Family Dietary and Activity Behaviors Associated with Overweight Risk Among Low-income Preschool Age Children

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Abstract

Overweight is the most prevalent nutrition related problem for children of all ages in the U.S. Despite this there is a paucity of research linking specific lifestyle behaviors with risk for overweight in young children. The purpose of this descriptive study was to assess family eating and activity lifestyle behaviors associated with overweight in low-income preschool age children. Mothers (n=132) of children (n=141) aged 2-5 participating in the Women, Infants and Children (WIC) Nutrition Program in Butte County, CA, were selected via a sample of convenience. A Family Activity and Eating Habits questionnaire was administered during regularly scheduled WIC appointments. Higher maternal questionnaire scores indicated more positive weight related behaviors. Analysis of variance was used to test for differences in child's BMI for maternal questionnaire scores, however, no significant differences were found. Correlation analysis identified a positive relationship between mother's BMI and child's BMI-for-age percentile such that as mother's BMI increased, child's BMI-for-age percentile increased (r=.191; p=.033). Four weight related behaviors were associated with children's weight, including a significant association between fast food consumption and child's BMI-for-age percentile (r=.202; p=.016). Mean BMI-for-age percentiles were significantly higher for Hispanic compared to white children (p=.001). 42% of the Hispanic children were above the 85th BMI-for-age percentile compared to 26% for the white preschool age children. Despite this higher rate, Hispanic children were significantly less likely to eat while watching TV (p=.003). Study results suggest that the mothers of these preschool age children were knowledgeable about positive lifestyle behaviors, but additional measures are needed to promote a healthy BMI-for-age for young, low-income children.

Keywords: childhood overweight, pediatric obesity, BMI-for-age percentile, dietary behaviors

Introduction

Childhood overweight has doubled in the last 10 years and has been recognized as the most prevalent nutritional problem of children since 1995 (Hediger et al., 2001). Children at risk for overweight (85th-<95th percentile BMI-for-age) and those that are currently defined as overweight (>95th percentile BMI-for-age) are now being diagnosed with health problems that have been previously thought of as adult medical issues, including hypertension, hyperlipidemia, and type 2 diabetes. Additional consequences of childhood overweight include early onset of puberty, early menarche, low self-esteem, gallbladder disease, sleep apnea, and asthma (Myers & Vargas, 2000). The most recent

NHANES data (1999-2000) for children and adolescents indicate that there will be another generation of overweight adults at risk for subsequent overweight and obesity related health conditions (CDC, 2002). Currently, there is limited information regarding factors that either promote or protect against overweight in young children (St. Jeor et al., 2003).

Prevalence of Overweight

Overweight is recognized as a chronic and pervasive health problem spanning all age groups. In 1999, 35% of American adults aged 20 and over were overweight and 27% were obese (CDC, 2002). The rate of childhood overweight increases with increasing age.

Currently, over 10% of preschool children aged two to five, 15% of children aged 6-11, and 16% of adolescents aged 12-19 years are classified as overweight. An additional 21% of children two to five years, 30% of children aged 6-11 years, and 30% of adolescents 12 – 19 years are considered "at risk of overweight" (Ogden et al., 2002). Guo et al. (2002) found that children and adolescents with BMI-for-age values at the 95th percentile have a 62-98% chance of being overweight at 35 years of age.

In 1998, 13% of one to five year olds enrolled in the Women, Infants and Children (WIC) Nutrition Program were overweight (measured by weight-for-height) (USDA, 2001). The prevalence of overweight among these children increased 20% between 1992 and 1998, and varied by ethnicity. Hispanic and Native American children had the highest rate of overweight (16.4% and 18.6%, respectively). Overweight WIC children are more likely to have multiple nutrition risks compared to other WIC children, for example, 79% of overweight WIC children had two or more nutrition risks, while only 48% of other WIC children had two or more risks (USDA, 2001).

The overall rate of at risk for overweight for low-income Butte County children age two to five years is 13.7%. With a BMI-for-age of >95th percentile, an additional 12.2% are overweight. Hence, 25.9% of Butte County low-income children have a BMI-for-age >85th percentile. These rates for at risk for overweight and overweight vary by ethnicity and are significantly higher for Hispanic and Asian children. The rate of at risk for overweight and overweight are the same for Hispanic and Asian preschool age children at 15.2 and 17.2%, respectively. Hence, a total of 32.4% of Hispanic and Asian low-income preschool age children are either at risk for overweight or already overweight. At 10.7% and 12.5% respectively, the rates for overweight and at risk for overweight are relatively low for Butte County black preschool age children. There are no data available for American Indian children (PedNSS, 2001). As elsewhere, the rate of overweight among Butte County children increases with age. According to the California

Center for Public Health Advocacy, 24% of all fifth, seventh, and ninth grade children in Butte County are overweight (CCPHA, 2002).

Prevention of Overweight
Causal factors for the development of childhood overweight need to be identified in order to establish preventative guidelines and to assist in treatment. Prior research has identified several environmental factors that appear to be associated with childhood overweight. These include hours of TV/video watched, fruit and vegetable consumption, parental educational level, socioeconomic status, and fast food consumption (Andersen et al., 1998; Baughcum et al., 2000; Dennison et al., 1998; Dennison et al., 2002; McMurray et al., 2000; Nielsen, 1990).

The American Academy of Pediatrics recommends limiting media viewing to 2 hours or less of quality programs per day. Children who watch the most television are less likely to engage in vigorous activity and have higher BMIs and body fatness than those who watch less than 2 hours of television per day (Andersen et al., 1998; Dennison et al., 2002).

In a cross-sectional survey of fruit and vegetable intake in young children, Dennison and colleagues (1998) found that on average, preschool age children consumed 80% of recommended fruit servings/day and only 25% of recommended vegetable servings/day. An inverse relationship was found between fruit and vegetable consumption and total fat, saturated fat, and cholesterol intakes. Low fruit and vegetable consumption was also associated with inadequate intakes of vitamin A, vitamin C, and dietary fiber. It is estimated that only 1% of children aged 2-19 years meet all the guidelines specified in the food guide pyramid, including the recommended number of servings of fruits and vegetables (Munoz et al., 1997). Inadequate fruit and vegetable consumption appears to be one of the risk factors associated with the development of pediatric overweight (Lin & Morrison, 2002).

Family eating patterns have changed over the past several decades such that a greater

proportion of the typical U.S. diet is consumed outside of the home (Booth et al., 2001). Higher fat, higher calorie foods are frequent components of these meals and have been linked with an increased risk for overweight in adults (French et al., 2000). The link between higher frequency of fast food restaurant use and increased risk for overweight in preschool age children is hypothesized, but not yet documented in the scientific literature.

Low socioeconomic status also appears to be a risk factor for pediatric overweight. Parental education level has also been shown to contribute to child overweight in that children of mothers with low education may be at a greater risk for later obesity (Baughcum et al., 2000).

Children at risk of overweight must be identified at the preschool level as prevention of overweight is perceived to be more effective than treatment. Healthy habits can formed in the preschool years, including those that pertain to eating and activity. Anliker and colleagues (1990) found that children ages two to five have adequate cognitive ability to learn about nutritious food choices, are eager learners, and have not yet been overly influenced by peer pressure. It is reasonable to assume that the encouragement of healthy eating and activity behaviors via parental teaching and role modeling would increase the probability that young children will adopt these behaviors as lifelong habits.

The purpose of this study was to identify family eating and activity patterns that may either promote or protect against overweight among preschool age children. The researchers investigated the association between mothers' scores on a Family Activity and Eating Habits questionnaire (FAEHQ) and their preschool child's BMI-for-age and whether specific lifestyle behavior patterns were associated with overweight among this sample of preschoolers.

Methods
Subjects and Method of Selection
The study sample consisted of low-income mothers (N=132) and children (N=141) participating in the Supplemental Nutrition Program for Women, Infants, and Children (WIC) program in Butte County, California. Inclusion criteria were child's age and WIC participation. Subjects were selected via a sample of convenience. Mothers of children aged two to five years were asked to complete a Family Activity and Eating Habits Questionnaire at the time of their regularly scheduled WIC appointments during a two-week period. Subjects understood that participation was voluntary. Members of the research team administered the survey on site at the Chico WIC facility. The Human Subjects Review Committee at California State University, Chico approved the study methods.

Data Collection Instrument
A 17-item Family Activity and Eating Habits Questionnaire (FAEHQ) was adapted from a validated instrument (Golan & Weizman, 1998) and used to collect data from the WIC mothers. The questionnaire included demographic and behavioral statements concerning eating and activity practices. Responses to behavioral statements were scored using a frequency ranking scale. Possible scores for individual statements ranged from 1-5 points with responses coded such that a score of 1 corresponded to a negative behavior and a 5 corresponded to a positive behavior (never=1, almost never=2, sometimes=3, on most days=4, daily=5). Minimum and maximum questionnaire scores were 17 and 85 points, respectively. Questionnaire subscales included: concentrated sweet consumption, consumption of high fat foods, fruit and vegetable consumption, media viewing, maternal activity patterns, child's activity patterns, breakfast consumption, eating related to hunger, and family dining style. The survey questionnaire was reviewed by two WIC dietitians and refined based upon their suggestions. Mothers were also asked to record their weight and height on the survey instrument. This information was used to calculate maternal BMI.

Data Collection Procedures
WIC staff provided anthropometrical data for the oldest child in the two to five year age range for each family. Mothers were asked to write their name and telephone number on a Post-It®

note attached to the instrument. WIC staff used this information to abstract the child's current height and weight data from their WIC chart. The name and phone number were removed from the survey and placed into a box for a prize drawing. As an incentive to complete the survey, two $25.00 supermarket gift certificates were awarded. All identifying information was removed from the surveys before they were returned to the research team for analysis.

Standard body mass index (BMI) interpretive criteria were used for the mothers and their preschool age children. Overweight in adults is defined as having a body mass index of 25 or greater and obesity is defined as having a BMI of 30 or greater. BMI-for-age growth charts are used to identify children aged 2 – 20 years who are "at risk of overweight" or "overweight". A child with a BMI-for-age between the 85th and 94th percentiles was categorized as "at risk for overweight," and a child with a BMI-for-age at or above the 95th percentile was categorized as "overweight."

Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 11.0. Descriptive statistics were calculated for questionnaire scores, maternal education level, ethnicity, child's gender, breastfeeding status, media viewing, and anthropometrical data. Relationships were examined between mean questionnaire score, child's activity level, mother's BMI, child's BMI-for-age percentile, mother's educational level, and family ethnicity. analysis of variance (ANOVA) was used to test for statistically significant differences in child's BMI and mothers' scores on the FAEHQ questionnaire. Pearson's correlation analysis was used to assess relationships between overall questionnaire scores/scores for specific items and BMI and demographic information. Statistical tests were considered significant at a p-value of < .05.

Results
Participant Characteristics
Characteristics of mothers are given in Table 1. Age ranged from 18 to 45 years with a mean age of 28.6 $\pm$ 5.7 years. Racial/ethnic composition of the sample was 48% White, 39% Hispanic, 5% Asian, 2% African-American, and 5% Other. The mean BMI of 28.0 $\pm$ 7.4 is above the cut-point for overweight of 25.0. Of the 124 women for whom BMI data was obtained, 6% were underweight (BMI<18.5); 34% were of normal weight (BMI=18.5-24.9); 27% were overweight (BMI=25.0-29.9); and 33% were obese (BMI>29.9) (see Figure 1).

Forty-five percent of the maternal subjects had attended at least some college, and of these, 9% were 4-year college graduates (or higher). Twenty-nine percent of subjects did not complete high school and 27% had a high school diploma or GED. The mean number of children per family was 2.6+1.3. Twenty-one percent of mothers had 1 child, 33% had 2 children, 21% had 3 children, 16% had 4 children, and 9% had five or more children. The majority of subjects lived in Chico (78%).

Characteristics of the children participants are given in Table 2. The sample was 47% male (N=66), and 53% female (N=75). The majority (94%) of these children were between the ages of 2 and 4; only 8 (6%) were five years old. Thirty four percent (N=48) of these preschooler age children were either at risk of overweight, or overweight, with BMI-for-age percentiles above the 85th percentile. Figures 2 and 3 present BMI-for-age percentile groups by gender. Eleven percent of the boys were at risk of overweight, and 20% were overweight. In comparison, 23% of the girls, more than double the rate for boys, were at risk of overweight, and 15% were overweight. Interestingly, less than half of the mothers of the overweight children identified their preschool age child correctly as being overweight.

Table 1
Characteristics of WIC Mothers (N=132)

	Mean $\pm$ SD	N	Percent
Age (years)	28.6 $\pm$ 5.7		
18 – 25		44	34
26 – 30		47	36
31 – 45		40	31
Family Race/Ethnicity			
White		63	48
African-American		3	2
Hispanic		51	39
Asian		8	6
Other		6	5
Body Mass Index[a]	28.0 $\pm$ 7.4		
Underweight		7	6
Normal		42	34
Overweight		33	27
Obese		41	33
Education Level			
< High school		37	29
High school Diploma/GED		35	27
Some college		46	36
$\geq$ 4yr college graduate		11	9
Number of Children in Family	2.6 $\pm$ 1.3		
1		28	21
2		44	33
3		28	21
4		21	16
5 or more		11	9

[a] N=124
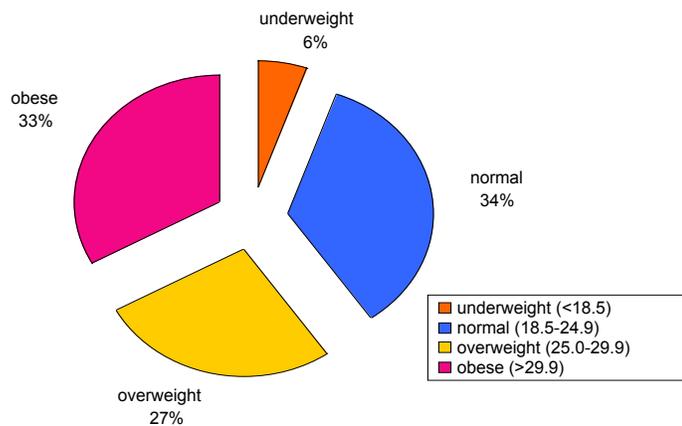
Figure 1
BMI Categories – Mothers

Table 2
Characteristics of WIC Children (N=141)

|	Mean + SD	N	Percent
Gender			
Male		66	47
Female		75	53
Age (years)	3.2 + 0.9		
2		36	26
3		46	33
4		50	36
5		8	6
BMI-for-Age Percentile	16.9 + 2.0		
Normal[a]		93	66
At Risk for Overweight		24	17
Overweight		24	17
Schooling			
Kindergarten		9	7
Headstart		18	13
Other Preschool		23	17
Daycare		9	7
Breastfed (months) [b]	11.0 + 9.3		
0 – 3		32	24
3 – 6		40	31
6 – 12		31	24
> 12		28	20
Television in Bedroom			
Yes		34	25
No		105	75
Hours Media Viewing/Day[c]	2.0 + 1.1		
0		2	2
1		47	34
2		50	37
3		25	18
4		7	5
5 or more		6	4

[a] includes underweight; [b] N=131; [c] N=137
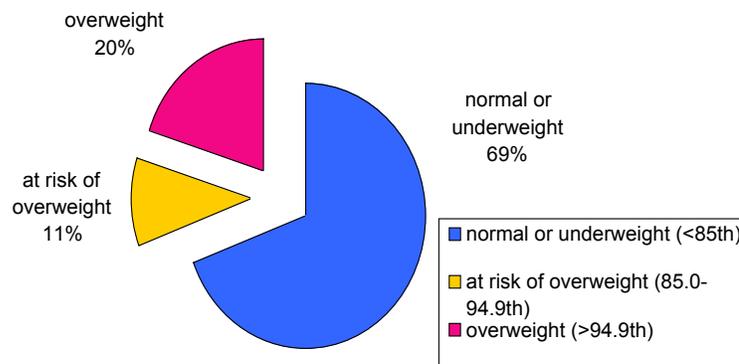

Figure 2
BMI-for-Age Percentiles – Boys
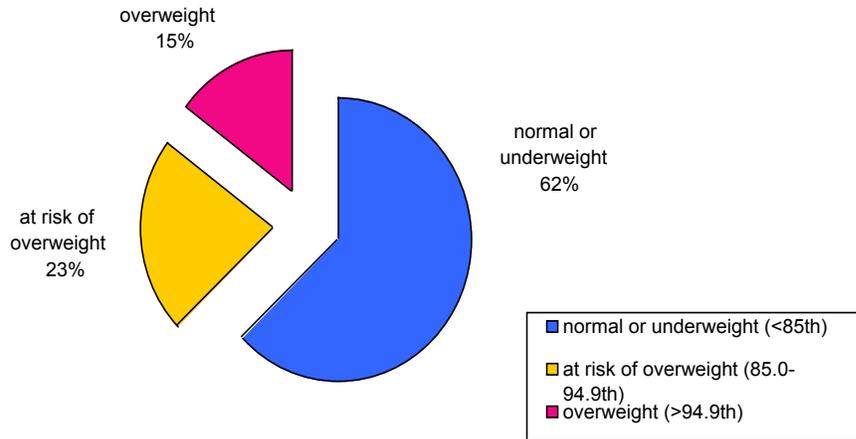
Figure 3
BMI-for-Age Percentiles – Girls

There were significant differences in mean BMI-for-age percentiles among ethnic groups (p=.000). The mean BMI-for-age percentile was 54.0+30.8 for White children, 73.2+25.1 for Hispanics, and 83.1+16.0 for Asians. Figure 4 delineates the percentages of normal weight, at risk of overweight, and overweight children by ethnic group. A total of 26% of the white

children were at risk of overweight (18%), or already overweight (8%), with BMI-for-age above the 85th percentile. In contrast, 42% of Hispanic children were above the 85th percentile (20% at risk and 22% overweight), while 49% of the eight Asian children were above the 85th percentile (8% at risk and 41% overweight).
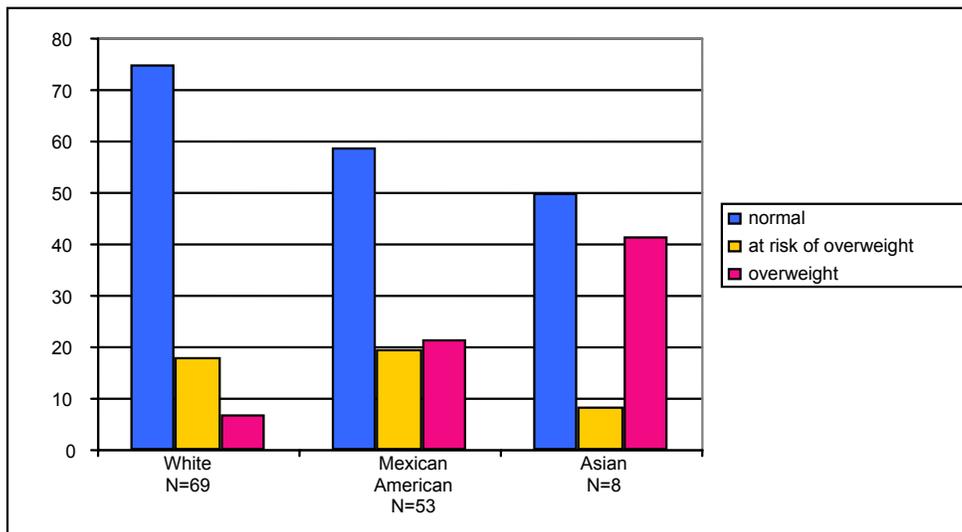

Figure 4
BMI Categories by Ethnicity

Pearson's correlation analysis indicated a positive relationship between mother's BMI and child's BMI-for-age percentile such that as mother's BMI increased, child's BMI-for-age percentile also increased (r=.191, p=.033). An independent samples t-test identified a significant difference in child's BMI-for-age percentile between those mothers with a BMI ≥25.0, and those with a BMI<25.0 (p=.020). The mean BMI percentile for children of mothers with BMIs ≥25.0 (overweight) was 70%, while children of mothers with BMIs <25.0 (normal weight) had a mean BMI of 57%.

Twenty-four percent (N=32) of study children were never breastfed or breastfed for less than 3 months, 31% (N=40) were breastfed for 3 – 6 months, 24% (N=31) were breastfed for 6 – 12 months, and 20% (N=28) were breastfed for a year or longer. Chi-square analysis showed no effect of being breastfed on child's BMI-for-age percentile category.

Twenty-five percent of preschoolers surveyed had a television in their bedroom. The mean number of hours of media viewing per day was 2.04±1.1. Twenty-seven percent of children watched three hours or more per day. No relationships were found between media viewing and child's BMI-for-age percentile. There were also no significant differences in child's BMI-for-age percentiles for mother's of different educational levels.

Family Eating and Activity Habits Statements
There was no statistically significant difference in child's BMI between mothers scoring higher on the questionnaire and mothers scoring lower. The mean questionnaire score was 62.3±5.9. The range of scores was 49 to 78, out of 17 to 85 possible points. Additionally, there were no significant correlations between child's BMI and FAEHQ subscales.

Statistically significant relationships were identified between mother's responses for four of the 17 eating and activity behavior statements and their children's BMI-for-age percentile. The statement "I ask my child to finish his or her

meal before he or she may have dessert" resulted in the lowest mean score (2.0±1.3) (reversed coded such that never=5, almost never=4, sometimes=3, on most days=2, daily=1). Children of mother's with lower scores had a significantly (p=0.05) higher mean BMI-for-age percentile (77%) versus children of mothers with higher scores for this statement (37%).

A statement regarding fast food consumption, "My family eats fast food (KFC, Taco Bell, pizza, Dairy Queen, McDonald's, Jack in the Box, etc.)," resulted in a mean frequency score of 3.4±0.6. There was a positive correlation between fast food consumption and child's BMI-for-age percentile (r=.202, p=.016), such that as fast food meals were consumed more frequently (indicated by a lower score), child's BMI-for-age percentile increased. Interestingly, when boys and girls were analyzed independently, no association was found between fast food consumption and BMI-for-age percentile for boys (p=.961), while the association was significant for girls (r=.366, P=.001). Based on ranking responses, children were regrouped into two groups; those consuming fast food meals "sometimes" or "on most days" and those who "almost never" or "never" consumed fast food meals. Overall, children consuming fast food meals more frequently (sometimes or on most days) had statistically significantly higher BMIs (70th percentile) than children who "almost never" or "never" ate fast food (57th percentile) (p=.01). As with the correlation analysis results, when children were analyzed by gender, no significant differences were found between frequency of fast food consumption and BMI-for-age percentile for boys (p=.314), while there was a significant difference for girls (p=.011).

Noteworthy results were found for two statements used to assess the behavior of eating while watching television. The statement "My family eats meals while watching TV" resulted in a mean score of 3.9±1.0, while the mean score for the statement, "My child snacks while watching TV," was 3.6±1.1. Although there were no significant relationships between child's BMI-for-age percentile and these two

questionnaire scores, there were statistically significant differences in these behaviors between the two predominant ethnic groups. Hispanic children were significantly less likely to eat meals while watching television (p=.002), and to snack while watching TV (p=.003) than white children. Hispanic mothers scored significantly higher on these two statements than white or Asian mothers, indicating more positive behaviors.

Discussion
The results of this study failed to support the original research hypothesis that there would be statistically significant differences in child's BMI-for-age percentile for lower versus higher maternal scores on the Family Activity and Eating Habits Questionnaire. Overall scores were high, which indicated that mothers were generally aware of healthy diet and activity behaviors. While the average questionnaire score reflected generally positive behaviors, childhood overweight was prevalent. At 17%, the rate of overweight (BMI-for-age percentile above the 95th) for the low-income preschool age children in this study was higher than the 10% rate recently reported by the U.S Department of Health and Human Services (2002) for children ages two to five. An additional 17% of the children in the current study were at risk for overweight (BMI percentile between the 85th and 95th percentile). Hence, 34% of these preschool age study subjects were either at risk for overweight or already overweight. This 34% rate for children >85th percentile BMI-for-age is considerably higher than the overall rate of 26% reported for low-income Butte County children. Similarly, the finding that 42% of the Hispanic preschool age participants were above the 85th percentile is considerably higher than the 32% rate reported previously (PedNSS, 2001).

The observation from the current study that less than half of the mothers correctly identified their preschool child as overweight is congruent with findings by Maynard and her colleagues (2003). The failure of a significant proportion of mothers to recognize that her child is overweight is an important obstacle to implementation of behavior patterns to curb pediatric overweight.

The authors of the current study agree with the speculations of Maynard et al. (2003) that somemothers may genuinely not recognize that their heavy child is overweight, while others may be reluctant to admit that her child is fat, or maynot understand what "overweight" means.

The rates of maternal overweight (27%) and obesity (33%) are consistent with current national figures (CDC, 2002). In addition, the positive correlation between maternal and child BMI for the study sample is consistent with previous findings indicating that maternal BMI is the factor most predictive of child BMI. Hediger and colleagues (2001) found the strongest predictor of childhood overweight was the mother's concurrent weight such that the risk of overweight in early childhood was three-fold greater for children with overweight mothers and four-fold greater for children whose mothers were obese.

Dennison and colleagues (2002) found that the amount of time viewing television/video was significantly related to overweight risk in the preschool population. In addition, a television in the child's bedroom was a strong marker of overweight risk. Contrary to these findings, the present study found no relationships between media viewing and child's BMI. However, the preschoolers in this current study watched an average of 14.5 hours of television/video per week, nearly 50% less than the 27 hours watched by preschoolers in the Nielsen study (1990). Hispanic children were significantly less likely to eat while watching television than white children, which may be due to cultural differences.

There were statistically significant differences in child's BMI-for-age percentile among ethnic groups, particularly between the white and Hispanic children. The number of Asian children (N=8) was too small to be considered representative of this ethnic group. The higher rates for overweight for Hispanic children are consistent with NHANES III findings demonstrating that preschool overweight is more prevalent for this ethnic group compared to non-Hispanic white children (2002, CDC).

The relationship between fast food and child's BMI-for-age percentile was significant for preschool age girls, but not for boys. This finding may help to explain the higher rate of BMI-for-age above the 85th percentile for girls (38%) compared to boys (31%). Further study is needed to investigate which characteristics set these girls apart.

Limitations
Limitations of this study include the fairly small sample size, especially for Asian children, and the sample of convenience data collection design. In addition, the mothers in this study represented an atypical WIC sample, as 45% had at least some college education. A probable explanation for this finding is that though Butte County is rural, the majority of families in this study lived in close proximity to a state university. Lastly, mother's BMI was calculated using self-reported height and weight, which could lead to an underestimation of BMI. However, the finding that 60% of mothers had a BMI >25 is consistent with NHANES III data.

Applications
As exemplified by the results of this study, there is a need to assess if mothers are promoting healthy eating and activity habits among their preschool age children. Survey results indicate that mothers were educated about positive lifestyle behaviors, but additional measures are needed to promote a healthy BMI-for-age for young, low-income children. The rate of overweight for this preschool age sample was higher than expected. As pediatric overweight is a rapidly growing health problem in the U.S., further investigation is needed to better understand risk factors attributing to overweight in early childhood. WIC personnel may be able to apply the findings from the current study to the development of educational materials for their adult and child clientele. Overall, maternal questionnaire scores were high suggesting that while mothers had knowledge of healthy eating and activity habits, additional measures are needed to promote the consistent implementation of healthy lifestyle behaviors.

In addition, if mothers of at risk and overweight children do not perceive their child as such, they need to be made aware of their child's weight status, lifelong implications of childhood overweight, and strategies for assisting their child in the development of healthy weight related lifestyle behaviors.

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