Published in final edited form as:
J Am Diet Assoc. 2007 February ; 107(2): 223–234. doi:10.1016/j.jada.2006.11.004.

Does Food Group Consumption Vary by Differences in Socioeconomic, Demographic, and Lifestyle Factors in Young Adults? The Bogalusa Heart Study

PRIYA DESHMUKH-TASKAR, MS [research coordinator II], **THERESA A. NICKLAS, DrPH [professor]**, and **SU-JAU YANG, MS [statistician]**
Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX.

GERALD S. BERENSON, MD [professor and director]
Tulane Center for Cardiovascular Health, Tulane School of Public Health and Tropical Medicine, New Orleans, LA.

Abstract

Objective—To examine if food group consumption varies by differences in socioeconomic, demographic, and lifestyle factors in young adults from a semirural setting in Louisiana.

Design—Cross-sectional.

Subjects—Young adults (n=1,266, 74% European American, 26% African American; 39% men, 61% women) aged 20 to 38 years, enrolled in the Bogalusa Heart Study.

Measures—Food group consumption was assessed by a food frequency questionnaire. Socioeconomic (eg, income and education), demographic (eg, age, sex, and ethnicity), and lifestyle (eg, marital status and physical activity) information was obtained by a self-administered questionnaire and the subjects were stratified according to these groups.

Statistical analyses—Analysis of covariance (adjusted for covariates) was used to detect differences in the mean servings of food groups consumed per day between the various socioeconomic, demographic, and lifestyle groups.

Results—Compared to income ≤\$15,000, those with an income >\$45,000 had lower consumption of burgers/sandwiches ($P<0.05$) and those with income levels from \$30,001 to \$45,000 had lower consumption of mixed dishes ($P<0.05$). Intake of cereals/breads ($P<0.05$), dairy products ($P<0.01$), fruits/100% fruit juices ($P<0.001$), and vegetables ($P<0.001$) was higher in subjects with >12 years of education. European-American men consumed more servings of dairy products ($P<0.05$) and sweetened beverages ($P<0.05$) than African-American men. European-American women consumed more servings of dairy products ($P<0.05$), vegetables ($P<0.05$), and fats ($P<0.05$) than African-American women. African Americans (men and women) consumed more servings of fruits/ 100% fruit juices ($P<0.0001$) than European Americans (men and women), respectively. Married individuals consumed more servings of snacks/desserts ($P<0.05$), but fewer servings of alcoholic beverages ($P<0.0001$) than those who were unmarried. Active individuals consumed more servings of fruits/100% fruit juices ($P<0.05$) and fewer servings of burgers/sandwiches ($P<0.05$) than inactive individuals.

Address correspondence to: Theresa A. Nicklas, DrPH, Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, 1100 Bates Ave, Houston, TX 77030. tnicklas@bcm.tmc.edu.

Conclusions—These findings suggest that food group consumption varies by socioeconomic, demographic, and lifestyle factors in young adults from a semirural setting. Food and nutrition professionals who encounter diverse populations need to consider the influence of income, education, sex, ethnicity, marital status, and physical activity on food consumption patterns when planning diets, nutrition education programs, and interventions for young adults.

With rapid increases in obesity (1), metabolic syndrome (1), cardiovascular disease (2), diabetes mellitus (3), and cancer (4) in the young adult population (ages 19 to 39 years), there is a need for understanding their eating habits and lifestyle patterns. It has been noted that intake of fast foods, snacks (5,6), and sweetened beverages (5) has increased among young adults, whereas intake of fruits, vegetables (7), and dairy products (6) has decreased. Various factors such as socioeconomic status (eg, income and/or education) (8-16), demographics (eg, sex and ethnicity) (17-19), and lifestyle characteristics (eg, marital status [20-23] and physical activity [15,24,25]) have been thought to influence the food choices in this age group. However, the majority of studies conducted in the United States have either examined cost issues with respect to purchasing specific healthful foods (14,26-29) or have examined the influence of socioeconomic status on nutrient intakes (30,31) rather than the consumption of specific food groups. Because foods are usually consumed in many combinations (32), examining the role of single nutrients on socioeconomic status may be confounded by the effect of dietary patterns (33). Also, the high intercorrelation among some nutrients (34) and complicated interactions among nutrients (35) makes it more difficult to assess the influence of socioeconomic status on dietary (nutrient) intakes. Furthermore, reported results of the role of socioeconomic status/cost of foods on dietary intakes have been conflicting, with a majority of the research showing a positive connection (8-12,14-16), and a minority reporting either dubious (13) or no connection (28,29). This warrants more studies.

Ethnic differences in adult nutrient intakes have also been noted (36-38). Yet only a few recent studies have reported such differences in the consumption of specific foods (18-19). Furthermore, past research has depicted inconsistent results; some research shows that European Americans practice more healthful dietary habits than African Americans (17,18) and other research shows mixed results (19). Sex differences in food consumption also prevail; women in general tend to eat more healthfully than men (17). In contrast, it is true that African-American women have the highest rates of overweight/obesity in the United States (39). Thus, it is important to evaluate ethnic and sex differences in food group consumption in light of the current obesity epidemic in the United States.

Marriage has been thought to contribute to healthful living conditions due to sharing of household goods and, hence, reducing the cost of living (21). Yet some research has shown that married individuals have intakes consistent with the dietary guidelines (22) while others have reported that married individuals are more likely to be overweight/obese (40). In contrast, unmarried individuals have been noted to consume poor or less healthful diets (20). Hence, the role of marital status on food group consumption is ambiguous at this juncture.

Although physical activity does not affect the choice of food group consumption directly, it has been noted that unhealthful lifestyle patterns (eg, lack of exercise) and less healthful eating patterns (eg, lower intake of fruits and vegetables and/or higher intake of fats) tend to coexist or cluster among individuals (15,24,25), although more research is warranted in this area, particularly in the young adult population.

Due to the inconsistent findings and focus on nutrient intakes in the past research, there is a need to understand factors that influence food group consumption in young adults residing in semirural communities of the United States. This type of information will help food and nutrition professionals to plan tailored intervention programs to improve the eating habits of young adults relative to food consumption patterns. The purpose of our study was to examine whether food group consumption varies by socioeconomic status (ie, income and education), demographics (ie, sex and ethnicity) and lifestyle factors (ie, physical activity and marital status) in a biracial sample of young adults from the Bogalusa Heart Study.

MATERIALS AND METHODS

Background

The Bogalusa Heart Study began in 1973 as an epidemiologic study investigating the early natural history of cardiovascular risk factors in children; it eventually progressed into observations of young adults (41). Bogalusa is a biracial (European American/white-African American/black) semirural community 70 miles north of New Orleans, LA. The biracial population distribution of Bogalusa has been stable for years and is comparable to many other small southern semirural communities in the United States (41).

Subjects

Our study included a sample of 1,336 young adults aged 20 to 38 years who were examined in the 1995-1996 cross-sectional survey in the Bogalusa Heart Study. The young adults were recruited for this cross-sectional survey on the basis of whether or not they had participated in one of the childhood cross-sectional surveys conducted in the Bogalusa Heart Study. Written informed consents were obtained from all the participants for this study. The study plans, procedures, and consent forms were reviewed and approved by the Louisiana State University and Tulane University medical centers' ethics and research committees.

Procedures

To assess the food consumption patterns of the young adults, a validated (42) and reliable (43) 131-item semiquantitative, self-administered youth and adolescent food frequency questionnaire was used. The participants were asked to indicate how often, on average, they had consumed a given amount of the specified food during the past year. The responses for the foods/beverages (Figure) ranged from “never or less than once a month” to “five or more times a day.” Daily portion sizes were calculated for each of the food items. The selected frequency choice given by the subjects for each food item from the food groups was then converted to a daily intake (eg, “one serving per week” was converted to “0.14 serving/day”). Alcohol consumption was assessed based on the frequency, type, and length of alcohol use. The sum of the daily servings of each of the food/beverage items from a particular food group was used to determine the total number of servings of that food group consumed per day. The total energy intake (in kilocalories) was also computed for all participants.

Information on demographics, socioeconomic status, and lifestyle characteristics was obtained using a self-administered questionnaire. The following subcategories were used for classifying the study variables: Age at their most recent birthday; sex (ie, male or female); ethnicity (ie, European American or African American) and ethnicity by sex (ie, European-American man or European-American woman or African-American man or African-American woman). Socioeconomic status of the young adults was evaluated by eliciting information on their income levels (ie, ≤$15,000, $15,001 to 30,000, $30,001 to 45,000, >$45,000) and their education levels (ie, ≤12 years or >12 years). For information on their marital status, young adults were asked if they were currently married/cohabiting, or single (which included divorced and widowed). Physical activity level of the participants was also assessed using a self-report method. The participants were asked to give a subjective rating of their physical activity outside of work following a five-item Likert scale adapted from the Lipid Research Questionnaire (44), where 1=physically inactive (sedentary) and 5=very active. The participants were considered inactive if they classified themselves as ≤3 on the Likert scale and active if they classified themselves as ≥4 on the Likert scale.

Trained examiners measured heights and weights of participants following standardized protocols and using calibrated instruments (41). Height and weight were measured twice to the nearest 0.1 cm and 0.1 kg, respectively, using a standard height board and beam balance metric scale. The two readings were averaged for both height and weight. Body mass index (BMI) was calculated as kg/m^2.

Statistical Analyses

Statistical analyses were performed using the Statistical Analysis System (version 8.2, 1999, SAS Inc, Cary, NC). Descriptive statistics (ie, means, standard deviations/ standard errors, and percentages) were computed wherever necessary. *t*-tests and analysis of variance (with Tukey-Kramer's post hoc tests) were used to detect ethnicity, sex, and ethnicity by sex differences among the demographic variables, respectively. χ^2 analysis was used for testing the associations among the categorical demographic variables. Analysis of covariance was used to detect differences in the mean servings of food groups consumed per day among the various socioeconomic, demographic, and lifestyle groups. The dependent variable was the mean servings of the food groups consumed per day and the various independent variables were income, education, sex, ethnicity, ethnicity by sex, marital status, and physical activity. Because Kendall Tau-β coefficients showed significant correlations between income levels, education levels, marital status, and physical activity, these variables were included in the same model to control for each other, along with the other covariates (ie, energy intake, BMI, age, sex, ethnicity, and ethnicity by sex). Tukey-Kramer's post hoc significance tests were applied for multiple comparisons between any two groups. The statistical significance was set at $P<0.05$.

RESULTS

From a total of 1,336 subjects, 70 subjects were excluded from the analyses as outliers, which included women whose daily energy intakes >4,000 kcal/day (n=28) or those who were pregnant (n=24), and men with daily energy intakes >4,200 kcal/day (n=18). None of the subjects consumed extremely low energy intake (<600 kcal/day) or were lactating in this sample.

Demographic Characteristics of the Sample

As shown in Table 1, the cross-sectional sample of 1,266 young adults consisted of 74.4% European Americans, 25.6% African Americans, 38.7% men, and 61.3% women. During the analysis phase, the sample size varied from the original sample size due to missing data for income, education, and physical activity for some participants. The mean age of subjects was 29.7 years. There were significant ethnicity by sex differences in BMI, energy intake, income levels, education levels, and physical activity levels among the young adults. In short, African-American women had higher BMIs, African-American men had higher energy intakes, and European-American women had lower BMIs and lower energy intakes than all the other ethnicity by sex groups. Furthermore, a higher percent of African Americans reported having lower income levels and a higher percent of European Americans reported having >12 years of education. African-American men were the most physically active among all the ethnicity by sex groups and a higher percent of European Americans reported being married than did African Americans.

Socioeconomic Status and Food Group Consumption

As shown in Table 2, compared with those who reported lower income levels, young adults with higher income levels consumed significantly fewer servings of burgers and sandwiches and mixed dishes. Similarly, those young adults with a reported education level >12 years consumed significantly more servings of breads and cereals, dairy products (eg, cheese and yogurt), fruits, 100% fruit juices, and vegetables (with and without including french fries) than those with an education level of ≤12 years (Table 2).

Demographic Factors and Food Group Consumption

In general, men consumed significantly more servings of burgers and sandwiches and alcoholic beverages than women (Table 3). In contrast, women consumed significantly more servings of yogurt, fruits and 100% fruit juices, vegetables (with and without including french fries), mixed dishes, and fats than did men. Ethnic differences in food group consumption revealed that European-American young adults consumed significantly more servings of dairy products (eg, milk and cheese), vegetables (with and without including french fries), fats, mixed dishes, and sweetened beverages than their African-American counterparts. In contrast, African-American young adults consumed significantly more servings of fruits, 100% fruit juices, snacks, desserts, and alcoholic beverages than their European-American counterparts.

Post hoc comparisons (Table 3) for the ethnicity by sex groups revealed that European-American men consumed significantly more servings of: milk than did African-American men and African-American women, vegetables (including french fries) than did African-American men, fats than did African-American men, burgers and sandwiches than did European-American women and African-American women, and sweetened beverages than did African-American men. In contrast, African-American men consumed significantly more servings of: fruits and 100% fruit juices than did European-American men and European-American women; and burgers and sandwiches than did European-American women and African-American women.

European-American women consumed significantly more servings of: dairy products (eg, milk and cheese) than did African-American women; vegetables (including french fries) than did European-American men, African-American men, and African-American women; fats than did European-American men, African-American men, and African-American women; mixed dishes than did European-American men, African-American men and African-American women; and sweetened beverages than did African-American men. On the other hand, African-American women consumed significantly more servings of: fruits and 100% fruit juices than did European-American men and European-American women, snacks and desserts than did European-American men.

Lifestyle Factors and Food Group Consumption

The number of servings of snacks and desserts was significantly higher in married young adults compared with unmarried young adults (Table 4). In contrast, unmarried young adults consumed significantly more servings of alcoholic beverages than married young adults. The number of servings of burgers and sandwiches was significantly higher in the inactive young adults than in those who were active. The intake of fruits and 100% fruit juices was significantly higher in active individuals than in inactive individuals (Table 4).

DISCUSSION

It has been well established that increased consumption of healthful foods (eg, whole grains/cereals [45], fruits, vegetables [45], low-fat dairy products [46], and other low-fat foods [47]) is associated with lower mortality rates from obesity and related metabolic diseases (45-47).

These benefits have been mainly attributed to their vitamin/mineral (46,48), phytochemical (48), and fiber content (49). Conversely, higher intakes of high-fat foods or foods that provide discretionary calories (50) (eg, fast foods [1], snacks [51], desserts [4], sugar-sweetened beverages [3], and alcohol [52]) have been proposed to be associated with obesity and related metabolic diseases.

Findings from our research reveal that food group consumption varies by socioeconomic, demographic, and lifestyle factors in young adults. It was noted that young adults with higher income levels consumed fewer servings of burgers and sandwiches and mixed dishes and those with higher education levels consumed more servings of healthful foods (eg, breads and cereals, dairy products, fruits, 100% fruit juices, and vegetables). Similar findings from previous research have been reported; individuals with a lower socioeconomic status had a higher consumption level of potatoes, meat products, visible fats, and soft drinks (11); another study reported higher consumption of chips, soda, white bread, processed meats, full-fat dairy products, and sugar in women with a lower socioeconomic status (15). In contrast, individuals belonging to higher socioeconomic status groups were observed to have more consumption of whole grains (15), fruits/vegetables (11,15), and dairy products (11-13,15). It has been hypothesized that the relationship between higher socioeconomic status and more healthful food consumption could be due to the knowledge and health awareness that individuals may acquire with higher socioeconomic status, or increased pressures of social acceptability that occur with increasing socioeconomic status and these factors may influence their food consumption habits (53).

Our finding of socioeconomic status influencing food group consumption is interesting in light of the age group chosen for this study (ie, young adults). It has been reported that individuals belonging to younger age groups prefer to spend less time in food preparation (54). Furthermore, younger age groups may be more inclined to prefer ready-to-eat, processed, frozen, or canned fruits and vegetables for convenience. Yet, the high costs of some of these nutritious foods owing to their high processing costs and/or their highly perishable nature may be a strong impediment to eating healthfully (26,27) and, thus, is proposed to be a major factor mediating the relationship between socioeconomic status and healthful food consumption. One study reported that adolescents tend to eat more fast foods because they think that fast foods are inexpensive and easily available (54) compared to healthful foods. Despite the findings of our study and from past research (11,12,15,26,27), a recent economic analysis report from the US Department of Agriculture found that three servings of fruits and four servings of vegetables can be easily bought at a low cost of 64 cents daily (29). However, their findings did not consider the perishable nature of fruits and vegetables (29), which typically tends to affect the purchasing ability of these foods. More research is clearly warranted in this area and nutrition education programs should target cost issues in conjunction with attempts to improve the dietary habits of young adults.

The results for sex and ethnic differences in food group consumption in our study were mixed, yet interesting. Men consumed more servings of burgers and sandwiches. Conversely, women consumed more servings of healthful foods (eg, yogurt, fruits, 100% fruit juices, and vegetables). Similar findings have been reported earlier: One study found that women consumed more servings of fruits and vegetables and fewer servings of meat (17). On the other hand, we also noted that women consumed more servings of fats and mixed dishes, and these results are contradictory to previous studies (17) and it may be possible that our study findings may be specific only to the Bogalusa population.

Analogous results to our study have been depicted for ethnic differences in food consumption. For example, Champagne and colleagues (19) found that discretionary fat consumption was higher and fruits, grains, and cereal consumption were lower in European Americans when compared with African Americans. In contrast, another study reported that European Americans were more likely to use low-fat alternatives and replacements for meat in their diets than were African Americans (18). This discrepancy in results could be due to socioeconomic and demographic differences among the populations studied.

Men and African-American young adults were the groups that consumed more servings of alcoholic beverages in our study. Similar sex differences have been noted elsewhere (17,55). However, contrasting results have been noted for ethnic differences in alcohol intakes: one study found similar results to ours (56), another study found that European Americans consumed more alcohol than did African Americans (55). Reasons for this variation in results may be due to differences in sample size and age of the subjects, differences in definitions of alcohol consumption, underreporting of alcohol consumption by the subjects (57), or differences in the statistical methods used.

The basis for ethnic disparities in food consumption could be attributed to the fact that a larger number of African Americans were in the lower income group than European Americans (as observed in our study and also in previously published studies [58]) and hence may have consumed poorer diets (19) due to their inability to afford more healthful foods. Some other environmental factors like geographic reasons may also be responsible for these ethnic differences in food consumption. One previous study showed that predominantly low-income African-American neighborhoods in Louisiana had 2.4 fast food restaurants per square mile compared to 1.5 fast food restaurants in European American neighborhoods (59).

In our study married young adults consumed more servings of snacks and desserts and fewer servings of alcoholic beverages than those who were unmarried. It has been reported previously that married individuals tend to eat a greater number of meals and have higher energy intakes (23). These results from our study and previous studies (23) may be a reason for the increased weight gain among married individuals as reported in the literature (40).

Some previous studies have also reported that married individuals tend to eat more healthful diets than unmarried individuals (22). However, such differences were not found in our study. One can speculate that with both spouses working there may be fewer family-oriented meal consumption patterns and hence being married did not affect the food consumption patterns among these young adults. With respect to alcohol consumption and marital status, previous studies have reported contradictory results to ours. One study showed that married individuals consumed more alcohol than did unmarried individuals (55). Our findings may be specific to the Bogalusa population. Nevertheless, further investigation is essential in this area.

In our study less-active individuals consumed more servings of burgers and sandwiches and fewer servings of fruits and 100% fruit juices than did physically active young adults. One can hypothesize that such findings could be due to behavioral factors (60) (ie, individuals who are physically active could be more health conscious and may choose to consume more healthful foods). However, studies have not been able to establish a direct biologic link between increased physical activity and increased fruit consumption. Further, our study did not find statistically significant differences in consumption of vegetables and dairy products with respect to physical activity. Although not many studies have examined this issue, Jago and colleagues (25) reported that subjects who were more physically active consumed more servings of fruits, 100% fruit juices, and dairy products per day and a lesser percent of energy from fats than those who were less active. Another study (24) reported that a so-called cosmopolitan diet, mainly distinguished by higher consumption of vegetables, rice, pasta, vegetable oil, chicken, fish, and wine and lower intake of potatoes, was strongly associated with leisure-time physical activity. From these findings one can hypothesize that less-healthful food consumption patterns tend to occur with physical inactivity in young adults, although more studies are warranted in this area.

Our research does have some limitations. First, the cross-sectional design provided only a snapshot of the influences of socioeconomic, demographic, and lifestyle factors on the food group consumption patterns of young adults; therefore, causal links cannot be established (61). Second, despite the large biracial sample included in this study, the breakdown of the sample size inadvertently underrepresented the African-American young adults. Third, the researchers used youth/adolescent questionnaire instead of the adult version of the food frequency questionnaire (62) for dietary assessment. A major difference between the two questionnaires is that the youth/adolescent questionnaire contains more snack foods. Furthermore, a review of 24-hour dietary recalls in a previous Bogalusa cross-sectional survey revealed that the young adults consumed a lot of snack foods (63). Also, the total energy intake and percentage of energy from fat as measured using the youth/adolescent questionnaire from Bogalusa (64) was similar to other studies using the 24-hour dietary recall method from Bogalusa with the same age group (63) and to the 1995 Continuing Survey of Food Intakes by Individuals measured by a 2-day dietary recall (65). Collectively, these points provide a strong rationale for the use of youth/adolescent questionnaire for the young adult age group in this study. Fourth, this study relied on self-reported information from the participants. Dietary information obtained from a self-reported food frequency questionnaire may have substantial errors (eg, difficulty in the estimation of portion sizes among persons [66], recall bias for food consumption [66], and under- or over-reporting for less healthful or more healthful foods, respectively [57,66,67]). The influence of self-report is minimized for the measure of physical activity because past studies have shown that the five-item physical activity scale we used has high accuracy, with a test–retest reliability of 0.85, and has been reported to be significantly associated with 4-week physical activity (44). Nevertheless more objective measures of physical activity (eg, heart rate monitors or physical activity monitors [68]) could have added more credibility to the methodology. Fifth, the classification of young adults into only two marital status categories (ie, married/cohabiting and single individuals, which included divorced and widowed) for the ease of statistical analyses, could have overlooked certain issues (eg, married and cohabiting young adults could have different eating patterns, single individuals such as unmarried divorced and widowed persons could also differ in their eating habits, and the presence of children in the household could also mediate the relationship between food group consumption and marital status). Despite all these shortcomings, this study makes a valuable contribution to the literature on factors that influence food group consumption in young adults from a southern semirural community in the United States.

CONCLUSIONS

The results of our study suggest that food group consumption varies by socioeconomic, demographic, and lifestyle factors in young adults from a semirural community in Bogalusa, LA. Public health research nutritionists and other food and nutrition professionals who encounter diverse populations need to consider the influence of income, education, sex, ethnicity, marital status, and physical activity on food consumption patterns when planning diets, nutrition education programs, and interventions for young adults. Furthermore, data suggests that intervention programs may need to be tailored based on socioeconomic, demographic, and lifestyle differences in food consumption patterns. However, more studies are needed to confirm these findings in other young adult populations.

Acknowledgments

This research was supported by grants from the National Heart, Lung, and Blood Institute of the US Public Health Service; Early Natural History of Arteriosclerosis grant no. R01 HL 38844; National Institute of Aging grant no.

AG16592; and the US Department of Agriculture, Economic Research Service Cooperative Agreement No. 43-3AEM-0-80071.

This work is a publication of the US Department of Agriculture Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX. The contents of this publication do not necessarily reflect the views or policies of the US Department of Agriculture, nor does mention of trade names, commercial products, or organizations imply endorsement from the US government.

The authors thank the many people who contributed to the Bogalusa Heart Study collaborative effort. The authors also thank the children and young adults of Bogalusa without whom this study would not have been possible, Pamelia Harris for help in preparing the manuscript, and Bee Wong for help in gathering research articles.

References

1. Pereira MA, Kartashov AI, Ebbeling CB, Van Horn L, Slattery ML, Jacobs DR Jr, Ludwig DS. Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. Lancet 2005;365:36–42. [PubMed: 15639678]
2. Urbina EM, Srinivasan SR, Kieltyka RL, Tang R, Bond MG, Chen W, Berenson GS. Correlates of carotid artery stiffness in young adults: The Bogalusa Heart Study. Atherosclerosis 2004;176:157–164. [PubMed: 15306189]
3. Schulze MB, Manson JE, Ludwig DS, Colditz GA, Stampfer MJ, Willett WC, Hu FB. Sugar-sweetened beverages, weight gain, and incidence of type 2 diabetes in young and middle-aged women. JAMA 2004;292:927–934. [PubMed: 15328324]
4. Potischman N, Coates RJ, Swanson CA, Carroll RJ, Daling JR, Brogan DR, Gammon MD, Midthune D, Curtin J, Brinton LA. Increased risk of early-stage breast cancer related to consumption of sweet foods among women less than age 45 in the United States. Cancer Causes Control 2002;13:937–946. [PubMed: 12588090]
5. Zizza C, Siega-Riz AM, Popkin BM. Significant increase in young adults' snacking between 1977-1978 and 1994-1996 represents a cause for concern! Prev Med 2001;32:303–310. [PubMed: 11304090]
6. Nielsen SJ, Siega-Riz AM, Popkin BM. Trends in food locations and sources among adolescents and young adults. Prev Med 2002;35:107–113. [PubMed: 12200094]
7. Grunbaum JA, Kann L, Kinchen SA, Williams B, Ross JG, Lowry R, Kolbe L. Youth risk behavior surveillance—United States, 2001. J Sch Health 2002;72:313–328. [PubMed: 12389372]
8. Galobardes B, Morabia A, Bernstein MS. Diet and socioeconomic position: Does the use of different indicators matter? Int J Epidemiol 2001;30:334–340. [PubMed: 11369739]
9. Giskes K, Turrell G, Patterson C, Newman B. Socioeconomic differences in fruit and vegetable consumption among Australian adolescents and adults. Public Health Nutr 2002;5:663–669. [PubMed: 12372160]
10. Mishra G, Ball K, Arbuckle J, Crawford D. Dietary patterns of Australian adults and their association with socioeconomic status: Results from the 1995 National Nutrition Survey. Eur J Clin Nutr 2002;56:687–693. [PubMed: 12080411]
11. Hulshof KF, Brussaard JH, Kruizinga AG, Telman J, Lowik MR. Socioeconomic status, dietary intake, and 10-y trends: The Dutch National Food Consumption Survey. Eur J Clin Nutr 2003;57:128–137. [PubMed: 12548307]
12. Prattala RS, Groth MV, Oltersdorf US, Roos GM, Sekula W, Tuomainen HM. Use of butter and cheese in 10 European countries: A case of contrasting educational differences. Eur J Public Health 2003;13:124–132. [PubMed: 12803410]
13. Sanchez-Villegas A, Martinez JA, Prattala R, Toledo E, Roos G, Martinez-Gonzalez MA. A systematic review of socioeconomic differences in food habits in Europe: Consumption of cheese and milk. Eur J Clin Nutr 2003;57:917–929. [PubMed: 12879086]
14. Eikenberry N, Smith C. Healthful eating: Perceptions, motivations, barriers, and promoters in low-income Minnesota communities. J Am Diet Assoc 2004;104:1158–1161. [PubMed: 15215777]
15. Robinson SM, Crozier SR, Borland SE, Hammond J, Barker DJ, Inskip HM. Impact of educational attainment on the quality of young women's diets. Eur J Clin Nutr 2004;58:1174–1180. [PubMed: 15054431]

16. Neumark-Sztainer D, Wall M, Perry C, Story M. Correlates of fruit and vegetable intake among adolescents. Findings from Project Eat. Prev Med 2003;37:198–208. [PubMed: 12914825]
17. Patterson BH, Harlan LC, Block G, Kahle L. Food choices of whites, blacks, and Hispanics: Data from the 1987 National Health Interview Survey. Nutr Cancer 1995;23:105–119. [PubMed: 7644380]
18. Gans KM, Burkholder GJ, Risica PM, Lasater TM. Baseline fat-related dietary behaviors of white, Hispanic, and black participants in a cholesterol screening and education project in New England. J Am Diet Assoc 2003;103:699–706. [PubMed: 12778040]
19. Champagne CM, Bogle ML, McGee BB, Yadrick K, Allen HR, Kramer TR, Simpson P, Gossett J, Weber J. Dietary intake in the lower Mississippi delta region: Results from the Foods of our Delta Study. JAm Diet Assoc 2004;104:199–207. [PubMed: 14760567]
20. Gerrior SA, Guthrie JF, Fox JJ, Lutz SM, Keane TP, Basiotis PP. Differences in dietary quality of adults living in single versus multiperson households. J Nutr Educ 1995;27:113.
21. Waite LJ. Does marriage matter? Demography 1995;32:483–507. [PubMed: 8925942]
22. Roos E, Lahelma E, Virtanen M, Prattala R, Pietinen P. Gender, socioeconomic status and family status as determinants of food behavior. Soc Sci Med 1998;46:1519–1529. [PubMed: 9672392]
23. Davis MA, Murphy SP, Neuhaus JM, Gee L, Quiroga SS. Living arrangements affect dietary quality for US adults aged 50 years and older: NHANES III 1988-1994. J Nutr 2000;130:2256–2264. [PubMed: 10958821]
24. van Dam RM, Grievink L, Ocke MC, Feskens EJ. Patterns of food consumption and risk factors for cardiovascular disease in the general Dutch population. Am J Clin Nutr 2003;77:1156–1163. [PubMed: 12716666]
25. Jago R, Nicklas T, Baranowski T, Zakeri I, Yang SJ, Berenson G. Physical activity and health enhancing dietary behaviors in young adults: Bogalusa Heart Study. Prev Med 2005;41:194–202. [PubMed: 15917011]
26. French SA. Pricing effects on food choices. J Nutr 2003;133:841S–843S. [PubMed: 12612165]
27. Drewnowski A. Obesity and the food environment: Dietary energy density and diet costs. Am J Prev Med 2004;27(suppl 3):154–162. [PubMed: 15450626]
28. Raynor HA, Kilanowski CK, Esterlis I, Epstein LH. A cost-analysis of adopting a healthful diet in a family-based obesity treatment program. J Am Diet Assoc 2002;102:645–656. [PubMed: 12008989]
29. Reed, J.; Frazao, E.; Itskowitz, R. How Much Do Americans Pay for Fruits and Vegetables?. US Department of Agriculture; Washington, DC: 2004. USDA/ERA Report No. AIB-790
30. Crawford PB, Obarzanek E, Schreiber GB, Barrier P, Goldman S, Frederick MM, Sabry ZI. The effects of race, household income, and parental education on nutrient intakes of 9- and 10-year-old girls. NHLBI Growth and Health Study. Ann Epidemiol 1995;5:360–368. [PubMed: 8653208]
31. Archer SL, Hilner JE, Dyer AR, Greenlund KJ, Colangelo LA, Kiefe CI, Liu K. Association of education with dietary intake among young adults in the biethnic Coronary Artery Risk Development in Young Adults (CARDIA) cohort. Public Health Nutr 2003;6:689–695. [PubMed: 14552670]
32. Hu FB, Rimm E, Smith-Warner SA, Feskanich D, Stampfer MJ, Ascherio A, Sampson L, Willett WC. Reproducibility and validity of dietary patterns assessed with a food-frequency questionnaire. Am J Clin Nutr 1999;69:243–249. [PubMed: 9989687]
33. Ursin G, Ziegler RG, Subar AF, Graubard BI, Haile RW, Hoover R. Dietary patterns associated with a low-fat diet in the national health examination follow-up study: Identification of potential confounders in epidemiologic analyses. Am J Epidemiol 1993;137:916–927. [PubMed: 8484383]
34. Lee CN, Reed DM, MacLean CJ, Yano K, Chiu D. Dietary potassium and stroke. N Engl J Med 1988;318:995–996. [PubMed: 3352691]
35. National Academy of Sciences, National Research Council, Food and Nutrition Board. Diet and Health: Implications for Reducing Chronic Disease Risk. National Academies Press; Washington, DC: 1989.
36. Arab L, Carriquiry A, Steck-Scott S, Gaudet MM. Ethnic differences in the nutrient intake adequacy of premenopausal US women: Results from the Third National Health Examination Survey. J Am Diet Assoc 2003;103:1008–1014. [PubMed: 12891149]
37. Satia-Abouta J, Galanko JA, Martin CF, Potter JD, Ammerman A, Sandler RS. Associations of micro-nutrients with colon cancer risk in African Americans and whites: Results from the North Carolina Colon Cancer Study. Cancer Epidemiol Biomarkers Prev 2003;12:747–754. [PubMed: 12917206]

38. Perry CA, Renna SA, Khitun E, Ortiz M, Moriarty DJ, Caudill MA. Ethnicity and race influence the folate status response to controlled folate intakes in young women. J Nutr 2004;134:1786–1792. [PubMed: 15226470]
39. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999-2000. JAMA 2002;288:1723–1727. [PubMed: 12365955]
40. Lipowicz A, Gronkiewicz S, Malina RM. Body mass index, overweight, and obesity in married and never married men and women in Poland. Am J Hum Biol 2002;14:468–475. [PubMed: 12112568]
41. Berenson, GS.; McMahan, CA.; Voors, AW.; Webber, LS.; Srinivasan, SR.; Frank, GC.; Foster, TA.; Blonde, CV. Cardiovascular Risk Factors in Children—The Early Natural History of Atherosclerosis and Essential Hypertension. Oxford University Press; New York, NY: 1980.
42. Rockett H, Breitenbach M, Frazier A, Witschi J, Wolf A, Field A, Colditz G. Validation of a youth/adolescent food frequency questionnaire. Prev Med 1997;26:808–816. [PubMed: 9388792]
43. Rockett HRH, Wolf AM, Colditz GA. Development and reproducibility of a food frequency questionnaire to assess diets of older children and adolescents. J Am Diet Assoc 1995;95:336–340. [PubMed: 7860946]
44. Ainsworth BE, Jacobs DR Jr, Leon AS. Validity and reliability of self-reported physical activity status: The Lipid Research Clinics questionnaire. Med Sci Sports Exerc 1993;25:92–98. [PubMed: 8423761]
45. Steffen LM, Jacobs DR Jr, Stevens J, Shahar E, Carithers T, Folsom AR. Associations of whole-grain, refined-grain, and fruit and vegetable consumption with risks of all-cause mortality and incident coronary artery disease and ischemic stroke: The Atherosclerosis Risk in Communities (ARIC) study. Am J Clin Nutr 2003;78:383–390. [PubMed: 12936919]
46. Zemel MB, Miller SL. Dietary calcium and dairy modulation of adiposity and obesity risk. Nutr Rev 2004;62:125–131. [PubMed: 15141427]
47. Johnston CS, Tjonn SL, Swan PD. High-protein, lowfat diets are effective for weight loss and favorably alter biomarkers in healthy adults. J Nutr 2004;134:586–591. [PubMed: 14988451]
48. Tucker KL. Dietary intake and coronary heart disease: A variety of nutrients and phytochemicals are important. Curr Treat Options Cardiovasc Med 2004;6:291–302. [PubMed: 15212724]
49. Hallfrisch J, Behall KM. Mechanisms of the effects of grains on insulin and glucose responses. J Am Coll Nutr 2000;19(suppl 3):320S–325S. [PubMed: 10875604]
50. Dietary Guidelines for Americans. 2005. Available at: http://www.healthierus.gov/dietaryguidelines/. Accessed November 10, 2006.
51. Sanchez-Villegas A, Martinez-Gonzalez MA, Toledo E, de Irala-Estevez J, Martinez JA. Relative role of physical inactivity and snacking between meals in weight gain. Med Clin (Barc) 2002;119:46–52. [PubMed: 12084369]
52. Breslow RA, Smothers BA. Drinking patterns and body mass index in never smokers: National Health Interview Survey, 1997-2001. Am J Epidemiol 2005;161:368–376. [PubMed: 15692081]
53. Colhoun, Prescott-Clarke. Health survey for England 1994. Cited by: McLaren L, Kuh D. Women's body dissatisfaction, social class, and social mobility. Soc Sci Med 2004;58:1575–1584. [PubMed: 14990360]
54. Neumark-Sztainer D, Story M, Perry C, Casey MA. Factors influencing food choices of adolescents: Findings from focus-group discussions with adolescents. J Am Diet Assoc 1999;99:929–937. [PubMed: 10450307]
55. Moore AA, Gould R, Reuben DB, Greendale GA, Carter MK, Zhou K, Karlamangla A. Longitudinal patterns and predictors of alcohol consumption in the United States. Am J Public Health 2005;95:458–465. [PubMed: 15727977]
56. Sacco RL, Kargman DE, Zamanillo MC. Race-ethnic differences in stroke risk factors among hospitalized patients with cerebral infarction: The Northern Manhattan Stroke Study. Neurology 1995;45:659–663. [PubMed: 7723951]
57. Stockwell T, Donath S, Cooper-Stanbury M, Chikritzhs T, Catalano P, Mateo C. Under-reporting of alcohol consumption in household surveys: A comparison of quantity-frequency, graduated-frequency, and recent recall. Addiction 2004;99:1024–1033. [PubMed: 15265099]

58. Goodman E, Adler NE, Daniels SR, Morrison JA, Slap GB, Dolan LM. Impact of objective and subjective social status on obesity in a biracial cohort of adolescents. Obes Res 2003;11:1018–1026. [PubMed: 12917508]

59. Block JP, Scribner RA, DeSalvo KB. Fast food, race/ethnicity, and income: A geographic analysis. Am J Prev Med 2004;27:211–217. [PubMed: 15450633]

60. Reedy J, Haines PS, Campbell MK. The influence of health behavior clusters on dietary change. Prev Med 2005;41:268–275. [PubMed: 15917021]

61. Gordis, L. Epidemiology. Vol. 2nd ed.. WB Saunders; Philadelphia, PA: 2000. Case control and cross-sectional studies; p. 153-155.

62. Willett WC, Sampson L, Stampfer MJ, Rosner B, Bain C, Witschi J, Hennekens CH, Speizer FE. Reproducibility and validity of a semiquantitative food frequency questionnaire. Am J Epidemiol 1985;122:51–65. [PubMed: 4014201]

63. Nicklas TA. Dietary studies of children and young adults (1973-1988): The Bogalusa Heart Study. Am J Med Sci 1995;310(suppl 1):S101–S108. [PubMed: 7503111]

64. Yoo S, Nicklas T, Baranowski T, Zakeri IF, Yang SJ, Srinivasan SR, Berenson GS. Comparison of dietary intakes associated with metabolic syndrome risk factors in young adults: The Bogalusa Heart Study. Am J Clin Nutr 2004;80:841–848. [PubMed: 15447888]

65. US Department of Agriculture, Human Nutrition Information Service, Nutrition Monitoring Division. Nationwide Food Consumption Survey, Continuing Survey of Food Intake by Individuals, Women 19-50 Years and Children 1-5 Years, 1986. US Department of Agriculture; Hyattsville, MD: 1988. NFCS-CSFII Report No. 86-93

66. Willett, WC. Nutritional Epidemiology. Oxford University Press; New York, NY: 1998.

67. Mendez MA, Wynter S, Wilks R, Forrester T. Underand overreporting of energy is related to obesity, lifestyle factors, and food group intakes in Jamaican adults. Public Health Nutr 2004;7:9–19. [PubMed: 14972067]

68. Melanson EL Jr, Freedson PS. Physical activity assessment: A review of methods. Crit Rev Food Sci Nutr 1996;36:385–396. [PubMed: 8725670]

Food group	Foods included
Breads and cereals	Hot and cold breakfast cereals, toast, dark bread, corn bread, other grains such as kasha, couscous, bulgar, white bread, pita bread, noodles/pasta, rice, English muffins, muffins, biscuits and rolls, tortilla, pancakes
Dairy products	Whole milk, chocolate milk, instant breakfast drink, whipped cream, yogurt, cottage or ricotta cheese, cheese, cream cheese, low-fat milk, non-fat yogurt, low-fat/non-fat cottage cheese, low- or non-fat cheese, and other low- or non-fat dairy products
Fruits and 100% fruit juices	Grapes, bananas, cantaloupes, melons, apples, pears, oranges, strawberries, peaches, plums, apricots, tomatoes 100% fruit juices: orange juice, apple juice, and other 100% fruit juices
Vegetables	Broccoli, greens or kale, coleslaw, spinach, lettuce, tossed salad, yams, carrots, beets other than greens, corn, green or red peppers, eggplant, zucchini, summer squash, mixed vegetables, string beans, peas, lentils, soybeans, french fries, baked/boiled/mashed potatoes, potato salad
Fats	Butter, margarine, oil
Meats	Beef, steak, lamb, pork, meatballs, meatloaf, chicken, turkey, chicken nuggets, fresh fish, fish sticks, fish cakes, eggs, liver (beef/calf/pork), shrimp, lobster, scallops
Burgers and sandwiches	Cheeseburger, hamburger, hot dogs, peanut butter sandwich, chicken or turkey sandwich, roast beef or ham sandwich, salami, bologna, other deli meat, fish sandwiches
Mixed dishes	Pizza, tacos/burritos, lasagna/baked ziti, macaroni and cheese, spaghetti with tomato sauce
Snacks and desserts	Potato chips, corn chips/nacho cheese chips, nachos with cheese, popcorn, pretzels, peanuts, fun fruit, graham crackers, other crackers like saltines and wheat crackers, toaster pastries, cakes, snack cakes, Danish sweet rolls, pastry, donuts, cookies, brownies, pie, chocolates, candy bars, other candy such as mints, flavored gelatin, pudding, frozen yogurt, ice cream, milkshake, popsicles
Sweetened beverages	Soda, fruit punch, lemonade, fruit ade and other non-carbonated fruit drinks, sweetened iced tea
Alcoholic beverages	Beer, wine, other distilled spirits

Figure.

Components of food groups from the youth and adolescent questionnaire: The Bogalusa Heart Study, 1995-1996.

Table 1

Demographic characteristics[a] of young adults by ethnicity and sex: The Bogalusa Heart Study, 1995-1996

Characteristics of young adults	Ethnicity		Sex		Ethnicity by Sex				
	EA[b]	AA[c]	Males	Females	EA males	EA females	AA males	AA females	Total
Original sample size									
n	942	324	490	776	368	574	122	202	
%	74.4	25.6	38.7	61.3	29.1	45.3	9.6	16.0	1,266
Body mass index (mean±SD[d])	26.7±6.2	29.3 ±8.1****	27.8±5.8	27.1 ±7.4	27.8±5.2^{x}	26±6.7^{y}	27.8±7.3^{x}	30±8.4^{z}	27.4±6.8
Age (mean±SD)	29.9±5	29.2±5.3*	30.2±5.1	29.4±5.1**	30.3±5^{x}	29.6 ±5^{xy}	29.9±5.3^{xy}	28.7±5.3^{y}	29.7±5.1
Energy intake (kcal) (mean±SD)	2,055±636.8	2,290.7±759.4****	2,262±722.3	2,023.5±631.4****	2,208.8±687.6^{x}	1,957.5±581.7^{y}	2,422.5±799.9^{z}	2,211.0±724.3^{x}	2,115.8±677.8
Income levels[e]									
≤$15,000									
n	203	176	135	244	69	134	66	110	379
%	23	63	30	33	20	24	65	61	32
$15,001-$30,000									
n	255	63	128	190	104	151	24	39	318
%	28	23	28	26	29	27	24	22	27
$30,001-$45,000									
n	200	27	83	144	79	121	4	23	227
%	22	10	18	20	22	22	4	13	19
>$45,000									
n	246	14	108	152	101	145	7	7	260
%	27	5	24	21	29	26	7	4	22
Education[e] >12 y									
n	629	151	272	508	226	403	46	105	780
%	72	54	61	71	66	75	43	60	67
Education[e] ≤12 y									
n	250	130	176	204	116	134	60	70	380
%	28	46	39	29	34	25	57	40	33
Physical activity[ef] Mean±SD	3.2±1	3.4±1.2***	3.4±1.1	3.1±1.1****	3.4±1.0^{x}	3.1±1.1^{y}	3.7±1.3^{z}	3.2±1.2^{xy}	3.2±1.1
Married young adults									
n	568	75	233	410	209	359	24	51	643
%	61	23	48	53	57	63	20	25	51

[a] Income levels were associated with ethnicity (*P*<0.0001) and ethnicity by sex (*P*<0.0001); education levels were associated with ethnicity (*P*<0.0001), sex (*P*<0.0001), and ethnicity by sex (*P*<0.0001). Being married was associated with ethnicity (*P*<0.0001). Values with different superscripts (x, y, z) have significant mean differences at *P*<0.0001. Pairwise comparisons tested by Tukey-Kramer's multiple comparison test are significant at *P*<0.05.

[b] EA=European Americans.

[c] AA=African Americans.

[d] SD=standard deviation.

[e] Sample size varies from original due to missing data for income levels (n=82), education levels (n=106), and physical activity levels (n=75).

[f] Likert scale (1-5): 1 to 3=physically inactive (sedentary); 4 to 5=physically very active.

* *P*<0.05.

** *P*<0.01.

*** *P*<0.001.

**** *P*<0.0001.

Table 2

Food group consumption[a] in young adults (aged 20 to 38 years) by socioeconomic status: The Bogalusa Heart Study, 1995-1996

	Income Levels (n=1,184)[b]				Education Levels (n=1,160)[c]	
Food Groups	**≤\$15,000 (n=379)**	**\$15,001-30,000 (n=318)**	**\$30,001-45,000 (n=227)**	**>\$45,000 (n=260)**	**≤12 y (n=380)**	**>12 y (n=780)**
Breads and cereals	2.18	2.26	2.23	2.28	2.16	2.32*
Milk	0.61	0.64	0.60	0.70	0.60	0.68
Cheese	0.36	0.36	0.36	0.34	0.32	0.39*
Yogurt	0.008	0.038	0.035	0.04	0.02	0.04*
Dairy products	0.98	1.04	1.00	1.08	0.94	1.11**
Fruits and 100% fruit juices	1.10	1.26	1.30	1.35	1.14	1.37***
Vegetables including french fries	2.12	2.30	2.36	2.34	2.15	2.41***
Vegetables excluding french fries	1.91	2.08	2.13	2.12	1.91	2.2***
Fats	1.80	1.54	1.52	1.44	1.57	1.58
Meats	1.12	1.16	1.16	1.15	1.15	1.14
Burgers and sandwiches	0.78^{x}	0.74^{xy}	0.76^{x}	0.68^{y}	0.76	0.73
Mixed dishes	0.56^{x}	0.50^{y}	0.49^{y}	0.51^{xy}	0.5	0.53
Snacks and desserts	2.21	2.19	2.32	2.51	2.36	2.25
Sweetened beverages	1.60	1.54	1.48	1.41	1.6	1.45
Alcoholic beverages	0.19	0.17	0.2	0.21	0.19	0.20

[a] All values are least squared means of food group servings consumed per day. Standard errors (not shown) are available from the authors upon request.

[b] Sample size varies from original due to missing data (n=82). Analysis of covariance model for income levels adjusted for energy intake, body mass index, age, education, marital status, physical activity level, ethnicity, sex, and ethnicity by sex. Different superscripts (x, y) indicate significant mean differences at $P<0.01$ for both burgers and sandwiches and mixed dishes, respectively. Pairwise comparisons tested by Tukey-Kramer's multiple comparison test are significant at $P<0.05$.

[c] Sample size varies from original due to missing data (n=106). Analysis of covariance model for education levels adjusted for energy intake, body mass index, age, income, marital status, physical activity level, ethnicity, sex, and ethnicity by sex.

* $P<0.05$.

** $P<0.01$.

*** $P<0.001$.

NIH-PA Author Manuscript
NIH-PA Author Manuscript

Table 3

Food group consumption[a] in young adults (aged 20 to 38 years) by ethnicity and sex: The Bogalusa Heart Study, 1995-1996

	Ethnicity (n=1,266)		Sex (n=1,266)		Ethnicity by Sex (n=1,266)			
Food group	**EA[b] (n=942)**	**AA[c] (n=324)**	**Males (n=490)**	**Females (n=776)**	**EA males (n=368)**	**EA females (n=574)**	**AA males (n=122)**	**AA females (n=202)**
Breads and cereals	2.26	2.3	2.24	2.28	2.2	2.29	2.35	2.26
Milk	0.8	0.58****	0.79	0.73	0.83^{z}	0.78^{y},^{z}	0.6^{xy}	0.57^{x}
Cheese	0.43	0.37*	0.39	0.43	0.4^{xy}	0.45^{y}	0.39^{xy}	0.36^{x}
Yogurt	0.04	0.04	0.03	0.05*	0.03	0.05	0.03	0.04
Dairy products	1.28	0.98****	1.21	1.2	1.27^{y}	1.29^{y}	1.01^{x}	0.97^{x}
Fruits and 100% fruit juices	1.14	1.53****	1.17	1.28*	1.08^{y}	1.18^{y}	1.45^{x}	1.58^{x}
Vegetables including french fries	2.5	2.13****	2.21	2.52****	2.29^{z}	2.64^{y}	1.97^{x}	2.21^{xz}
Vegetables excluding french fries	2.27	1.91****	1.92	2.26***	2.06	2.47	1.78	2.04
Fats	1.83	1.36****	1.49	1.85****	1.57^{z}	2^{y}	1.22^{x}	1.43^{xz}
Meats	1.11	1.13	1.1	1.12	1.09	1.12	1.41	1.13
Burgers and sandwiches	0.73	0.76	0.82	0.69****	0.81^{y}	0.68^{x}	0.86^{y}	0.7^{x}
Mixed dishes	0.56	0.49****	0.53	0.55*	0.53^{x}	0.58^{y}	0.5^{x}	0.49^{x}
Snacks and desserts	2.14	2.42**	2.16	2.25	2.09^{y}	2.18^{xy}	2.38^{xy}	2.44^{x}
Sweetened beverages	1.65	1.48**	1.61	1.6	1.71^{y}	1.61^{y}	1.32^{x}	1.58^{xy}
Alcoholic beverages	0.17	0.24****	0.25	0.16***	0.20	0.14	0.29	0.18

[a] All values are least squared means of food group servings consumed per day. Standard errors (not shown) are available from the authors upon request. Analysis of covariance models for sex, ethnicity, and ethnicity by sex adjusted for energy intake, body mass index, and age, respectively. Different superscripts (x, y, z) indicate significant mean differences for milk (P<0.001), cheese (P<0.05), dairy products (P<0.0001), fruits and 100% fruit juices (P<0.0001), vegetables, including french fries (P<0.0001), fats (P<0.0001), burgers/sandwiches (P<0.0001), mixed dishes (P<0.0001), snacks and desserts (P<0.01), and sweetened beverages (P<0.01). Pairwise comparisons tested by Tukey-Kramer's multiple comparison test are significant at P<0.05.

[b] EA=European Americans.

[c] AA=African Americans.

* P<0.05.

** P<0.01.

*** P<0.001.

**** P<0.0001.

NIH-PA Author Manuscript
NIH-PA Author Manuscript

Table 4

Food group consumption[a] in young adults (aged 20 to 38 years) by lifestyle factors: The Bogalusa Heart Study, 1995-1996

	Marital Status[b] (n=1,266)		Physical Activity Levels[c] (n=1,191)[d]				
Food group	**Married (n=643)**	**Not married (n=623)**	**1 (n=74)**	**2 (n=181)**	**3 (n=544)**	**4 (n=180)**	**5 (n=212)**
Breads and cereals	2.26	2.22	2.11	2.37	2.17	2.36	2.19
Milk	0.65	0.62	0.54	0.64	0.61	0.65	0.76
Cheese	0.35	0.36	0.31	0.36	0.39	0.37	0.34
Yogurt	0.02	0.04	0.01	0.03	0.03	0.03	0.05
Dairy products	1.03	1.02	0.86	1.02	1.04	1.05	1.15
Fruits and 100% fruit juices	1.22	1.29	1.14^{xy}	1.06^{x}	1.27^{xy}	1.37^{y}	1.42^{y}
Vegetables including french fries	2.21	2.35	2.17	2.18	2.24	2.38	2.43
Vegetables excluding french fries	2.00	2.12	1.93	1.95	2.03	2.18	2.21
Fats	1.62	1.53	1.73	1.62	1.54	1.53	1.46
Meats	1.14	1.15	1.24	1.11	1.11	1.11	1.16
Burgers and sandwiches	0.75	0.74	0.72^{xy}	0.78^{x}	0.75^{xy}	0.69^{y}	0.77^{xy}
Mixed dishes	0.52	0.51	0.56	0.51	0.52	0.50	0.49
Snacks and desserts	2.40	2.21*	2.18	2.40	2.37	2.26	2.32
Sweetened beverages	0.60	0.68	1.60	1.47	1.54	1.57	1.37
Alcoholic beverages	0.16	0.23****	0.17	0.18	0.21	0.2	0.22

[a] All values are least squared means of food group servings consumed per day. Standard errors (not shown) are available from the authors upon request.

[b] Analysis of covariance model for marital status adjusted for energy intake, body mass index, age, income, education, ethnicity, sex, ethnicity by sex, and physical activity.

[c] Likert scale (1-5): 1 to 3=physically inactive (sedentary), 4 to 5=physically very active. Analysis of covariance model for physical activity levels adjusted for energy intake, body mass index, age, income, marital status, education, ethnicity, sex, and ethnicity by sex. Different superscripts (x, y) indicate significant mean differences for fruits and 100% fruit juices ($P<0.01$) and burgers and sandwiches ($P<0.05$). Pairwise comparisons tested by Tukey-Kramer's multiple comparison test are significant at $P<0.05$.

[d] Sample size varies from original due to missing data for physical activity (n=75).

* $P<0.05$.

**** $P<0.0001$.