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Diet Quality Varies by Race/Ethnicity of Head Start Mothers

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Abstract

Background—Despite the key role that women from limited income families play as family food providers and their high risk for diet-related chronic diseases, there is a paucity of data about their diet quality and how it might vary by race/ethnicity.

Objective—To compare nutrient and food intakes of multi-ethnic mothers with children in Head Start from Texas and Alabama.

Design—Cross-sectional, secondary data analysis.

Methods—The sample was 603 mothers, 33% Hispanic American from Texas; 19% African American from Texas; 24% African American from Alabama; and 24% white from Alabama who were interviewed from fall 2004 to spring 2005. Diet quality was evaluated by averaging 24-hour dietary recalls from 3 nonconsecutive days and calculating the percent meeting the Estimated Average Requirement, the Dietary Guidelines for fat and added sugar, and the mean adequacy ratio for eight nutrients. For multiple comparisons, the least square means statement was used for general linear model procedures, adjusted for age, body mass index, and energy intake.

Results—The average mean adequacy ratio scores for diet quality were low overall, but 44% of Hispanic Americans had mean adequacy ratio scores <85, whereas 96% to 97% of other groups did. Most mothers exceeded 35% of energy from fat, with Hispanic Americans having the lowest percentage. Overall, 15% of mothers exceeded 25% of energy from added sugars, with Hispanic Americans having 5% with excess intakes. Energy intakes were highest for Hispanic Americans (2,017 kcal) and lowest for African Americans (1,340 kcal). The Hispanic Americans surveyed averaged 4.6 c fruit and vegetables per day compared to 3.2, 2.3, and 2.9 c/day among African Americans from Texas, African Americans from Alabama, and whites from Alabama, respectively.

Conclusions—Despite limited food resources, Hispanic-American mothers consumed adequate amounts of fruit and vegetables. There was considerable variation in diet quality among race/ethnic groups on a low income budget.

There is a paucity of recent data on the diet quality of low-income mothers despite their key role as family food providers and high risk for diet-related chronic diseases (1). There are clear socioeconomic differentials in risks for morbidity and mortality of chronic diseases such as heart disease, diabetes, and some cancers (2), and diet plays a role in the etiology (3). A diet

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low in fruit, vegetables, whole grains, and low-fat dairy foods is an important antecedent for all of these pathologies according to the science-based advice of the Dietary Guidelines for Americans (4,5), with the premise being that nutrient needs should be met primarily through consuming foods in the recommended amounts (4,5). Increasingly the dietary intakes of economically disadvantaged groups are seen as contributing to poor health profiles (6–10) and costs of healthful diets as being out of reach for those with limited financial resources (11). Cristofar and Basiotis (12) used 1-day intakes from a national survey to demonstrate that food insecure mothers had lower intakes of fruit, vegetables, and low-fat dairy foods compared to food secure women (10,13,14). The women’s intakes of fruit and vegetables declined with decreasing income and increasing food insecurity (10,13,14). Analysis of the 1988–1994 National Health and Nutrition Examination Survey (NHANES) data demonstrated that low-income adults had lower quality diets than those with high incomes as reflected in lower intakes of fruit, vegetables, and dairy foods; higher intakes of fat and sodium (7); and lower intakes of vitamin C, calcium, and dietary fiber (15). In addition, low-income women were more likely than higher-income women to exceed the fat recommendation (7).

There are small, consistent differences in the relationship between diet quality and income relevant to increased risks for chronic diseases among some subgroups (16,17), but not in others, like less acculturated Hispanic Americans (18). In Washington State the least acculturated Hispanic Americans had the best diet quality, reflected in lower fat and higher fruit and vegetable intakes compared to whites or to acculturated Hispanic Americans. Arab and colleagues (19) found that Hispanic-American women had the highest intakes of vitamins B-6 and C and African-American women had the lowest intakes of calcium, vitamin D, folate, and vitamin B-6 from NHANES III data, but nutrient values were not adjusted for either income or energy intakes. Restrictions to indepth analysis of race/ethnic dietary differences among women with limited incomes are that few datasets provide adequate sample size with 3 days of dietary intakes (20). In addition, race/ethnicity is usually controlled for in the analysis, and cross-cultural comparisons are not made (20).

The goal of our study was to examine differences in nutrient intakes and food patterns of a large sample of multiethnic Head Start mothers. An additional objective was to predict the mean adequacy ratio, an established indicator of collective nutrient adequacy (21,22), from food group and beverage intakes. It was hypothesized that Hispanic-American women who are mothers would have higher vegetable and fruit intakes compared to African-American and white mothers.

METHODS

Sample

Our study was a secondary analysis of the data collected for a cross-sectional assessment of mother-child dyads in Head Start families recruited from 57 Head Start centers in three geographical areas: northern rural Alabama, northern urban Alabama, and southeastern urban Texas. The purpose of the original study was to assess and compare facilitators and barriers to fruit and vegetable intakes in preschool children from three race/ethnic groups: African Americans, Hispanic Americans, and whites. There were 624 mothers out of the 761 caregivers interviewed for whom there were 3 days of complete dietary intakes. Inclusion criteria included being a non-pregnant mother aged 20 to 50 years, having a 3- to 5-year-old child enrolled in Head Start, and income at or below 100% of the poverty index. After excluding mothers with average energy intakes <600 kcal (n = 6) or >4,000 kcal (n = 4), the final sample was 603 mothers.

PROCEDURES

Following approval by the appropriate universities' Institutional Review Boards, Head Start personnel sent recruitment flyers to parents about study participation. After mothers were screened and signed consent forms, data collectors conducted personal interviews with each at a Head Start center between fall 2004 and spring 2005. Bilingual data collectors were matched by race/ethnicity to the mothers they interviewed.

The US Department of Agriculture multiple pass protocol was used to collect the 24-hour dietary recall data because it is considered a standardized method (23); two-dimensional food models assisted participants with accuracy of recalling portion sizes (24). One weekend day and 2 nonsequential weekdays comprised the 3 days of intake. Each mother provided information about the foods and beverages consumed within the previous 24 hours, including dietary supplements, vitamins, and minerals. For each food or beverage the mother provided time of consumption, amount ingested, the location of purchase or preparation, and identified each food and beverage occasion as a specific meal. Additional self-reported demographic data were elicited, such as marital status, level of education, and race/ethnicity.

Data collectors conducted weight and height measurements twice on each participant without shoes and dressed in light clothing using standardized protocols (25). Weight was measured to the closest 0.1 kg on a digital platform scale accurate to 500 kg within ± 0.05 kg (Befour Model PS-6600, Saukville, WI). Height was measured to the closest 0.1 cm using an adult height measuring board (Shorr Productions Growth Unlimited, Olney, MD). Upon data completion, participants received incentives of $35 in cash and $10 in food coupons.

Diet Quality

Dietary data were collected and analyzed using Nutrient Data System for Research (version 5.0_35, 2004, Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN). The Nutrient Data System for Research database contains 18,000 foods, including ethnic foods, and quantifies nutrient intakes and food group servings. Three days of dietary intakes were averaged to improve estimates of usual intakes. Diet quality was assessed by several methods: nutrient adequacy and achieving less than the Estimated Adequate Intake (EAR) or Adequate Intake (AI) as appropriate; dietary intakes of fats, added sugars and sodium in excess of recommendations from the Dietary Guidelines for Americans (4) and from My-Pyramid (26); mean adequacy ratio of eight nutrient intakes; and food group intake.

Nutrient adequacy without supplements from foods and beverages was examined for nutrients of interest for women of child-bearing years. These nutrients included protein; dietary fiber; n-3 fatty acids; vitamins A, D, E, B-6, and C; folate; calcium; iron; potassium; and zinc. Nutrient intakes were compared to the Dietary Reference Intakes (27) and the percentage meeting the EAR or AI as appropriate and reported by race/ethnicity. Nutrients of concern for excessively high intakes were fat, saturated fat, *trans* fat, cholesterol, sugar, and sodium (4,26).

The mean adequacy ratio of eight key nutrients was calculated as an indicator of overall nutrient adequacy (21,28), in addition to individual nutrient adequacy. The nutrient adequacy ratio, or percentage of the Recommended Dietary Allowances consumed, was calculated for each nutrient and the resulting value truncated at 100 before averaging, so those consuming large amounts of food were not unfairly advantaged. The indicator nutrients selected for the mean adequacy ratio score were those considered good markers for fruit, vegetables, milk, and whole grains and/or low in the diets of women of childbearing age: dietary fiber, vitamins A and C, folate, calcium, iron, zinc, and potassium. The mean adequacy ratio equals the sum of nutrient adequacy ratios divided by the number of nutrients considered (21). A score of 85 was selected as the cutpoint for adequacy because it fell between conservative and liberal scores of 100 to 67 used in previous studies (21) and was close to the EAR for most nutrients.

Mean intakes of foods and beverages of interest were reported as the five main food groups of fruit, vegetables, dairy foods, grains, and meats, and highlighted various subgroups of special interest, such as fluid milk, vegetables without fried potatoes, and fruit plus 100% fruit juice. The types of beverages reported included milk (whole and reduced fat), sweetened beverages (eg, soft drinks and fruit drinks), 100% fruit juice, and water. Fruit juice (100% fruit) and milk intakes were summarized in two places and legumes were counted in both the vegetable group and the meat group. The food group serving sizes were those in MyPyramid (29); that is, 1-c equivalents for fruit and vegetables, 300-mg calcium equivalents for dairy, 1-oz equivalents for grains, and 1-oz meat equivalents.

Data Analysis

All statistical analyses were run using the Statistical Analysis Software (version 9.1.3, 2006, SAS Institute Inc, Cary, NC). Body mass index (BMI) was calculated as kg/m^2 and weight status reported as underweight <18.5; normal 18.5 ≤ 25; overweight 25 to 30; obese ≥30. To estimate the degree of underreporting for mothers, we calculated the ratio of energy intake to basal metabolic rate (EI:BMR) using the Harris Benedict equation (30), assuming low levels of activity and reported the percentage of mothers with an EI:BMR ratio <1.30. Nutrient intakes were compared by the two age groups for whom there are separate Dietary Reference Intakes: ages 19 to 30 years and 31 to 50 years, but no differences were found except for vitamins A, D, and E and folate, with lower percentages of women aged 31 to 50 years meeting the EAR (P<0.05). Age groups were combined for ease of data reporting. Differences in the percentage of mothers meeting the EAR by race/ethnicity were compared using independent χ^2 analysis.

Means and standard deviation as well as frequency distributions of participant characteristics were calculated. Analysis of variance was conducted to detect difference in race/ethnicity groups for continuous variables and χ^2 analyses for categorical outcomes. Homogeneity of variance and normal distribution of nutrients and food groups were investigated by plots and histograms of residuals showing it was necessary to log-transform intakes of some vitamins (ie, vitamins A, D, and C) and food groups (ie, beverage, sweetened beverage, grain, dairy, meats, vegetables, fruit and 100% fruit juice, and fat). The distributional properties of some subcategories of food groups did not permit significance testing, but the means were reported adjusted for age, BMI, and energy intake as were the percentage from each race/ethnic group who consumed them during the 3 days. For multiple comparisons, the least square means statement was used for general linear model procedures, adjusted for age, BMI, and energy intake. Least square means and standard errors were estimated and transformed back where necessary before presentation. Due to multiple comparisons, Bonferroni correction was used to account for increase in Type I error (31). Significance level was set to 0.05 for overall ethnicity/race, and at 0.01 for pairwise comparisons.

Finally, stepwise multiple regressions (forward selection) with P<0.05 were conducted to examine the relationship between mean adequacy ratio score and selected foods or beverages (ie, total vegetables without fried potatoes, total fruit and fruit juice, fluid milk, total grains, total meats, sweetened beverages, cheese, fried potatoes, and sweeten desserts). Based on analysis of transformed data where the original failed to approximate normality or upon transformation, some foods (ie, milk, sweet beverage, fruit juice, cheese, fried potatoes, legumes, and desserts) were converted to interval level ranking in serving amounts. The interval levels were no intake of a food or beverage = 0, >0 to 1.0 serving = 1, >1.0 to 1.5 servings = 2, >1.5 to 2.0 servings = 3, >2.0 to 5.0 servings = 4, and so on. The ranges of intake for food/beverages so ranked were as follows: milk, 0 to 4.6 8-fl oz c; sweetened beverage, 0 to 11.1

8-fl oz c; fruit, 0 to 4.3 c; fruit juice, 0 to 10.7 8-fl oz c; cheese, 0 to 11.8 1-oz servings; fried potatoes, 0 to 3 c; legumes, 0 to 4.4 c; desserts, 0 to 5.6 servings.

RESULTS

The demographic and BMI data by race/ethnicity and location are shown in Table 1. The sample distribution by location and race/ethnicity was 33% Hispanic American from urban Texas, 19% African American from urban Texas, 24% African American from urban Alabama, and 24% white from rural Alabama. The educational status of the total group was low with 27% overall having less than high school equivalency and more than half of the Hispanic American women having less than high school equivalency (not shown). About half of the women were married; 28% had never been married. BMIs ranged from 17 to 77. Nine women had a BMI <18.5, whereas 285 women (49% of the sample) were obese. The urban African-American women in Alabama had the highest prevalence of overweight and obesity, significantly higher than the rural white women (P<0.0001). A high percentage of women had energy intakes that were low as indicated by EI:BMR ratios, indicating dieting for weight loss or underreporting.

The nutrients and diet quality indicators of concern for adequacy and excess are shown in Table 2. Forty-six mothers reported use of nutrient supplements: four Hispanic-American mothers and 22 African-American mothers from Texas, eight African-American mothers and 12 white women from Alabama. Intakes from supplements were not included in the nutrient means. Reported energy intakes were highest for Hispanic Americans and lowest for African Americans (P<0.001). The average mean adequacy ratio scores for diet quality, adjusted for energy, age, and BMI, were low for all women, although highest for Hispanic American women. Of the Hispanic American women, 44% had mean adequacy ratio scores under 85, but 96% to 97% of the other groups did. More than 85% of women in each group failed to meet the EAR/AI for vitamin E and potassium, and more than 50% failed to meet the EAR/AI for n-3 fatty acids and vitamin D. Two thirds to 100% of African-American and white women were low in folate and fiber, respectively. Hispanic women differed notably with higher intakes for fiber, vitamin A, folate, phosphorus, iron, and potassium (P<0.0001). Between states, mothers from Texas had higher intakes of vitamins C, B-6, and D compared to those from Alabama.

The percentage of women exceeding 35% of energy from fat ranged from 59% among Hispanic Americans to 77% among African Americans from Alabama. Overall, 15% of mothers exceeded 25% of energy from added sugars; 5% of the Hispanic-American women had excessive intakes, vs nearly one-third of the rural white women from Alabama (P<0.001). Sodium intakes from food were likewise high; two-thirds of the women overall averaged >2,300 mg sodium per day.

Overall nutrient adequacy was low (mean adequacy ratio <85) and fat intakes were high (>35% of energy from fat) with the food consumption patterns reflecting this (Table 3). The food group data showed striking differences by race/ethnicity. Hispanic-American women in Texas had the highest intakes of vegetables, fruit, dairy foods, and water, but the lowest intakes of sweetened beverages. Ninety-six percent of Hispanic-American women reported drinking milk and averaged 0.81 c/day compared to 72% of the African-American women from Texas who averaged 0.38 c/day. Cheese did not account for the higher dairy intakes by Hispanic-American women and yogurt intake was negligible in all groups (not shown). White rural women from Alabama consumed the most sweetened beverages and African Americans consumed the most fruit juices. In both states the African-American women reported the highest intakes of foods from the meat group averaging 5.4 oz compared to 4.1 oz for Hispanic-American women and 3.7 oz for white women. Notable were the high takes of all fruit and vegetables by the Hispanic-American women (4.6 c/day). Furthermore the Hispanic Americans had the highest percentage consuming each of the vegetable subcategories, except fried potatoes, compared to other race/ ethnic groups; 71% consumed legumes. Within the grain group, the intakes of whole grains were negligible as reflected by the low fiber intakes overall.

Vegetables without fried potatoes, fruit, 100% fruit juices, and milk all accounted for the variance in the mean adequacy ratio, but only for the mothers overall and for Hispanic-American mothers (Table 4). Vegetables without fried potatoes were the strongest predictor for all groups, predicting 19% to 42% of the variance in mean adequacy ratio, except for African-American women from Alabama for whom grains were the strongest. For all groups, the grain group added more to the total variance in mean adequacy ratio than did fruit plus 100% fruit juice or fluid milk. For African-American women from Texas and white mothers from Alabama, sweet desserts contributed to the mean adequacy ratio. Meats contributed to the mean adequacy ratio for all four ethnic groups, but strongly for only the African-American mothers from Texas ($R^2 = 0.18$). For the white mothers in Alabama, sweetened beverages negatively contributed to the mean adequacy ratio score. Three food groups—vegetables without fried potatoes, fruit, and milk—predicted 60% of the variance in nutrient adequacy; adding grains increased the R^2 to 0.72.

DISCUSSION

This study on diet quality reported both consumption of nutrients and food groups from 3 days of dietary recalls in a large sample of multiethnic women nearly all of whom had limited incomes. An important finding was the significantly better diet quality exhibited by the Hispanic-American women, despite their lower education levels. Such findings are somewhat contrary to studies that reported diet quality as inversely related to income (6,7,12,16,32), but supported by those that show Hispanic Americans having better diet quality compared to other groups (8,18). A study of food insufficiency, income, acculturation, and diet quality using NHANES data found that limited acculturation partially ameliorated the negative association between poverty and dietary intake for Hispanic youth (33). Findings from our study suggest that this might also occur with Hispanic women in Head Start and should be further investigated.

Energy intakes overall were similar to those reported by mothers the same age in Canada seeking food assistance (34) and in data from the Continuing Survey of Food Intakes of Individuals (12), but 150 to 200 kcal less than those reported by women in a national survey (35) and 400 kcal less than those reported in another regional survey of African-American and white adults in southern states (36). In our study, the energy intakes of the Hispanic women were both significantly higher than those of the other ethnic groups and similar to those from national survey data (8). This difference in reported energy intake by race/ethnicity might have accounted in part for the poorer diet quality of the African-American and white women compared to the Hispanic mothers. It is likely that the underreporting of food was for those foods seen as less healthful, such as foods high in fat, and not for foods perceived as healthful, such as fruit and vegetables (37,38).

Average intakes for folate overall were higher in our study compared to national surveys, but intakes for vitamins A and C and calcium were lower (20,35,39). For all vitamins and calcium, the Hispanic women had better average intakes and lower percentages under the EAR, reflecting greater intakes of vegetables, milk, and energy. Higher folate intakes in our study likely reflect the fortification of grains since earlier surveys. The low average intake of dietary fiber was similar to findings from other surveys as was the significantly higher intakes by the Hispanic women (18,20,35,39). As also shown in national surveys (19), most women in our study failed to reach the EAR for vitamin E, although few people nationwide show overt deficiencies (26). Calcium intakes overall were even lower than those from national surveys except for the Hispanic women (19,40), mirroring the milk intakes in our study. Both calcium intakes and dairy servings were higher in a rural sample of white women with limited incomes in Michigan than they were in those from Alabama in this study (1). Catfish and fish intake was responsible for the relatively higher vitamin D intakes of the African-American women from Texas compared to those from Alabama. The significantly higher intake of water by Hispanic-American women is a finding that merits further study and replication.

As supported by national survey data, the Hispanic women in our study had the highest intakes of vegetables (8). The overall energy adjusted average of 2.25 c vegetables is lower than that reported from national dietary data (20). In several studies, including ours, "other vegetables," including corn, peas, green beans, cabbage, and summer squash averaged about 1 c/day and/or comprised the largest portion of vegetables (20,36,40). The average overall intake of >3 c fruit and vegetables daily in this study is driven primarily by the very high intakes by the Hispanic-American women and higher intakes in Texas overall compared to Alabama.

Although fruit is the food group that women most likely omit on a daily basis (41,42), and this was still true in our study, more than half of women had at least some fruit or 100% juice during the 3-day period. In 2005 nearly half of children in Head Start were also the Special Supplemental Nutrition Program for Women, Infants, and Children, which provides 100% fruit juice (43). Such dual enrollments might have positively influenced the mothers' fruit intakes either indirectly by availability in the home or directly if the mothers were also enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children. The Hispanic-American women were notable by having the highest percentage consuming fruit or fruit juice, similar to other findings (18). In the FOODS of our Delta study, both African-American and white adults had low fruit intakes, but the African Amercians had higher intakes compared to whites, as also found in our study.

Higher meat intakes in African-American compared to White and Hispanic women have also been reported in national survey data, but not in the FOODS of the Delta Study with adults (36). For young adults in Louisiana, young white women consumed more beef and African American consumed more pork, poultry, and seafood (44). The higher intakes of sweetened beverages by white women and of fruit juices by African-American women in our study is similar to the finding Nicklas and colleagues (45), who reported on a mixed white and African-American sample of children in Louisiana. As reported in our study, Champagne and colleagues (36) reported higher intakes of added sugars by rural white women compared to African-American. Similar to one other study of rural white mothers of Early Head Start children in Michigan (1), vegetable intakes without fried potatoes were a strong predictor of the nutrient adequacy overall, especially for the Hispanic women in our study. This finding supports the high nutrient density of vegetables.

These data illustrate important differences in diet quality by race/ethnicity, but study limitations caution generalizability. It is apparent that some dietary intakes are underreported, a typical finding in samples with people with high BMIs (46) or low income (47), both relevant to this sample. Splitting the 1988–1994 NHANES sample by income at 185% of the Federal Poverty Level showed that all women on average underestimated their energy intakes by 350 to 550 kcal, but that this underreporting was about 100 kcal greater for those with low incomes (35). Available evidence suggests that energy-dense, nutrient-poor foods are those most likely to be underreported (38). If true, then the data for fruit and vegetables should be the most robust. Also, Hispanic women did the least underreporting of food and their mean energy intake most similarly approached the average intakes of 2,000 kcal reported in other surveys. Because people often underreport fruit and vegetable intakes on screener type items, the use of 3 days of dietary recalls in this study from which intakes could be extracted was an advantage in estimating intakes where people do not always recognize foods in mixed dishes. Furthermore, the under-reporting criteria of EI:BMR <1.3 was higher than in many studies and some cutpoints range as low as <0.9 (48). Despite the fact that the sample was examined by race/ethnic subgroups, it is still important for health professionals to recognize that within groups there can be further cultural differences in dietary intakes, especially with increasing time spent in the United States (8,49). Other studies have shown that education and household size appear to drive some of the differences in nutrient intakes not addressed in our study using a sample with limited incomes (12,16,32,50). It should be noted that due to differences in urban vs rural by race/ethnicity our study was not strictly a comparison of race/ethnic differences, because the white mothers from Alabama were mostly rural whereas the three other groups were all urban.

CONCLUSIONS

Despite limited income for food, there were important differences in diet quality among race/ethnic groups. The Hispanic-American mothers had better diet quality compared to the other two groups, possibly due in part to limited acculturation. It is ironic that although good diet quality is a factor that can reduce the risk for costly chronic diseases, those groups most at risk, such as those with limited resources, are often the least likely to consume them. Nevertheless, the Hispanic-American women in Texas managed to find ways to consume 5.6 c/day fruit and vegetables on average. These findings have implications for ways that health professionals can offer cost-conscious ways to meet recommended nutrient intakes in low-income families. In addition, these findings offer evidence that some families with limited incomes do manage to consume diets not as low in fruit, vegetables, and milk as is generally believed.

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Table 1

Demographics, anthropometrics, energy density, diet quality, and food security of mothers by race/ethnicity (African American [AA], Hispanic American [HA], or white [W]) and state of residence (Texas [TX] or Alabama [AL]) presented as means ± standard deviation (SD) or percentages[a]

Characteristic[b]	**Total sample**		**TX HA**		**TX AA**		**AL AA**		**AL W**	
	mean ± SD									
Age, y (n = 604)	29 ± 5.8		30 ± 5.7		30 ± 5.9		30 ± 6.5		28 ± 5.1	
No. in household (n = 603)	4.4 ± 1.6		4.7 ± 1.6		4.5 ± 1.8		4.2 ± 1.4		4.3 ± 1.5	
Range	1–12		2–12		1–10		2–12		2–12	
Body mass index (n = 591)[c]	31 ± 8.0		30 ± 6.1^{x}		32 ± 7.8^{xy}		33 ± 9.1^{y}		30 ± 8.6^{x}	
EI:BMR[d]	1.1 ± 0.6		1.4 ± 0.7^{x}		0.9 ± 0.4^{w}		0.8 ± 0.4^{w}		1.0 ± 0.5^{w}	
	n %									
Race/ethnicity, self-defined	610	100	195	33	115	19	146	24	147	24
EI:BMR <1.3	464	76	103^{w}	52	108^{wx}	92	130^{x}	89	123^{x}	84
Education completed										
High school or less	357	59	151^{x}	76	46^{w}	39	73^{wz}	50	87^{z}	59
Some college/technical school	200	33	34^{x}	17	53^{xy}	45	59^{y}	40	54^{xy}	37
College graduate and higher	53	9	15^{wz}	7	18^{w}	16	14^{wz}	10	6^{z}	4
Marital status										
Married	282	46	106^{xz}	53	35^{w}	30	39^{w}	27	102^{z}	69
Divorced/widowed/separated	115	19	34	17	19	16	30	20	32	22
Never married	170	28	27^{xz}	14	56^{w}	48	74^{w}	51	13^{z}	9
Other	43	7	33^{x}	17	7^{wy}	6	3^{y}	2	0^{y}	0
Body mass index category										
<25.0 Normal/underweight	165	27	58^{x}	29	25^{w}	22	26^{w}	18	56^{x}	38
25.01–30.0 Overweight	287	47	109^{x}	54	53^{w}	45	64^{w}	44	61^{w}	42

Characteristic[b]	Total sample		TX HA		TX AA		AL AA		AL W	
>30.01 Obese	158	26	33[yz]	17	39[yz]	33	56[w]	38	30[z]	20

[a]Means or percentages with the same superscripts (w, x, y, z) did not differ significantly from each other.

[b]Numbers do not always equal 610, because not all participants provided complete data (eg, seven women did not report race/ethnicity so their data are only in the totals).

[c]Body mass index calculated as kg/m^2. Heights or weights were missing for 13 participants.

[d]Energy intake in kilocalories/basal metabolic rate; values less than 1.3 are considered unlikely to be adequate for weight maintenance at sedentary activity levels.

Table 2

Nutrients of concern regarding inadequate or excess intake for multiethnic (African American [AA], Hispanic American [HA], and white [W]) Head Start mothers from two southern states (Texas [TX] and Alabama [AL]) using 3-day dietary recalls, least square means ± standard error (SE), and percentage, adjusted for age, energy, and body mass index[a] unless otherwise indicated[b]

	Nutrient of Concern for Inadequacy				% < EAR[c]			
Nutrient	TX HA (n = 195)	TX AA (n = 115)	AL AA (n = 146)	AL W (n = 147)	TX HA	TX AA	AL AA	AL W
	← mean ± SE →							
Energy[d] (kcal)***	2,133 ± 40.8[x]	1,430 ± 53.3[w]	1,442 ± 47.1[w]	1,587 ± 48.2[w]	NA[e]	NA	NA	NA
MAR[f] ****	77 ± 0.75[x]	66 ± 0.91[w]	62 ± 0.81[w]	64 ± 0.81[wy]	44	96	97	97
Protein (g)****	72 ± 1.14[w]	68.3 ± 1.39[w]	66.8 ± 1.23[w]	58.2 ± 1.23[z]	1.0	17	21	22
Dietary fiber (g)****	18.7 ± 0.42[x]	11.4 ± 0.51[w]	10.3 ± 0.45[w]	12 ± 0.45[w]	65	100	100	99
n-3 Fatty acid (mg)****	1.2 ± 0.05[x]	1.6 ± 0.06[w]	1.4 ± 0.06[wx]	1.2 ± 0.06[x]	34	50	58	63
Vitamin A (μg)[g]****	758 ± 45.2[x]	484 ± 35.3[w]	437 ± 28.2[w]	416 ± 26.9[w]	17	51	63	70
Vitamin D (μg)[g]****	4.5 ± 0.18[w]	4.5 ± 0.23[w]	3.3 ± 0.15[y]	3.3 ± 0.15[y]	63	74	94	92
Vitamin E (mg AT[h])****	6.0 ± 0.18[x]	4.9 ± 0.21[w]	4.9 ± 0.19[w]	4.9 ± 0.19[w]	94	99	97	98
Vitamin B-6 (mg)****	1.8 ± 0.04[x]	1.5 ± 0.05[w]	1.3 ± 0.04[y]	1.3 ± 0.04[y]	13	47	58	45
Vitamin C (mg)[g]****	79.9 ± 4.43[w]	62.4 ± 4.22[w]	47.4 ± 2.84[y]	39.4 ± 2.37[y]	23	52	64	75
Folate (mg)****	480 ± 10.9[x]	336 ± 13.3[w]	304 ± 11.8[w]	311 ± 11.8[w]	14	70	76	69
Phosphorus (mg)****	1,184 ± 17.2[x]	1,013 ± 21.0[wz]	918 ± 18.6[y]	946 ± 18.7[z]	1	17	28	16
Calcium (mg)****	748 ± 17.5[x]	533 ± 21.4[w]	538 ± 18.9[w]	592 ± 19.0[w]	68	98	98	93
Iron (mg)****	14.8 ± 0.29[x]	12.1 ± 0.36[w]	10.8 ± 0.32[w]	11 ± 0.32[w]	6	27	42	29
Potassium (mg)****	2,292 ± 38.1[x]	1,902 ± 46.5[wz]	1,683 ± 41.2[y]	1,793 ± 41.3[z]	96	100	100	100
Zinc (mg)**	9.4 ± 0.2[x]	8.7 ± 0.25[xz]	8.5 ± 0.22[xz]	8.2 ± 0.22[z]	15	43	51	43
Fat (g total)****	61.1 ± 0.99[x]	66.8 ± 1.21[wz]	72.1 ± 1.07[y]	67.9 ± 1.07[z]	NA	NA	NA	NA
Saturated fat (g)****	20.5 ± 0.45[w]	22.4 ± 0.55[wy]	23.8 ± 0.49[y]	23.3 ± 0.49[y]	NA	NA	NA	NA

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Nutrient	Nutrient of Concern for Inadequacy				% < EAR[c]			
	TX HA (n = 195)	TX AA (n = 115)	AL AA (n = 146)	AL W (n = 147)	TX HA	TX AA	AL AA	AL W
Trans fat (g)[i]****	2.8 ± 0.17^{x}	4.7 ± 0.21^{wz}	5.4 ± 0.19^{y}	5.9 ± 0.19^{z}	NA	NA	NA	NA
Total fat (% kcal)[dj]***	32.7 ± 0.49^{w}	33.0 ± 0.65^{w}	37.1 ± 0.57^{x}	34.5 ± 0.58^{w}	35	38	62	47
Saturated fat (% kcal) [dk]****	10.9 ± 0.20^{x}	11.0 ± 0.27^{xy}	12.1 ± 0.24^{y}	11.8 ± 0.24^{xy}	59	70	77	75
Cholesterol[l] (g)****	296 ± 10.7^{w}	280 ± 13.1^{w}	273 ± 11.6^{w}	218 ± 11.6^{z}	53	33	27	16
Sugars (% kcal)[d]***	22.2 ± 0.60^{w}	22.8 ± 0.75^{w}	21.7 ± 0.69^{w}	26.2 ± 0.70^{z}	NA	NA	NA	NA
Added sugars (% kcal) [dm]**	13.2 ± 0.63^{w}	15.8 ± 0.82^{wy}	17.6 ± 0.73^{y}	20.9 ± 0.74^{z}	5	10	16	32
Sodium[n] (mg)**	$2,872 \pm 55.5^{wz}$	$2,761 \pm 67.8^{w}$	$2,942 \pm 60.01^{wz}$	$3,053 \pm 60.2^{z}$	85	51	53	74

[a] Height or weight were missing for 13 participants.

[b] Means with same superscript (w, x, y, z) do not differ significantly from one another, according to Tukey Kramer with *P*<0.01.

[c] EAR = Estimated Adequate Requirement or Adequate Intake for those nutrients without an EAR.

[d] Adjusted for age and body mass index only.

[e] NA = Not available.

[f] MAR = Mean adequacy ratios were the % Recommended Dietary Allowance for each of eight nutrients (ie, dietary fiber, vitamin A, vitamin C, folate, calcium, iron, zinc, and potassium) but truncated at 100 before averaging. The percentages with scores <85 are reported under the %<EAR.

[g] Transformation of variables was required to make original data approximate normality.

[h] AT = Alpha tocopherol equivalents.

[i] Reference value for "high" is 0 g *trans* fat.

[j] Reference value is <35% energy from fat.

[k] Reference value is <10% energy from saturated fat.

[l] Reference value is <300 mg cholesterol.

[m] Reference value is <25% energy from added sugars.

[n] Reference value is 2,300 mg sodium.

** *P*<0.01.

***$P<0.001$.

****$P<.0001$.

Table 3

Food group intakes[ab] for multiethnic mothers (ie, African American [AA], Hispanic American [HA], and white [W]) from two states (Texas [TX] and Alabama [AL]) from 3 days of dietary recalls, least square means and standard error (SE) for main groups and percentage consuming for subcategories of food groups[c]

Food category	Total adjusted	TX HA (n = 195)	% Consuming	TX AA (n = 115)	% Consuming	AL AA (n = 146)	% Consuming	AL W (n = 147)	% Consuming
	← mean ± SE →			*← mean ± SE →*		*← mean ± SE →*		*← mean ± SE →*	
Beverages[a], 8 fl oz	4.54 ± 0.01	6.67 ± 0.03[x]	100	3.79 ± 0.03[w]	100	3.45 ± 0.03[w]	100	4.77 ± 0.03[z]	100
Milk[b], all types	0.48 ± 0.02	0.81 ± 0.05	96	0.38 ± 0.06	72	0.30 ± 0.05	84	0.47 ± 0.05	91
Fruit juice[b], 100%	0.68 ± 0.04	0.86 ± 0.08	84	0.88 ± 0.09	65	0.62 ± 0.08	49	0.35 ± 0.08	38
Sweetened beverages[a]	1.37 ± 0.60	0.84 ± 0.04[x]	86	1.31 ± 0.05[w]	81	1.39 ± 0.04[w]	93	2.06 ± .04[z]	93
Water[b]	1.65 ± 0.10	3.82 ± 0.19	93	0.94 ± 0.23	80	1.03 ± 0.21	74	0.79 ± 0.21	49
Grains[a], 1oz	4.89 ± 0.01	5.60 ± 0.02[x]	100	4.78 ± 0.02[w]	100	4.62 ± 0.02[w]	100	4.58 ± 0.02[w]	100
Cereals[b]	0.34 ± 0.02	0.57 ± 0.04	54	0.32 ± 0.05	40	0.23 ± 0.05	30	0.23 ± 0.05	37
Salty snacks[b]	0.28 ± 0.02	0.12 ± 0.03	35	0.28 ± 0.04	41	0.31 ± 0.03	51	0.4 ± 0.03	65
Dairy[a], 1c milk equivalent	0.92 ± 0.01	1.15 ± 0.03[x]	100	0.80 ± 0.03[w]	96	0.79 ± 0.03[w]	98	0.97 ± 0.03[wx]	100
Cheese[b]	0.48 ± 0.03	0.54 ± 0.06	85	0.35 ± 0.07	75	0.48 ± 0.06	89	0.54 ± 0.06	93
Meats[a], 1oz meat equivalent	4.50 ± 0.50	4.07 ± 0.03[xz]	99	5.44 ± 0.04[w]	100	5.40 ± 0.03[w]	99	3.69 ± 0.03[z]	100
Fish[b]	0.65 ± 0.05	0.35 ± 0.10	29	1.33 ± 0.12	43	0.57 ± 0.11	34	0.34 ± 0.11	22
Chicken[b]	1.48 ± 0.07	1.01 ± 0.12	72	1.99 ± 0.15	79	2.02 ± 0.13	79	0.89 ± 0.14	65
Pork[b]	0.63 ± 0.04	0.63 ± 0.08	58	0.53 ± 0.09	50	0.83 ± 0.08	64	0.54 ± 0.08	63
Red meat[b]	1.16 ± 0.05	1.23 ± 0.09	82	1.07 ± 0.11	71	1.13 ± 0.1	58	1.22 ± 0.10	82
Franks/lunch meat/sausage[b]	0.65 ± 0.04	0.63 ± 0.07	64	0.56 ± 0.08	56	0.84 ± 0.07	73	0.59 ± 0.07	67
Eggs[b]	0.45 ± 0.03	0.61 ± 0.05	65	0.43 ± 0.06	71	0.44 ± 0.05	64	0.34 ± 0.05	58
Vegetables[a], 1c	2.25 ± 0.01	3.09 ± 0.03[x]	99	2.09 ± 0.03[w]	100	1.66 ± 0.03[y]	99	2.32 ± 0.03[w]	100
Fried potatoes[b]	0.32 ± 0.02	0.03 ± 0.03	26	0.42 ± 0.04	43	0.35 ± 0.04	53	0.46 ± 0.04	62
Dark yellow[b]	0.09 ± 0.01	0.13 ± 0.01	62	0.1 ± 0.02	52	0.05 ± 0.02	39	0.08 ± 0.02	50
Dark green[b]	0.15 ± 0.01	0.21 ± 0.03	64	0.14 ± 0.03	35	0.18 ± 0.03	35	0.08 ± 0.03	16

Food category	Total adjusted	TX HA (n = 195)	% Consuming	TX AA (n = 115)	% Consuming	AL AA (n = 146)	% Consuming	AL W (n = 147)	% Consuming
Tomatoes[b]	0.45 ± 0.02	0.96 ± 0.04	98	0.27 ± 0.05	65	0.22 ± 0.05	68	0.36 ± 0.05	87
Legumes[b]	0.32 ± 0.02	0.64 ± 0.04	71	0.21 ± 0.05	35	0.16 ± 0.05	25	0.25 ± 0.05	39
Fruits and juice[b]	1.12 ± 0.05	1.78 ± 0.10	93	1.23 ± 0.12	74	0.83 ± 0.11	62	0.64 ± 0.11	57
Fruit and juice and vegetable[a]	3.17 ± 0.50	4.58 ± 0.03[x]	99	3.20 ± 0.04[w]	98	2.31 ± 0.03[y]	99	2.89 ± 0.04[w]	100
Sweet desserts[a]	0.58 ± 0.03	0.46 ± 0.05	72	0.59 ± 0.07	54	0.61 ± 0.06	58	0.66 ± 0.06	71
Fats[a], 1tsp	2.88 ± 0.02	2.80 ± 0.04	100	2.88 ± 0.04	98	3.05 ± 0.04	99	2.77 ± 0.04	99

[a]Food groups were log-transformed; *P* values were for analysis of covariance (ANCOVA) adjusted for age, body mass index (BMI), and energy intake

[b]The distributional properties of these food groups did not permit significance testing, but means are reported adjusted for age, BMI, and energy intake.

[c]Means with the same superscripts (w, x, y, z) do not differ significantly from one another according to ANCOVA adjusted for age, BMI, and energy intake at $P<0.01$.

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Table 4

Stepwise regression of mean adequacy ratio (MAR)[a] scores on food groups for multiethnic (ie, African American [AA], Hispanic American [HA], and white [W]) Head Start mothers from two states (Texas [TX] and Alabama [AL]) race/ethnicity, adjusted for age and body mass index[b], reporting standardized beta coefficients (Std β) and partial variance (partial R^2)

	Total		TX HA		TX AA		AL AA		AL W	
Forward test	**Std β**	**Partial R^2**	**Std β**	**Partial R^2**	**Std β**	**Partial R^2**	**Std β**	**Partial R^2**	**Std β**	**Partial R^2**
Vegetable no fried potatoes	0.3785	0.504	0.3302	0.415	0.4448	0.194	0.3703	0.200	0.4991	0.231
Fruit and juice	0.2055	0.042	0.2432	0.060	0.2168	0.068	0.2750	0.091	0.1407	0.042
Milk	0.1788	0.021	0.2329	0.035	0.2257	0.041	0.1179	0.012	0.2071	0.031
Grains	0.3078	0.158	0.3580	0.169	0.3715	0.183	0.3842	0.387	0.3769	0.277
Meats	0.1629	0.018	0.1919	0.032	0.3673	0.110	0.1380	0.019	0.1235	0.014
Sweetened beverage									−0.1336	0.014
Cheese	0.0923	0.008	0.1104	0.012					0.1629	0.019
Fried potatoes	0.0792	0.006			0.1477	0.020	0.1701		0.3325	0.066
Sweetened dessert	0.1473	0.024	0.1344	0.019	0.2369	0.063		0.025	0.2280	0.038
Total R^2		0.78		0.73		0.66		0.72		0.71

[a] %Recommended Dietary Allowance for each of eight nutrients (ie, dietary fiber, vitamin A, vitamin C, folate, calcium, iron, zinc, and potassium) but truncated at 100 before averaging.

[b] Height or weights were missing for 13 participants.