dollars spent per month and daily consumption of

fruits and vegetables by 2-5 year olds. For those families in which the children ate less than the

recommended number of vegetables daily, the mean fast food dollars per month was more than double that spent by families in which the children met the recommended guidelines for vegetables; the median fast food dollars spent was exactly double. For fruit consumption, the picture was not quite so clear. The means were different statistically but not clinically. However, the median fast food dollars spent by families in which the children did not meet the guidelines for fruit consumption was

33% higher than for families in which the children met the guidelines. These data clearly demonstrate that the amount of money spent on fast food was inversely related to vegetable consumption among pre-school children and could possibly also be a factor in low rates of fruit consumption. (Note: no family in the study reported that their children met the guidelines for both fruit and vegetable consumption.)

**Table 6**  
**Mean Monthly Expenditure on Fast Food by Daily Vegetable and Fruit Consumption**

	<b>&lt; 3 Veggies</b>	<b>≥ 3 Veggies</b>	<b>&lt; 2 Fruits</b>	<b>≥ 2 Fruits</b>
Mean (95% CI)	\$26.87 (26.50, 26.88)	\$12.86 (12.82, 12.92)	\$27.53 (27.51, 27.54)	\$25.26 (25.24, 25.29)
Median	\$20.00	\$10.00	\$20.00	\$15.00

This study found a statistically significant correlation between children’s BMI and their fruit and vegetable intake. Results indicate a

slight negative correlation between fruit intake and overweight children. Vegetable intake was slightly positive for overweight children (Table 7).

**Table 7.**  
**Correlation between Children's BMI and Fruit and Vegetable Intake,**  
**Pearson's *r***

Children's Servings	BMI < 95%	BMI ≥ 95%
Fruit	.032	-.033
Vegetable	.083	.034

*p* value = 0.01 level (2- tailed) between BMI groups for fruit and vegetable servings.

## Discussion

This study examined the diet-related attitudes, knowledge, and family fast food spending of parents with preschoolers, and compared these with their children's fruit and vegetable consumption, and BMI status. There were several major findings of this study:

- fruit and vegetable consumption of preschool children vary significantly between whites and blacks,
- parents' knowledge and attitudes are not correlated with children's fruit and vegetable intake,
- children in families that spend more dollars on fast food tend to eat fewer vegetables and to a lesser extent, fewer fruits,
- preschool children's overweight status was not associated with the diet-related attitudes and knowledge of parents, and

- significant numbers of overweight children are in families with older parents, or parent employed full-time, or parents with some college education.

Parents of preschool children appeared to be knowledgeable in areas related to fruit and vegetable intake, the importance of maintaining a healthy weight, and diseases related to being overweight. This may imply that parental knowledge was not a primary factor in children's diets. Many fast food restaurants serve fruit pies and fruit juices and in salads (with large servings of fatty salad dressings or potatoes as a vegetable). This may help explain the correlation between fast food and fruit and vegetable servings in preschool children.

In addition to this work, other studies also found a significant

number of adults were aware of the correct recommended number of fruit and vegetable servings.<sup>13,23,24</sup> Variyam's<sup>23</sup> study of children ages 6-17 years suggested that there was a relationship between children's BMI and their fruit and vegetable intake; Lin and Morrison<sup>15</sup> found a correlation between children's fruit intake and BMI, but did not find a consistent correlation between vegetable intake and BMI. Their findings suggest that children with BMI < 85% eat more fruit than overweight children.<sup>15</sup> Binkley and colleagues'<sup>30</sup> findings suggested that males had an increase in BMI with increased fast food consumption. Results of this study suggested a negative correlation between fast food and vegetable intake, which are similar to the results of the study by French et al,<sup>31</sup> who found a negative association between fast foods and fruit and vegetable servings in an adolescent population in a large Midwestern city. A possible explanation for the difference in fruit results may be due to the operational definition for fruit. Results of this study were also consistent the recent work by Bowman and colleagues,<sup>4</sup>

which suggested children who eat more fast foods eat less fruit and vegetables. This study included all sources of fruit and studied children and youth ages 4-19. Kranz and colleagues<sup>28</sup> found younger preschool children had higher fruit and vegetable intake than children 4-5 years old. Muñoz and colleagues<sup>35</sup> findings indicated that the mean daily servings of fruit was 5.2 and vegetables 1.9 in preschoolers are consistent with this study findings that preschool children eat sufficient fruit servings per day, but fail to meet the recommended vegetable servings.

Limitations to this study included the exclusion of teen parents, inclusion of fruit juice and desserts such as pies with fruit consumption, the under-representation of the Hispanic population, and the self-reporting of all data. There was also over-sampling for low income but not for race/ethnicity in this study.<sup>32</sup> This may account for the low representation of Hispanics based on the 1990 US Census, which estimated the Hispanic population at 9%.<sup>36</sup> Use of Day-1 and not Day-2

CFSII data is a study limitation and possible threat to internal validity

Future studies should include adolescent parents. The teen birth rate in 2003 was 48.5 per 1,000 births.<sup>37</sup> Preschool children with teen parents have poor health outcomes and therefore information on what parents' attitudes are and what they know may be important in developing nursing and public health interventions to reduce the epidemic of overweight in children. Studies to broaden our knowledge of barriers to children eating the recommended levels of fruit and vegetables and exploration into why families are increasing their fast food intake could be important in development of success interventions to promote healthy eating patterns.

From this study, it is clear that public health nurses specifically, and nurses in general, should develop and implement health promotion

programs to educate all parents, including older ones, about the need to provide the recommended numbers of fruits and vegetables each day for their preschool children. Nurses should also work with fast food chains to both continue and increase their development of healthy alternative meals for children and to aggressively market these alternatives. Day care settings need to be included in these health promotion programs because of the large number of preschool children they feed each day in this country. Especially needed is an emphasis on targeting African American parents and children due to the significantly higher prevalence of overweight in this population. It is crucial that public health practitioners address overweight/obesity in preschool children through primary prevention strategies to reduce these rates in children, adolescents, and adults.

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