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CHANGES IN FAMILY VARIABLES AMONG NORMAL AND OVERWEIGHT PRESCHOOLERS

Philisie Starling Washington, PhD, RN

Prairie View A & M University

Elizabeth Reifsnider, PhD, APRN, BC
Sheryl L. Bishop, PhD
Melissa Domingeaux Ethington, PhD, RN

University of Texas Medical Branch

Rawslyn E. Ruffin, MA

School of Nursing, University of Texas Medical Branch

Purpose: *The purpose of this study was to examine differences in the weight and height of normal and overweight children in variables relating to the individual, home/family and community across a six month time period. Research Questions/Hypotheses: What are the ecological factors that influence the body mass index (BMI) of preschool children? Significance: The rate of overweight preschool children aged 2 to 5 years has more than doubled in the past 30 years. Low socioeconomic and ethnic minority groups have higher rates. Research shows a strong correlation between a child's size (height, weight, and BMI) and the ecological factors present in the family's environment.* Methods: *This study is a secondary data analysis from a cross sectional study of 200 Mexican American children ages 2–3 years old receiving WIC services. The sample consisted of 100 children with a BMI > 95% for age and 100 children with a BMI of <85% for age. Variables and measurements included: host/child (BMI percentile, diet, TV watching hours); agent/food (feeding assistance);*

Received 10 September 2009; accepted 3 October 2009.
Address correspondence to Philisie Starling Washington. Prairie View A & M University 6436 Fannin St. Houston, TX 77030. E-mail: pmwashington@pvamu.edu

microsystem/parent (parental BMI, acculturation level, employment, physical activities); microsystem/home (stimulation, TV hours); and microsystem/mother-child relationship (NCAST Teaching Scale).This study is limited to populations with similar characteristics. Results: *Both overweight and normal weight children showed decreases in BMI, but maintained their between group differences even while slimming down (p = .000). Overweight children consumed significantly more fruit, bread and other carbohydrates, and total calories, than did normal weight children. Both groups of children increased significantly in their consumption of water, fruit juice and juice drinks, as well as meat and other protein. Maternal BMIs for overweight children were higher than those for the mothers of the normal weight children and increased across time. More overweight children ate in the presence of another person. The interaction patterns between mothers and overweight children were significantly more positive and responsive than were the interaction patterns of mothers and normal weight children.* Discussion/Conclusion: *Multiple ecological factors influence the BMI of the preschooler leading to obesity. Nurses can use these findings to teach parents about the importance managing the environmental factors that contribute to childhood obesity and growth.*

Keywords: Toddler, Ecological model of growth, BMI, Obesity, Feeding behavior

Childhood obesity has become a major health concern in nearly every country in the world, including the United States. In the United States, the number of overweight children aged 2 to 5 years has more than doubled in the past 30 years. The Centers for Disease Control and Prevention (CDC) (2004) have reported data from two National Health and Nutrition Examination Surveys (NHANES), for 1976–1980 and 2003–2004, which show that the rate of overweight preschool children increased in that period from 5 to 13.9%. *Overweight* and *obesity* are terms used by the American Academy of Pediatrics (AAP) (2003) to describe children with a body mass index (BMI) above that recommended for height, age, and gender. According to the AAP, nearly one of every three children is at risk of becoming overweight, which is defined as having a BMI in the 85th to 95th percentile, and one of every six is overweight, which is defines as having a BMI over the 95th percentile.

Although obesity affects all ages and ethnicities (Olgen et al., 2006), studies suggest that childhood obesity is disproportionately high in children from low socioeconomic groups (Langnäse, Mast, Danielzik, Spethmann, & Muller, 2002) and ethnic minority groups (Olgen et al.). In 2002, data from the Pediatric Nutritional Surveillance indicated that 17 percent of Hispanic and 17.4 percent of American Indian/Alaskan Native children less than age 5 were overweight, as compared to 11.5 percent of White, non-Hispanic children (Gross, Carson, Madigan, & Pitt, 2005).

The toddler stage is a time of transition from dependent feeding to independent feeding. During this early time in life, food preferences develop, and often they predict preferences throughout life (Allen & Myers, 2006; Sternstein, 2007). Not only is this a crucial stage for monitoring growth and BMI, it is the most opportune time to prevent obesity in children by promoting healthy dietary and physical activity behaviors (He, 2006; Story, Holt, & Sofka, 2002).

Many factors contribute to the alarming rates of childhood obesity. Childhood obesity has a strong hereditary tendency (AAP, 2003; Barsh, Faroogi, & O'Rahilly, 2000); however, there is evidence that a child's size (height, weight, and BMI) is also influenced by factors in the family's environment. Many researchers have examined the relationship between childhood obesity and individual and family risk factors (Hawkins & Law, 2006), such as parental BMI (Burke, Beilin, & Dunbar, 2001; Wardle, Guthrie, Sanderson, Birch, & Plomin, 2001), childhood television use (Adachi-Mejia et al., 2007; Dennison, Erb, & Jenkins, 2002; Faith et al., 2001), and diet (Dennison, Rockwell, & Baker, 1997; Welsh et al., 2005).

In one of the largest studies (N=428, children aged 4–5 years) to investigate appetite and activity preferences in children at risk of becoming obese, Wardle et al. (2001) found that children of obese or overweight families had a higher preference for fatty foods in a taste test, lower preference for vegetables, and a more "overeating-type" eating style. In addition, children of overweight or obese families had a stronger affinity for sedentary activities. Similarly, in a longitudinal study of older children, Burke and colleagues (2001) found that obese or overweight parents had children with higher BMIs.

Several studies have examined the relationship between television viewing and obesity among school-aged children (Adachi-Mejia et al., 2007; Faith et al., 2001) and adolescents (Delmas et al., 2007), but few studies have investigated this relationship in preschool-aged children (Dennison et al., 2002). Adachi-Mejia and colleagues found children with a television in their bedroom had a higher BMI and were significantly more at risk of being overweight than children without a television in their bedroom. Dennison et al. also found an association between television viewing and risk of being overweight in low-income preschool age children. Although the reasons for the link between television viewing and obesity are not fully known, it is thought that children with televisions in their rooms are less likely to participate in physical activity (Adachi-Medjia et al.; Faith et al.).

Several studies have found a positive association between increased sweet drink consumption and obesity in preschool-aged children (Dennison, Rockwell et al., 1997; Welsh et al., 2005) and school-aged children (Tam et al., 2006). However, a study by Skinner et al. (1999) did not support these findings.

Researchers have also investigated the impact of parental feeding practices on restriction of foods (Keller, Pietrobelli, Johnson, & Faith, 2006),

children's eating behaviors (Benton, 2004) and children's weight (Birch & Fisher, 2000). Studies suggest that certain parental feeding practices can have a negative outcome on children's eating behavior. Johnson and Birch (1994), for example, reported that parental control of child eating was associated with poorer eating regulation by the child and with increased BMI. In two other studies, Birch and Fisher (1998) reported that, over time, restricting access to foods only encouraged the child to consume these foods, which led to increased food consumption (Fisher & Birch, 1999).

While parents desire to promote healthy eating behaviors in children, they do not always seem to recognize their role in preventing obesity in preschoolers (Reifsnider et al, 2006). Educating parents is thus a key component in addressing the growing epidemic of childhood obesity in preschool-aged children (Roa, 2008; Vaughn & Waldrop, 2007). It is important for parents to recognize the significance of the balance between energy consumption and energy expenditure in preventing childhood obesity. Additionally, it is essential that parents encourage children to recognize the cues of hunger and not eat in the absence of hunger.

CONCEPTUAL FRAMEWORK: ECOLOGICAL MODEL OF GROWTH

Reifsnider, Gallagher & Forgione's (2005) ecological model of growth (EMG) (see Figure 1) explains the connections between child growth and the environment. The ecological model of growth (Reifsnider, 1995) combines the ecology of human development (Bronfenbrenner, 1979) with epidemiology (Mausner & Kramer, 1985) to give meaning to the relationship between the host (child) and the agent (food) and the way they interact in the environment. Interactions are based on the child's temperament as well as food preferences, choices, amounts, and feeding practices. The microsystem is the biological, social, and physical environment that immediately surrounds the child, including the number in the home, the responsiveness of the caregiver, and maternal stress. In particular, the microsystem of the child includes the emotional and physical interactions with parents, as well as interactions between the child and the home environment. The EMG also takes into account the mesosystem or community in which the child resides. However, the effects of the mesosystem are usually more apparent if the child and parent move to a new location or residence.

Many factors contribute to a toddler's BMI, weight and height, and the differences in these can be examined by looking at the elements of the microsystem. This study examined differences between normal and overweight children in variables related to the individual, home/family and community over a 6 month time period. The EMG served as a conceptual model to determine the specific variables to measure.

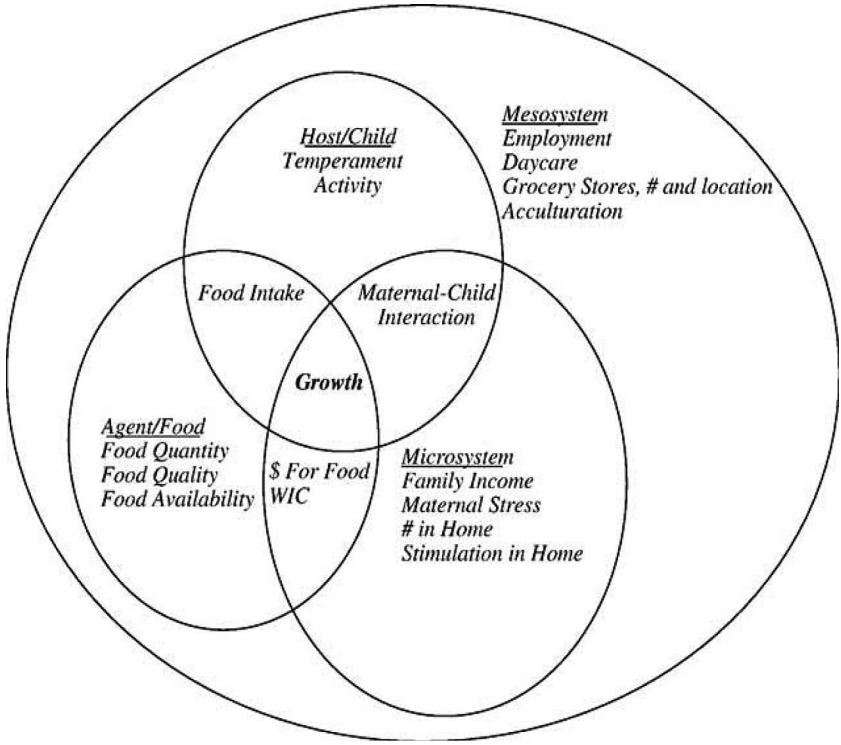

Figure 1. Ecological Model of Growth.

METHODS

Mexican American mothers obtaining services at a WIC clinic in a large metropolitan city in South Texas were informed of the study. Permission was obtained from the mothers to take anthropometric measures to verify whether their children qualified for the study. If a child met the qualifications, the mother was given a packet of instruments in English or Spanish to complete. For their time, mothers were given a $20 local retail gift card. Human subject protections were reviewed and approved by the Institutional Review Board (IRB) of the university and the IRB of the health department where the subjects were recruited.

The sample consisted of 200 Mexican American children; 100 were considered overweight (BMI for age >95th percentile) and 100 were of normal weight (BMI for age < 85th percentile). The variables examined were the child's BMI, child's diet, TV watching, parents' BMI, parents' acculturation status, parents' employment and leisure activities, child's

home environment, and mother-child relationship. The variables were measured at enrollment in the study, and 6 months later, when the children were recertified for the WIC program.

Instruments

Dietary Data

The 24-Hour Diet Recall was used to collect information on food intake for the past 24 hours. Data were then entered into the Food Processor II™ computer nutrient analysis system and converted to multiple analysis levels. The dietary data analyzed included individual foods, micronutrients, macronutrients, and food pyramid servings.

Home Environment

The home environment was measured by the Home Observation for Measurement of the Environment (HOME) and Home Screening Questionnaire (HSQ) (Frankenburg & Coons, 1985). The 30 item HSQ is adapted from the Home Observation for Measurement of the Environment (HOME) Inventory and is in written form to be answered by the parent rather than by an observer during a home visit. The HSQ measures the proximal and distal home environments of the child. The proximal environment consists of the parental attention and emotional stimulation the child receives from adults in the home. The distal environment consists of the stimulation the child receives from interactions outside of the home, such as accompanying parents to a grocery store or visiting with other relatives in their homes. The HSQ is the proxy measure for the microsystem. The test-retest reliability of the HSQ over four months is .82 (Lozano, 1985). The same population was tested with the HOME and the HSQ, and the agreement between the scales was 81.2% (Frankenburg & Coons, 1985).

Anthropometrics

The child's height in centimeters and weight in kilograms were measured in a dry diaper to the nearest 0.1 kg on a balance beam scale. The mother's height and weight were measured using a wall-mounted stadiometer while wearing indoor clothing and shoes with heels of 1" or less. Body mass index (weight in kilograms divided by height in meters squared) was calculated using methods established by the National Center for Health Statistics. The children's BMI results were graphed on the CDC BMI-for-age growth charts, and based on the percentile reading, the children were then categorized as normal or overweight. All measures were converted to *z* scores for comparisons by gender and age in months.

Demographic Data

Characteristics of **c**hild, parent, and family situation were also collected. Data included the amount of food stamps received per month, parent education level, parent employment status, family income, generation in United States**,** length of stay in current residence, ethnicity, language spoken in home, and number and relationships of members of the household.

The Nursing Child Assessment Teaching Scale (NCATS) (Barnard et al., 1989)

The NCATS was used to measure parent-child interaction. This 73-item scale measures the parent's responsiveness to interactions (cue sensitivity, response to distress, social-emotional growth fostering, and cognitive growth fostering); the child's cue clarity and responses to the caregiver are also measured. Cronbach α is .83 for the entire scale; α = .83 for the parent subscale and .84 for the child subscale (Barnard et al., 1989). Test-retest reliability was 0.85; validity r =.48 when correlated with the Bayley Scale and r = .48 with the HOME scale. The research team achieved inter-rater reliability on scoring above .90 before collecting data.

Baecke Scale of Habitual Physical Activity

The Baecke scale measures daily physical activities for the mother, including work, leisure, and sports (Baecke & Frijetrs, 1982).To test validity, Florindo and Dias de Oliveira Latorre (2003) compared 21 adult subjects on aerobic fitness, an index of physical activity, a weekly walking log, and the Baecke Questionnaire. Subjects who were considered most fit according to the Baecke Questionnaire also demonstrated fitness abilities on the 12-minute aerobic run/walk and were most active on the weekly physical activity log. A significant intraclass correlation of 0.77 was achieved on 6-week test-retest scores on the Baecke Questionnaire.

Acculturation

Acculturation of Hispanic families was measured using the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II) (Cuellar, Arnold, & Maldonado, 1995). This scale measures acculturation based on language, ethnic identity and ethnic interactions. High scores on the 30-item scale mean the individual is acculturated into Anglo American culture.

RESULTS

Microsystem Differences

While there were significantly skewed distributions on the home environment questions regarding someone sitting with the child at meals and who

Table 1. Microsystem differences

1a. Home environment
Someone Sits With Child at Meals

	Time 1		p
	Yes	**No**	
Normal	93%	7%	.020
Overweight	100%	0%	
	Time 2		**p**
	Yes	**No**	
Normal	97%	3%	.365
Overweight	99%	1%	

P = Chi-Square two-tailed Pearson's correlation.

1b. Home environment
Who Sits With Child at Meals

	Time 1		p
	Mother	**Other**	
Normal	68%	32%	.000
Overweight	68%	32%	
	Time 2		**p**
	Yes	**No**	
Normal	55%	45%	.352
Overweight	52%	48%	

P = Chi-Square two-tailed Pearson's correlation.

sits with the child at meals, the differences were largely between the "none versus someone" (Tables 1a and 1b) and the "mother versus others" rather than relevant differences between the obese versus normal group. There was a small proportional difference at T1 between the groups regarding having someone sit with them during meals (i.e., 93% versus 100%) but both groups showed highly similar patterns on these two home environment items at T1 and T2 with similar patterns of change. By Time 2 (T2) there were no significant differences between the categories for either question. There were no significant differences between the normal and overweight participants in questions from the demographic questionnaire of "Who feeds child most meals" and "Who

else feeds child most meals." Unsurprisingly, in both groups, higher percentages of mothers fed the child the most meals; fathers were the second most likely person to feed the child.

Significant differences on BMI at T1 were ensured by grouping criteria. However, it is noteworthy that the BMIs of the two groups of children continued to differ significantly ($p < .001$) and increase across time (Figure 2). At T1 the mean of the overweight participants was 2.7 kg/m^2 above the normal participants and at T2 the mean was 3.0 kg/m^2 above the normal group. This increasing difference between the two groups was found despite the fact that both groups of children slimmed down significantly across 6 months ($p = .000$, within effect; $p = .000$, between effect). There was no significant interaction between group and time on child BMI. Maternal BMIs (Figure 3) also differed significantly ($p = .001$)

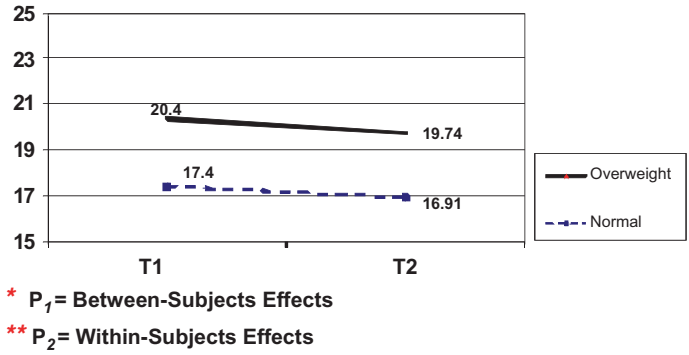

Figure 2. Child mass index.
*P_1 = Between-Subjects Effects
**P_2 = Within-Subjects Effects

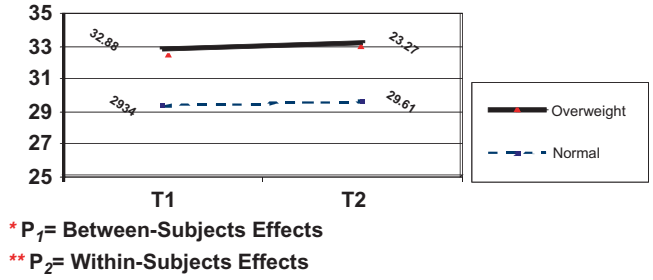

Figure 3. Maternal body mass index
*P_1 = Between-Subjects Effects
**P_2 = Within-Subjects Effects

between groups but not across time (p = .083, within effect). At T1, mean BMI of mothers of overweight children was 3.54 kg/m^2 which increased slightly to 3.66 kg/m^2 by T2 compared to those of the mothers of normal weight children. Again, there was no significant interaction between group and time for mothers' BMI. Maternal physical activity using the Baecke Habitual Physical Activity Scale showed no significant differences between the groups.

There were no significant differences in the scores from the Home Screening Questionnaire. Maternal child relationships, measured using the NCATS scores, are shown in Table 2. There were significant differences between the normal weight and overweight groups in response to distress and in cognitive growth fostering between mothers of normal and overweight participants. Mothers of normal weight children were more responsive to distress at T1, while mothers of overweight children fostered more cognitive growth at T1. These differences were gone by T2

Table 2. Nursing child assessment teaching scale (NCAST) subscores maternal child relationship (see codes below)

			T1	T2	P_1*	P_2**	P_3***
	Measure		**Mean *(sd)***	**Mean *(sd)***	**P_1**	**P_2**	**P_3**
Sensitivity to cues	0–11	Normal	8.17 *(1.63)*	9.24 (1.38)	.322	.000	.032
		Overweight	8.08 *(1.78)*	9.64 (1.17)			
Response to Distress	0–11	Normal	10.37 *(1.32)*	10.47 *(1.24)*	.006	.000	.006
		Overweight	9.78 *(1.74)*	10.48 (1.07)			
Emotional growth fostering	0–11	Normal	7.69 *(1.56)*	8.18 *(1.34)*	.213	.000	.149
		Overweight	7.70 *(1.40)*	8.52 (1.24)			
Cognitive growth fostering	0–17	Normal	10.58 *(2.78)*	11.62 *(2.69)*	.003	.000	.689
		Overweight	11.26 *(2.52)*	12.47 *(2.05)*			
Clarity of cues	0–10	Normal	7.33 *(1.40)*	7.18 *(1.32)*	.922	.032	.370
		Overweight	7.42 *(1.44)*	7.07 *(1.53)*			
Responsiveness to caregiver	0–13	Normal	5.64 *(2.81)*	5.74 *(2.43)*	.071	.158	.352
		Overweight	5.91 *(2.61)*	6.40 *(2.15)*			
Caregiver total	0–50	Normal	36.70 *(5.55)*	39.51 *(4.95)*	.097	.000	.064
		Overweight	36.81 *(5.41)*	41.11 *(4.0)*			
Child total	0–23	Normal	12.79 *(3.94)*	12.71 *(3.48)*	.089	.818	.616
		Overweight	13.26 *(3.62)*	13.47 *(3.24)*			
NCAST total	0–73	Normal	49.50 *(7.56)*	52.23 *(6.56)*	.033	.000	.085
		Overweight	50.07 *(6.65)*	54.58 *(4.95)*			

* P_1 = Between-Subjects Effects.
** P_2 = Within-Subjects Effects.
*** P_3 = Interaction Effects.

for responsiveness but not for cognitive growth fostering. There were significant increases across time in sensitivity to cues, response to distress, emotional growth fostering, cognitive growth fostering, and caregiver total. In general, for all subscales except clarity of cues, which showed a significant decrease across time in both groups ($p = .03$), the mothers and children's scores in both groups improved from T1 to T2. This may reflect a maternal-child relationship that is increasing in synchronicity, or may reflect maturation of the child's communication abilities. There were significant interaction effects across time in sensitivity to cues and response to distress indicating that while the mothers of overweight children were less sensitive and responsive at T1 they became significantly more sensitive and responsive to their children by the end of 6 months. There was a similar trend for more rapid improvement for the overweight group across time ($p = .00$) for caregiver total (Figure 4). The NCATS total score was significantly higher ($p = .03$) and increased significantly across time ($p = .00$) for the overweight group (Figure 5).

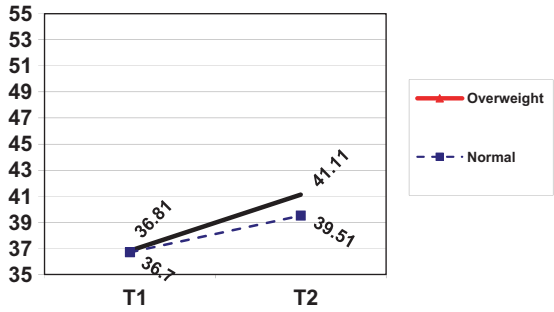

Figure 4. Caregiver (NCATS) total score.

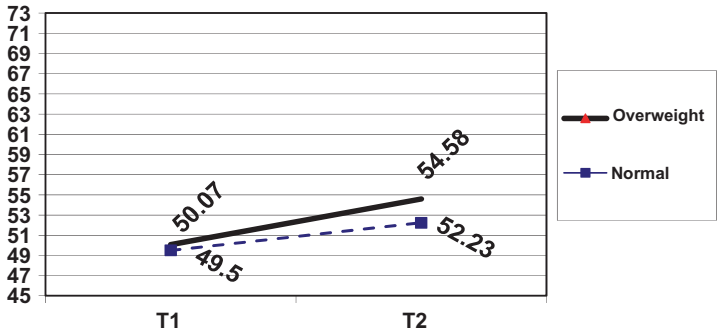

Figure 5. Nursing child assessment teaching scale (NCATS) total score.

Agent Differences

The differences between the groups on dietary intake were grouped into fluids, fat, protein, carbohydrates, and total calories as seen in Table 3. Both groups significantly increased water, fat, meat, bread, calories, proteins and carbohydrates across time. The overweight group ingested significantly more bread, calories, protein and carbohydrates at both T1 and T2. Both groups actually decreased in soda consumption across time, with the overweight group consuming slightly more at both time points. There were three interaction patterns found. Although the differences were nonsignificant, the normal group consumed more juice at T1 compared to the overweight group but this relationship was reversed by T2. Although both groups increased their amounts of fruit juice over time, overweight children consumed less fruit juice at T1 but rapidly caught up and significantly surpassed their normal counterparts by T2. The pattern is somewhat different for consumption of fruit wherein the normal group actually decreased the amount of fruit consumed across time compared to an increase for the overweight group.

MESOSYSTEM DIFFERENCES

Mesosystem variables demonstrated no significant differences. In both the normal and overweight groups, parents tended to have higher acculturation scores (Table 4a), indicating that they were acculturating into the Anglo-American culture. There were no significant differences between the parents of normal and overweight children in employment (Table 4b); in both groups, the mother's employment status was almost exactly the same.

DISCUSSION

This study found both clinically and statistically significant differences in various aspects of the microsystem (home), and agents (foods) but not in the mesosystem of normal and overweight preschoolers. A variety of factors influence the development of overweight in young children. For example, a child may be encouraged to consume more when accompanied by a parent than when eating alone. Those who sit with children tend to influence their intake at mealtime. At both time points in this study, more of the overweight children ate with someone present. Given the definitional grouping of children at T1 into weight categories, the greater BMI measures of the overweight group at T2 were expected. The increasing difference between the groups on BMI supports the view that the

Table 3. Drinks and food pyramid

Measure			T1 Mean *(sd)*	T2 Mean *(sd)*	P_1*	P_2**	P_3***
Water	Oz/day	Normal (n = 94)	9.50 *(7.65)*	13.33 *(10.52)*	.075	.000	.820
		Overweight (n = 88)	12.26 *(12.75)*	15.65 *(14.42)*			
Juice	Oz/day	Normal (n = 94)	9.13 *(7.12)*	10.73 *(7.18)*	.861	.001	.257
		Overweight (n = 87)	8.21 *(5.95)*	11.36 *(8.47)*			
Soda	Oz/day	Normal (n = 72)	1.65 *(3.15)*	0.93 *(2.03)*	.548	.044	.999
		Overweight (n = 60)	1.88 *(3.92)*	1.17 *(2.79)*			
Fruit juice	Oz/day	Normal (n = 62)	0.62 *(2.04)*	0.94 *(2.51)*	.238	.003	.031
		Overweight (n = 61)	0.30 *(1.23)*	2.25 *(5.24)*			
Fat	Serving/day	Normal (n =201)	4.59 *(4.50)*	6.11 *(6.90)*	.334	.010	.643
		Overweight (n = 90)	5.36 *(5.31)*	6.42 *(6.53)*			
Meat	Serving/day	Normal (n = 203)	1.55 *(1.27)*	1.85 *(1.80)*	.543	.004	.821
		Overweight (n = 90)	1.44 (0.91)	1.79 *(1.03)*			
Fruit	Serving/day	Normal (n = 199)	1.68 *(1.41)*	1.58 *(1.30)*	.043	.147	.022
		Overweight (n = 90)	1.68 *(1.31)*	2.15 *(2.00)*			
Bread	Serving/day	Normal (n = 203)	3.15 *(2.55)*	3.85 *(2.41)*	.009	.001	.904
		Overweight (n = 90)	3.85 *(2.53)*	4.50 *(3.24)*			
Calories	Kcal/day	Normal (n = 203)	1230.33 *(568.19)*	1325.57 *(460.68)*	.010	.002	.090
		Overweight (n = 90)	1301.14 *(419.32)*	1631.31*(1642.07)*			
Proteins	Gm/day	Normal (n =201)	51.52 *(24.97)*	56.26 *(21.68)*	.268	.000	.285
		Overweight (n = 90)	51.97 *(19.53)*	60.70 *(22.78)*			
Carbohydrates	Gm/day	Normal (n = 203)	144.60 *(73.23)*	158.42 *(62.05)*	.001	.003	.479
		Overweight (n = 90)	161.55 *(62.43)*	183.78 *(75.82)*			

*P_1 = Between-Subjects Effects.
*P_2 = Within-Subjects Effects.
***P_3 = Within-Subjects Interaction Effects.

Table 4a. Acculturation rating scale for Mexican Americans-II (ARSMA-II) scores and parental employment

Variable ARSMA Score	Normal	Overweight	F	*P*
Parent scores Possible score = 100 Table Employment	59.4	58.9	.249	.85

Table 4b. Employment

	Normal		Overweight		
	E	U	E	U	*P*
Maternal	33.5%	66.5%	35.3%	64.7%	.74
Paternal	79.2%	20.8%	81.8%	18.2%	.60

% Employed (E); % Unemployed (U).

microsystem influences body size. The mothers of the overweight participants had significantly higher BMIs at T1 and remained higher across the 6 months of measurement. If children reflect or imitate parental behavior in diet and/or activity, overweight children in this study could be destined to follow their mothers. It would thus be important to follow these mothers and children to see whether the trend continues or whether reversals in both occur.

In the home environment, mothers of both groups at T1 were twice as likely to sit with their children at mealtime than were fathers ($p = .00$), however this difference was not significant at T2. Someone sat with the overweight children at mealtime (100%) as opposed to 93% of the time for normal weight children ($p = .02$).This suggests that both groups received attention at meals (by mothers most often), even though the overweight group received attention more often.

The dietary intake of the groups revealed areas of significant differences between the groups in fluid, fat, bread and carbohydrate intake and total calories, with the overweight group consuming more servings. Across time, the overweight group increased significantly in water, juice, meat, and protein intake (Figure 6). These differences resulted in an alarming increase in calories, with the overweight group consuming a mean of 300 more calories per day by T2 (Figure 7). Both groups significantly decreased their soda intake across time. Adjustments to dietary intake such as a reduction in fruit juice intake may alter weight at an early age. These dietary changes may reflect the emphasis on the food pyramid when it included breads and carbohydrates as its bottom tier, encouraging

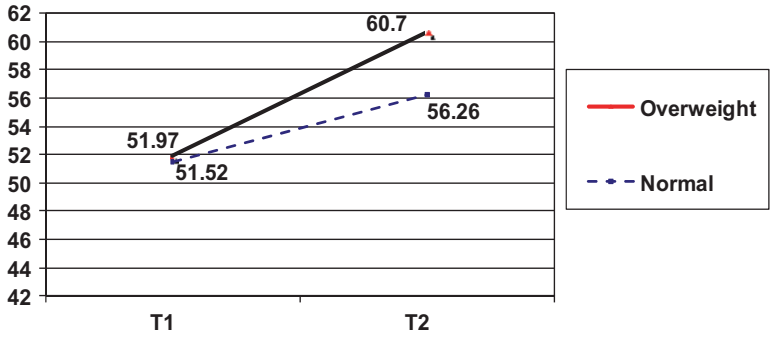

Figure 6. Protein intake of child (grams).

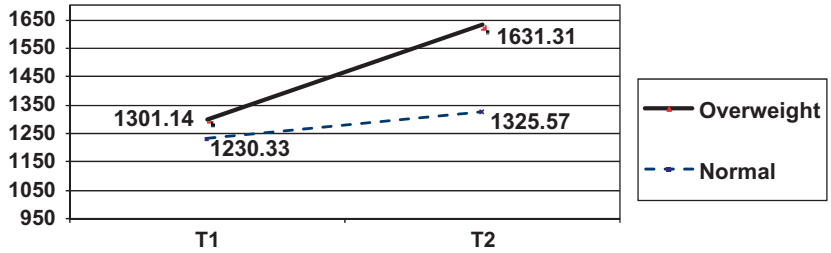

Figure 7. Total caloric intake of child.

consumption of 6–11 servings a day. The increase in fruit juices and the decrease in soda may reflect the impact of nutrition education, as all of the children were in WIC, and their mothers were receiving nutrition education every 6 months.

The overall NCATS scores indicated that mothers of the overweight group had more positive interactions with their children except for response to distress. The mothers of both groups significantly increased in their responsiveness to their children over time. However, in all the subscales except clarity of cues, the mothers of overweight children had a greater increase than did the mothers of the normal weight children. It is not apparent from these results why the mothers of the overweight group had more positive interactions with their children. It is possible that in this sample, the mothers of the overweight children viewed feeding their children as an important way to interact with their children and show them affection. The mothers of the overweight children were more likely to be overweight themselves, and perhaps they associated food with positive emotion and were repeating that pattern with their children. It may be

possible to educate mothers of overweight children to interact with their children in more active ways that do not involve food, such as reading stories, going on walks, and paying attention to their children at times other than mealtimes. This would also help the children learn that there are other positive ways to receive attention and affection than through meals and food.

LIMITATIONS

This study was limited to Mexican American, low income children participating in a WIC program in a large city. Generalization to other Hispanic populations may be possible, but similarities in acculturation and economic situations must be taken into consideration.

IMPLICATIONS

The findings of this study can be used to teach families about the impact of diet and environment on the growth of the child. Nurses can use the information to plan programs for patients who are overweight and those who want to maintain a healthy weight. Nutritionists can use the information to look at parent influences as well as parent BMIs in relation to their child's weight. Pediatricians can also use these findings to plan for early detection of childhood obesity. Researchers need to conduct further studies to examine how mothers of overweight children can positively interact with their children in ways that do not include providing food.

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