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Multiple Measures of Physical Activity, Dietary Habits and Weight Status in African American and Hispanic or Latina Women

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Abstract

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Compared measures of physical activity and dietary habits used in the Health Is Power (HIP) study, and described the associations of physical activity and dietary habits among African American and Hispanic or Latino women, adjusted for weight status. Cross-sectional baseline data were compared for community dwelling, healthy African American (N = 262) and Hispanic or Latina women (N = 148) who participated in HIP. Physical activity was measured using the International Physical Activity Questionnaire (IPAQ) long form, the Check And Line Questionnaire (CALQ) log and accelerometry. Dietary habits were measured using NCI 24-h recall screeners, vegetable and fruit (VF) logs and the NCI Diet History Questionnaire (DHQ). Differences in physical activity and dietary habits were assessed using simultaneous 2 (ethnicity) × 3 (weight status) ANCOVAs adjusted for age and socioeconomic status. Women (M age = 44.4 ± 10.9 years) were obese (M = 34.0 ± 9.7 kg/m^2), did not meet physical activity guidelines as measured by accelerometry (M = 19.4 ± 19.1 min MVPA/day) and ate few VF (M = 2.8 ± 2.7 servings/day). DHQ variables differed by weight status. IPAQ was associated with CALQ, and CALQ with accelerometry (P < .05). IPAQ was not associated with accelerometry. Regardless of ethnicity, normal weight women did more physical activity, reported more VF consumption, and consumed more fat calories than overweight and obese women (Ps < .05). African American women did more MVPA than Hispanic or Latino women (P < .001). Relationships between behaviors and weight status suggest accelerometry and DHQ are preferable, regardless of ethnicity; and studies may capture different domains of physical activity and dietary habits depending on measure used.

Keywords

Minority health; Obesity; Women; Physical activity; Nutrition

Introduction

Populations of color in the US have higher prevalence of physical *in*activity (35% of African Americans and 40% of Hispanics vs. 18% of Caucasians and 29% of the US population), with African American and Hispanic women having higher prevalence of physical inactivity than men (41% of African American and 45.7% of Hispanic women vs. 23% of African American and 29% of Hispanic men) even after adjusting for SES factors [1]. Current dietary habits in populations of color are poorly documented by prevalence data. Some data suggest that African Americans may have poorer dietary habits compared to non-Hispanic whites [2–4], although there is some evidence to suggest that Hispanics consume more fruits and vegetables compared to other groups; but fewer than 40% of all Americans from all groups meet daily recommendations [5]. The high prevalence of physical inactivity and poor dietary habits, and particularly the large health disparities that exist among populations of color and women (compared to whites and men), are a concern as they may contribute to the development of obesity, and to a number of related health compromising conditions, such as cardiovascular disease, type 2 diabetes and some cancers [6–8]. The prevalence of obesity among women of color in the US is particularly troubling, as 54% of non-Hispanic black and 42% of Mexican-American women are obese, compared to 31% of non-Hispanic white women [9].

Despite these existing prevalence data, many inconsistencies remain in the assessment and understanding of these health behaviors, contributing to unsuccessful interventions and health promotion efforts. Many of the studies examining physical activity in African American and Hispanic or Latino women historically have relied on self-reported measures of physical activity rather than objective measures of physical activity [10–16]. More recent data sets have documented accelerometry measured physical activity and subsequent comparison to self report; however, these large epidemiological data sets do not allow for detailed investigation of health behaviors and characteristics [17–19]. There are a less than a handful of in depth studies comparing physical activity measurement strategies in African American women [20–23] and only one done in Hispanic or Latino women [24]; nearly all of these are conducted with smaller sample sizes, with little consideration of possible factors that might influence the relationship between accelerometer-measured and self-reported physical activity.

The dearth of studies done on African American and Hispanic or Latina women point to a need for greater measurement development and testing. In comparing self-report measures of physical activity to objective measures, there may be low correspondence, in part related to intentional and unintentional biases in reporting, or to inaccuracies or irregularities in objective measurement protocols [25]. Self-report measures of physical activity have been estimated to account for only 10–15% of the variance in actual physical activity, and are thus prone to extensive misclassification of individual and population physical activity [26]. These low numbers may be driven by individual characteristics such as weight status or ethnic differences, which have not been studied extensively.

Studies of dietary habits in women of color have focused primarily on fat and fruit and vegetable consumption, without providing a detailed understanding of the complexities of dietary habits in these populations. For example, African American women report diets high in dietary fat and low in fruit and vegetables more often than non-Hispanic white women [2–4]. As few as one in every four African American adults report low fat intake diets compared to one in three non-Hispanic whites or Hispanic adults [27]. However previous studies have found an overestimation of self-reported vegetable intake compared to observed intake in ethnic minority populations [28]. Studies that have used dietary history questionnaires, widely regarded as a superior method of dietary assessment for larger and non-clinic based studies [29, 30], have been validated in several studies [29–31], but have been less commonly used to report and compare more detailed information about dietary habits in these populations.

Studies measuring and comparing physical activity and dietary habits and their correlates in African American and Hispanic or Latina women are needed. There is an evident dearth of data describing these factors in these most vulnerable populations. Most studies investigating correlates of these behaviors have relied on a single measure of the health behavior under investigation unable to adequately assess the complexities of health behaviors. Self-report measures are influenced by intentional and unintentional biases, while objective measures may suffer from operator error or device failures. The lack of investigation and understanding of important individual level factors, such as weight status and ethnicity, may contribute to measurement inconsistencies and hamper reliability and validity. Physical activity and dietary habits measurements may vary significantly by weight status across all populations, but may be a particularly important variable in women of color given the high vulnerability toward overweight and obesity [32–35].

The Health Is Power (HIP) study was a 5-year, multi-site longitudinal study (R01CA109403) to increase physical activity and improve dietary habits in African American and Hispanic or Latina women in Houston and Austin, Texas. The HIP study provides an excellent opportunity to explore relationships in physical activity and dietary habits within and between these two ethnic groups. The purposes of the study were to (1) evaluate the interrelationships within measures of physical activity and dietary habits, (2) evaluate relationships between physical activity and dietary habits measures and (3) determine whether these relationships differed by ethnicity and weight status. We expected physical activity and dietary habits to vary between African American and Hispanic or Latina women and vary by weight status. Findings from this study can enhance understanding of physical activity and dietary habits in women of color across weight status groups and aid with the development of effective obesity prevention and control strategies.

Methods

Participants

Four hundred ten community dwelling, African American and Hispanic or Latina women (311 in Houston and 99 in Austin) were enrolled in the study and assessed. Of those enrolled in Houston, 84.6% identified as African American and 15.4% identified as Hispanic or Latina; all participants in Austin identified as Hispanic or Latina. All HIP study assessments, measures and procedures were approved by the Committee for the Protection of Human Subjects at the University of Houston, and participants provided written informed consent to participate.

Procedure

Participants were recruited via posted advertisements in local media and in announcements in bulletins of community partners to participate in a health promotion intervention focused on increasing physical activity or vegetable and fruit consumption. Interested participants completed a telephone-administered inclusionary screener, which included a brief description of the study and the Physical Activity Readiness Questionnaire (PAR-Q) [36]. Physically inactive women between the ages of 25 and 60 years old were invited to participate in the project.

Women who met inclusionary criteria were consented and completed a baseline, Time 1 (T1) health assessment. At the T1 assessment, participants completed an interviewer administered questionnaire, anthropometric measures of body mass index (BMI = kg/m^2) and body fat, and they were given a take home packet to complete before the next meeting (approximately 1 week later). The packet contained more detailed questionnaires not found in the interviewer-administered survey, including the CALQ, the DHQ and the VF log. Women who completed the packet were eligible to complete the accelerometer assessment.

Women participating in the accelerometer assessment were instructed to wear the accelerometer for 7 days at all times, except when showering or sleeping. To enhance compliance, women were given an accelerometer log, where they recorded the date, time they put the accelerometer on and time they took the accelerometer off. At the end of 7 days, women returned the accelerometer to the study team to download and process the accelerometer data as previously described [37].

Measures

Physical Activity—The *International Physical Activity Questionnaire* (IPAQ) long form was interviewer-administered at the baseline health assessment. The IPAQ was used to measure self-reported total physical activity, including work-related, transportation, domestic and leisure-time physical activity and walking-, moderate- and vigorous-intensity physical activity, over the last 7 days [38]. Physical activity was reported in terms of MET-minutes per week. IPAQ is widely used and reliable ($r = 0.8$) but has shown relatively low validity ($r = 0.3$) when compared to accelerometry [39], suggesting measurement of divergent elements of physical activity.

The *Check And Line Questionnaire* (CALQ) was used to measure self-reported detailed daily physical activity for 7 days [40]. The CALQ was administered in the run-in packet. Women were asked to monitor and record their physical activity for 7 days using check boxes that could be connected by drawing a line through them. The CALQ measures type of physical activity, number of 15-min sessions of the physical activity, whether the 15-min sessions were done continuously, and intensity.

Objective physical activity data were collected using a uni-directional ActiGraph GT1M accelerometer (ActiGraph, Pensacola, FL) [41]. The ActiGraph accelerometer exhibits strong associations between activity counts and measured energy expenditure, is responsive to different intensities of physical activity and has the lowest amount of variance across measurement devices, indicating strong (ICC = 0.87) reliability and validity [42]. An average number of minutes spent in moderate or greater physical activity (MVPA) per week was used in analyses.

Dietary Habits—Dietary habits were measured using the National Cancer Institute's *Fruit and Vegetable Screener* and *Fat Screener* [43, 44]. Fruit and vegetable consumption was reported in terms of frequency and amount consumed over the last month. The Fruit and Vegetable All-day Screener has adequate validity ($r = 0.68$ in men, 0.49 in women) in white adults when compared to the By-Meal Screener [45]. The Fat Screener measures an individual's usual dietary intake of percent calories from fat. The Fat Screener has good validity ($r = 0.64$ in men, 0.58 in women) in adults when compared to true intake [44].

The National Cancer Institute's *Diet History Questionnaire* (DHQ) was administered in the run-in packet to measure food frequency and amount for 124 food items over the past 12 months. The Diet History Questionnaire has adequate validity (rs = 0.49 in men, 0.48 in women) and reliability (r= 0.7–0.85) in predominantly white men and women when compared to the Food Frequency Questionnaire [30, 31].

The *Vegetable and Fruit Log* (VF Log) was designed to measure self-reported detailed daily fruit and vegetable consumption for 7 days. The VF Log was administered in the run-in packet. Women were asked to monitor and record their vegetable and fruit consumption for 7 days, including type of vegetable and fruit eaten, number of ½-cup servings, whether multiple servings were consumed at one sitting, and color of vegetable or fruit eaten.

Anthropometry—Anthropometric measures of BMI and body fat were collected by trained personal using established protocols [46]. Height was measured using a stadiometer. Body weight, BMI and percent body fat were measured in both pounds and kilograms using a Tanita TBF-310 body composition analyzer (Tanita, Arlington Heights, IL) [47]. Each measure was taken twice, and an average of the two measurements was used in analyses.

Analyses

Descriptive analyses were performed to describe individual health characteristics of the study sample by weight status and ethnicity, African American and Hispanic or Latina. Physical activity average minutes per day (measured by an accelerometer), MET-minutes per week and physical activity intensity categories were used in analyses. Fruit and vegetable servings, dietary fat intake and other nutrient intake were used in analyses.

Weight status was derived from individual BMI using the following classifications:

1 = Normal (BMI 18.5–24.9 kg/m^2)

2 = Overweight (25–29.9 kg/m^2)

3 = Obese (30+ kg/m^2)

Interrelationships between physical activity measures and dietary habit measures were assessed using bivariate correlations. The relationship between physical activity and dietary habits was also assessed using bivariate correlations. Pearson correlations were computed for correlations among accelerometer, CALQ, screener and VF Log variables. Spearman's rho correlation coefficients (r_S) were computed for correlations among IPAQ and DHQ variables, which were positively skewed. Differences in physical activity and dietary habits were assessed using ANCOVA, adjusted for age (years) and socioeconomic status (income, education and parent's education), within ethnicity, across categories of weight status. Physical activity and nutrient intake measures were transformed by raising the value by one minus the slope, or one-fourth, prior to analyses to approximate normality. A P value of 0.05 was used as the criterion for all statistical testing.

Results

Descriptive Characteristics

Most participants were overweight or obese (M BMI = 34.0 kg/m^2, SD = 9.7) and had a mean body fat percentage of 41.8% (SD = 9.4). Two-thirds (66%) had graduated from high school or completed the GED, and nearly half (49.1%) reported an income 401% or greater above the Federal Poverty Level for a family of four [48]. Demographic characteristics by ethnicity and weight status are presented in Table 1.

Interrelationships Among Physical Activity Measures

Intercorrelations among physical activity measures are presented in Table 2. IPAQ transportation-related, leisure-time, and vigorous physical activity were significantly correlated with moderate or vigorous physical activity (MVPA) logged on the CALQ (r = .115–.119, P<.016– .020). Physical activity logged on the CALQ was correlated with accelerometry measured MVPA (r = .186, P = .011). IPAQ and accelerometry measures were not significantly correlated.

Interrelationships Among Dietary Habits Measures

Intercorrelations among dietary habits measures are presented in Table 3. Fruit and vegetable servings reported on the FV screener were correlated with total fruit and vegetable servings recorded on the VF Log (r = .164, P = .001) and fruit (r = .523, P < .001) and vegetable (r = .226, P = .001) servings on the DHQ. Screener servings of fruit and vegetables were also significantly correlated with food energy calories, carbohydrates and dietary fiber from the DHQ (r = .156–.322, P = .000–.026).

In general, FV screener and VF log measures of fruit and vegetable servings were consistent with vegetable and fruit servings on the DHQ and inversely related with fat intake. Servings of fruit and vegetables reported on the screener were negatively correlated with percent energy intake from fat reported on the DHQ (r = −.214, P = .002). Percent calories consumed from fat on the screener was positively correlated with total fat in grams (r = .318, P <.001) and percent energy intake from fat (r = .307, P< .001) on the DHQ. Screener calories from fat was negatively correlated with screener fruit and vegetable servings (r = −.099, P = .049) and VF Log fruit servings (r = −.103, P = .042) but not significantly correlated with VF Log vegetable servings. Percent calories consumed from fat on the screener was also positively correlated with food energy, protein and cholesterol intake reported on the DHQ (r = .168–.317, P = .000–.018). Total VF Log fruit and vegetable servings were correlated with servings of fruit (r = .293, P < .001) and vegetables (r = .302, P<.001) on the DHQ.

Relationships Between Measures of Physical Activity and Dietary Habits

Self-reported physical activity measured by the IPAQ was significantly correlated with dietary habits measures. IPAQ measured work (r_S = .111, P = .025), transportation (r_S = .104, P = .035), leisure-time (r_S = .127, P = .010), walking (r_S = .183, P < .001), vigorous intensity (r_S = .128, P = .010) and total (r_S = .161, P = .001) physical activity were positively correlated with fruit and vegetable servings reported on the Screener. IPAQ gardening and housework physical activity were correlated with total fruit and vegetable servings logged on the VF Log (r_S = .103, P = .038). IPAQ work (r_S = .142, P = .043) and walking (r_S = .168, P = .016) physical activity were significantly correlated with consumption of deep yellow vegetables as measured by DHQ.

International Physical Activity Questionnaire vigorous intensity physical activity was positively correlated with consumption of starchy vegetables (r_S = .155, P = .027) as measured by DHQ. Correlations between physical activity and dietary habits measures are presented in Table 4. Physical activity logged on the CALQ was not correlated with any dietary habits. Accelerometry measured physical activity was significantly correlated with percent calories consumed from fat (r = .164, P = .028) and consumption of dark green vegetables (r = .307, P = .001).

Physical Activity and Dietary Habits Differences by Ethnicity and Weight Status

Self-reported IPAQ, logged (CALQ) and measured (accelerometer) physical activity descriptive characteristics are presented in Table 5. IPAQ self-reported MVPA (converted from MET-minutes) ranged from 28 min per week for normal weight African American women to 90 min per week for normal weight Hispanic or Latina women. Obese African American women logged nearly 5 h of physical activity each week on their CALQ—two to three times as much MVPA per week than normal weight or overweight African American women. Mean accelerometer-measured MVPA ranged from 26.8 min per day for normal weight African American women to 9.7 min per day for obese Hispanic or Latina women. Obese and overweight African American women did less physical activity as measured by accelerometer compared to normal African American women. Normal weight Hispanic or Latina women logged (on CALQs) and did (measured by accelerometer) more MVPA than overweight and obese Hispanic or Latina women. African American women did significantly more MVPA accelerometry measured physical activity than Hispanic or Latina women (F(1,186) = 10.4, P = .002).

Dietary habits reported on the FV and Fat screeners, logged on the VF Log and reported on the DHQ are presented in Table 6. Fruit and vegetable servings per day measured by screener ranged from 1.7 for overweight Hispanic or Latina women to 3.2 for both normal weight African American and Hispanic or Latina women, which was higher than the average number of servings reported each day on the VF Log. Fruit and vegetable servings reported on the DHQ and VF Log were similar across all ethnicity and weight status groups. Percent of calories consumed from fat each day as measured by the Fat Screener ranged from 29.4% for normal weight Hispanic or Latina women to 32.3% for obese African American women. Protein, carbohydrate and total fat intakes as percentage of food energy consumption (in kcal) were similar across ethnicity and weight status groups. Protein averaged 15.2%, carbohydrate averaged 49.4% and total fat averaged 36.4% kcal across all women.

Post hoc comparisons among groups using F statistics and Bonferroni-type simultaneous confidence intervals showed African American and Hispanic or Latina normal weight women reported more fruit and vegetable consumption than overweight women (SE = 0.6, CI: 0.06–2.31, P = .039). Calorie consumption from fat varied significantly by weight status (F(2,387) = 4.7, P = .02). Post-hoc comparisons showed both African American and Hispanic or Latina normal weight women consumed fewer calories from fat than overweight and obese women (SE = 0.483, CI for difference: −3.105 to −0.166, P = .029). African American and normal weight women consumed more servings of dark green vegetables than Hispanic or Latina (F(1,199) = 7.2, P = .008) and overweight and obese (SE = 0.18, CI: 0.13–0.82, P = .007) women, respectively, but the interaction between ethnicity and weight status was not significant. Statistically significant physical activity and dietary habits differences between ethnicity and weight status groups are indicated by boldface in Tables 5 and 6.

Discussion

This study is among the first to measure interrelationships within and between physical activity and dietary habits measures and determine whether these measures differed by ethnicity and weight status in a sizable sample of African American and Hispanic or Latina community dwelling women. We found that African American women demonstrated significantly more accelerometry measured physical activity compared to Hispanic or Latino women in contrast to recent reports that have suggested that middle aged Hispanic or Latina women may demonstrate more physical activity compared to other ethnic groups of women [17, 18]. This may be a function of weight status, as these data suggested that women who are more physically active as measured by accelerometry tend to weigh less, consistent with previous research in other samples [24, 49]. This relationship endured, regardless of ethnicity. The interaction between ethnicity and weight status in determining physical activity patterns bears further investigation, particularly among Hispanic or Latina women, who have received little attention in the literature.

In contrast, obese African American women tended to log more physical activity on the CALQ than did obese Hispanic or Latina women. Further, overweight or obese African American and Hispanic or Latina women reported more physical activity on the IPAQ compared to normal African American women, suggesting an additional potential interaction between ethnicity and weight status. It is unclear whether the inconsistency between accelerometry and self report reflects volitional misreporting, measurement of different domains of physical activity represented by the instruments, or whether obese African American women perceived that they were getting more physical activity than they actually did. This may suggest that there is need for better education in these populations about the experiential quality of the intensity and duration of physical activity that is needed to meet guidelines. It is also likely that accelerometry may not be as precise a measure when assessed on obese samples; the larger mass and girth introduces additional points of measurement error. It is also possible that the very low levels of fitness in obese woman may bias accelerometer cutpoints, suggesting more room for refinement in applicability of objective physical activity measurement.

We found interesting relationships among measures of physical activity. The CALQ self monitoring instrument demonstrated good criterion validity compared to both the IPAQ and accelerometer. The CALQ appears to tap into a unique dimension of physical activity monitoring than either the IPAQ or accelerometer alone, given that these two measures were not associated with each other (IPAQ was associated with CALQ, and CALQ was associated with accelerometer, but IPAQ was not associated with accelerometer). The widely used IPAQ is clearly capturing some measure of physical activity, but it is not clear how accurate that is, at least in comparison to objectively measured physical activity. Although other studies have found some level of criterion validity between the IPAQ and accelerometry [50], perhaps this relationship is not true in minority women or among populations that are overweight and obese. It might be more efficient to use a less time consuming self administered instrument, since IPAQ appears to have the same limitations associated with self-report that other self-report measures of physical activity have in this sample.

Regardless of ethnicity, normal weight women tended to eat more fruit and vegetables and eat less fat than did overweight or obese women, consistent with previous reports [51, 52]. It is unclear whether this reflects understanding of recommendations for maintaining a healthy body weight or whether these women simply selected different foods because of taste preference. This finding was only found when dietary habits were measured using the DHQ. Although some screener and VF log data appear to support this also, there may have been insufficient statistical power or lack of sensitivity in these measures to distinguish among groups.

The NCI endorsed screeners showed good validity; they were correlated with both VF log and DHQ. The new VF log self monitoring instrument showed good validity as it was correlated with both screeners and DHQ. Despite these promising measures of validity, the DHQ was the only instrument sensitive enough to illuminate dietary habits differences among groups, contributing evidence to its superiority among self-report dietary habits measures. Although the screener and VF log provide important information, more detailed instruments, like the DHQ are important to reflect the relatively subtle dietary differences that contribute to weight status.

At both sites and among all women, regardless of ethnicity, the majority of women were overweight or obese, suggesting that research studies soliciting women of color for physical activity interventions are likely to attract those who wish to lose weight. It is notable that some measures of physical activity appeared related to measures of dietary habits, suggesting that physical activity and dietary habits may be closely aligned behaviorally, particularly in women who are concerned with weight loss and control. Approximately two thirds of the sample indicated that losing weight was an important reason that they had joined the project (data not shown). It may be that many women, regardless of ethnicity, are interested in developing sustainable habits for healthful living, despite earlier reports of populations of color preferring larger body sizes [53–55]. This underscores the importance of continuing to develop strategies and messages to reach populations of color, as there may be many overweight and obese women who would like assistance with weight control, and simply not have the resources to access it. Strengths of this study include a sizeable, community dwelling sample of African American and Hispanic or Latino women, enhanced ecologic validity, unprecedented detail in measures of dietary habits and physical activity, and measured weight status. Future studies are needed to replicate these findings and develop strategies to improve the health of African American and Hispanic or Latina women.

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References

1. Centers for Disease Control and Prevention. Behavioral risk factor surveillance system, prevalence and trends data, overweight and obesity (BMI). 2007. Retrieved March 20, 2009, from http://apps.nccd.cdc.gov/brfss/list.asp?cat=OB&yr=2007&qkey=4409&state=All

2. Stolley MR, Fitzgibbon ML, Schiffer L, et al. Obesity reduction black intervention trial (ORBIT): Six-month results. Obesity (Silver Spring). 2009; 17(1):100–106. [PubMed: 18997671]

3. Buller DB, Woodall WG, Zimmerman DE, et al. Randomized trial on the 5 a day, the Rio Grande Way Website, a web-based program to improve fruit and vegetable consumption in rural communities. Journal of Health Communication. 2008; 13(3):230–249. [PubMed: 18569356]

4. Savage JS, Marini M, Birch LL. Dietary energy density predicts women's weight change over 6 y. American Journal of Clinical Nutrition. 2008; 88(3):677–684. [PubMed: 18779283]

5. Fruit and vegetable consumption among adults–United States. MMWR Morbidity and Mortality Weekly Report. 2005; 56(10):213–217.

6. Woolf K, Reese CE, Mason MP, Beaird LC, Tudor-Locke C, Vaughan LA. Physical activity is associated with risk factors for chronic disease across adult women's life cycle. Journal of the American Dietetic Association. 2008; 108(6):948–959. [PubMed: 18502225]

7. Krishnan S, Rosenberg L, Palmer JR. Physical activity and television watching in relation to risk of type 2 diabetes: The Black Women's Health Study. American Journal of Epidemiology. 2009; 169(4):428–434. [PubMed: 19056835]

8. Li TY, Rana JS, Manson JE, et al. Obesity as compared with physical activity in predicting risk of coronary heart disease in women. Circulation. 2006; 113(4):499–506. [PubMed: 16449729]

9. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999–2004. Journal of the American Medical Association. 2006; 295(13):1549–1555. [PubMed: 16595758]

10. He XZ, Baker DW. Differences in leisure-time, household, and work-related physical activity by race, ethnicity, and education. Journal of General Internal Medicine. 2005; 20(3):259–266. [PubMed: 15836530]

11. Peterson KE, Dubowitz T, Stoddard AM, Troped PJ, Sorensen G, Emmons KM. Social context of physical activity and weight status in working-class populations. Journal of Physical Activity and Health. 2007; 4(4):381–396. [PubMed: 18209230]

12. Wellman NS, Kamp B, Kirk-Sanchez NJ, Johnson PM. Eat better & move more: a community-based program designedtoimprove diets and increase physical activity among older Americans. American Journal of Public Health. 2007; 97(4):710–717. [PubMed: 17329647]

13. Zhao G, Ford ES, Li C, Mokdad AH. Compliance with physical activity recommendations in US adults with diabetes. Diabetic Medicine. 2008; 25(2):221–227. [PubMed: 18201213]

14. Carlson SA, Densmore D, Fulton JE, Yore MM, Kohl HW 3rd. Differences in physical activity prevalence and trends from 3 U.S. surveillance systems: NHIS, NHANES, and BRFSS. Journal of Physical Activity and Health. 2009; 6(Suppl 1):S18–S27. [PubMed: 19998846]

15. Marshall SJ, Jones DA, Ainsworth BE, Reis JP, Levy SS, Macera CA. Race/ethnicity, social class, and leisure-time physical inactivity. Medicine and Science in Sports and Exercise. 2007; 39(1):44–51. [PubMed: 17218883]

16. Caspersen CJ, Pereira MA, Curran KM. Changes in physical activity patterns in the United States, by sex and cross-sectional age. Medicine and Science in Sports and Exercise. 2000; 32(9):1601–1609. [PubMed: 10994912]

17. Ham SA, Ainsworth BE. Disparities in data on healthy people 2010 physical activity objectives collected by accelerometry and self-report. American Journal of Public Health. 2010; 100(Suppl 1):S263–S268. [PubMed: 20147669]

18. Hawkins MS, Storti KL, Richardson CR, King WC, Strath SJ, Holleman RG, et al. Objectively measured physical activity of USA adults by sex, age, and racial/ethnic groups: A cross-sectional study. International Journal of Behavioral Nutrition and Physical Activity. 2009; 6:31. [PubMed: 19493347]

19. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. Medicine and Science in Sports and Exercise. 2008; 40(1):181–188. [PubMed: 18091006]

20. Banda JA, Hutto B, Feeney A, et al. Comparing physical activity measures in a diverse group of midlife and older adults. Medicine and Science in Sports Exercise. 2010; 42(12):2251–2257.

21. Smitherman TA, Dubbert PM, Grothe KB, et al. Validation of the Jackson Heart Study physical activity survey in African Americans. Journal of Physical Activity and Health. 2009; 6(Suppl 1):S124–S132. [PubMed: 19998858]
22. Wolin KY, Heil DP, Askew S, Matthews CE, Bennett GG. Validation of the International Physical Activity Questionnaire-short among Blacks. Journal of Physical Activity and Health. 2008; 5(5): 746–760. [PubMed: 18820348]
23. Carter-Nolan PL, Adams-Campbell LL, Makambi K, Lewis S, Palmer JR, Rosenberg L. Validation of physical activity instruments: Black women's health study. International Society on Hypertension in Blacks. 2006; 16(4):943–947.
24. Vella CA, Zubia RY, Ontiveros D, Cruz ML. Physical activity, cardiorespiratory fitness, and metabolic syndrome in young Mexican and Mexican-American women. Applied Physiology, Nutrition and Metabolism. 2009; 34(1):10–17.
25. Slootmaker SM, Schuit AJ, Chinapaw MJ, Seidell JC, Van Mechelen W. Disagreement in physical activity assessed by accelerometer and self-report in subgroups of age, gender, education and weight status. International Journal of Behavioral Nutrition and Physical Activity. 2009; 6:17. [PubMed: 19320985]
26. Sallis, JF.; Owen, N. Physical activity and behavioral medicine. Thousand Oaks, CA: Sage; 1999.
27. Centers for Disease Control and Prevention. the healthy people 2010 database. 2009. from http://wonder.cdc.gov/data2010/focus.htm
28. Di Noia J, Contento IR. Use of a brief food frequency questionnaire for estimating daily number of servings of fruits and vegetables in a minority adolescent population. Journal of the American Dietetic Association. 2009; 109(10):1785–1789. [PubMed: 19782180]
29. Millen AE, Midthune D, Thompson FE, Kipnis V, Subar AF. The National Cancer Institute diet history questionnaire: Validation of pyramid food servings. American Journal of Epidemiology. 2006; 163(3):279–288. [PubMed: 16339051]
30. Subar AF, Thompson FE, Kipnis V, Midthune D, Hurwitz P, McNutt S, et al. Comparative validation of the Block, Willett, and National Cancer Institute food frequency questionnaires: The Eating at America's Table Study. American Journal of Epidemiology. 2001; 154(12):1089–1099. [PubMed: 11744511]
31. Subar AF, Ziegler RG, Thompson FE, Johnson CC, Weissfeld JL, Reding D, et al. Is shorter always better? Relative importance of questionnaire length and cognitive ease on response rates and data quality for two dietary questionnaires. American Journal of Epidemiology. 2001; 153(4): 404–409. [PubMed: 11207159]
32. Wang Y, Liang H, Chen X. Measured body mass index, body weight perception, dissatisfaction and control practices in urban, low-income African American adolescents. Bio Med Central Public Health. 2009; 9:183.
33. Crespo CJ, Smit E, Andersen RE, Carter-Pokras O, Ainsworth BE. Race/ethnicity, social class and their relation to physical inactivity during leisure time: Results from the Third National Health and Nutrition Examination Survey, 1988–1994. American Journal of Preventative Medicine. 2000; 18(1):46–53.
34. Tudor-Locke C, Johnson WD, Katzmarzyk PT. Accelerometer-determined steps per day in US adults. Medicine and Science in Sports Exercise. 2009; 41(7):1384–1391.
35. Hernandez-Valero MA, Thomson CA, Hernandez M, et al. Comparison of baseline dietary intake of Hispanic and matched non-Hispanic white breast cancer survivors enrolled in the Women's Healthy Eating and Living study. Journal of the American Dietetic Association. 2008; 108(8): 1323–1329. [PubMed: 18656572]
36. Thomas S, Reading J, Shephard RJ. Revision of the Physical Activity Readiness Questionnaire (PAR-Q). Canadian Journal of Sports Science. 1992; 17(4):338–345.
37. Layne CS, Mama SK, Banda JA, Lee RE. Development of an ecologically valid approach to assess moderate physical activity using accelerometry in community dwelling women of color: A cross-sectional study. International Journal of Behavioral Nutrition and Physical Activity. 2011; 8(1):21. [PubMed: 21439052]
38. Sjostrom, M. International Physical Activity Questionnaire (IPAQ). 2001. from http://www.ipaq.ki.se/index.htm

39. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, et al. International Physical Activity Questionnaire: 12-country reliability and validity. Medicine and Science in Sports Exercise. 2003; 35(8):1381–1395.

40. Lee RE, Mama SK, Banda JA, Medina AV, Reese-Smith JY, Layne CS, et al. Differences across physical activity, dietary habits, and weight in women of color. Annals of Behavioral Medicine. 2010; 39(1):S179.

41. ActiGraph. ActiGraph. 2009. from http://www.theactigraph.com/

42. Welk GJ. Principles of design and analyses for the calibration of accelerometry-based activity monitors. Medicine and Science in Sports Exercise. 2005; 37(11 Suppl):S501–S511.

43. Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: Performance of 2 new short instruments and a food frequency questionnaire. Journal of the American Dietetic Association. 2002; 102(12):1764–1772. [PubMed: 12487538]

44. Thompson FE, Midthune D, Subar AF, Kipnis V, Kahle LL, Schatzkin A. Development and evaluation of a short instrument to estimate usual dietary intake of percentage energy from fat. Journal of the American Dietetic Association. 2007; 107(5):760–767. [PubMed: 17467371]

45. Thompson FE, Kipnis V, Subar AF, et al. Evaluation of 2 brief instruments and a food-frequency questionnaire to estimate daily number of servings of fruit and vegetables. American Journal of Clinical Nutrition. 2000; 71(6):1503–1510. [PubMed: 10837291]

46. Pickering TG, Hall JE, Appel LJ, et al. Recommendations for blood pressure measurement in humans and experimental animals: Part 1: Blood pressure measurement in humans: A statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. Circulation. 2005; 111(5):697–716. [PubMed: 15699287]

47. Tanita. Body composition analyzer/scales. 2007. Retrieved March 142008, from http://www.tanita.com/BodyComposition.shtml.

48. U.S. Department of Health and Human Services. The 2007 HHS poverty guidelines. 2007. from http://aspe.hhs.gov/poverty/07poverty.shtml

49. Sternfeld B, Wang H, Quesenberry CP, et al. Physical activity and changes in weight and waist circumference in midlife women: Findings from the Study of Women's Health across the Nation. American Journal of Epidemiology. 2004; 160(9):912–922. [PubMed: 15496544]

50. Hagstromer M, Ainsworth BE, Oja P, Sjostrom M. Comparison of a subjective and an objective measure of physical activity in a population sample. Journal of Physical Activity and Health. 2010; 7(4):541–550. [PubMed: 20683097]

51. Alexy U, Sichert-Hellert W, Kersting M, Schultze-Pawlitschko V. Pattern of long-term fat intake and BMI during childhood and adolescence—results of the DONALD Study. International Journal of Obesity and Related Metabolic Disorders. 2004; 28(10):1203–1209. [PubMed: 15211368]

52. Rolls BJ, Ello-Martin JA, Tohill BC. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? Nutrition Reviews. 2004; 62(1):1–17. [PubMed: 14995052]

53. Burke LE, Steenkiste A, Music E, Styn MA. A descriptive study of past experiences with weight-loss treatment. Journal of the American Dietetic Association. 2008; 108(4):640–647. [PubMed: 18375220]

54. Mama SK, Quill BE, Fernandez-Esquer ME, Reese-Smith JY, Banda JA, Lee RE. Association between body image and physical activity in African American women. Obesity. 2009; 17(Suppl 2):S162.

55. Lipowski M, Bulinski L, Krawczynski M. Physical activities among other types of health-related behaviour in people losing weight. Medical Science Monitor. 2009; 15(8):CR423–CR428. [PubMed: 19644420]

Table 1

Baseline participant demographic characteristics by ethnicity and weight status

	African American			Hispanic or Latina		
	Normal (*n* = 24) *M* (SD)	**Overweight (*n* = 62) *M* (SD)**	**Obese (*n* = 176) *M* (SD)**	**Normal (*n* = 11) *M* (SD)**	**Overweight (*n* = 33) *M* (SD)**	**Obese (*n* = 102) *M* (SD)**
Age (years)	37.1 (10.7)	46.3 (9.99)	44.1 (11.5)	41.4 (11.3)	49.4 (8.6)	44.37 (10.9)
BMI (kg/m^2)	23.0 (1.4)	27.7 (1.42)	38.3 (10.6)	22.7 (1.5)	27.8 (1.4)	36.49 (8.2)
	% (*N*)	% (*N*)	% (*N*)	% (*N*)	% (*N*)	% (*N*)
Completed some college or more	9.1 (23)	22.6 (56)	66.0 (163)	0.06 (8)	17.0 (24)	72.3 (70)
401+ % above federal poverty level	60.9 (14)	50.9 (28)	54.8 (85)	44.4 (4)	46.7 (14)	37.9 (36)

Table 2

Bivariate correlations among physical activity measures

	Accelerometer	CALQ
IPAQ work	.078	.041
IPAQ transportation	.109	**.118**
IPAQ domestic	−.026	.066
IPAQ leisure	.026	**.119**
IPAQ walking	.077	.049
IPAQ moderate	−.022	.059
IPAQ vigorous	.037	**.115**
IPAQ total PA	.059	.063
Accelerometer	1.000	**.184**
CALQ	**.186**	1.000

Spearman's rho reported for all IPAQ subscale correlations; Pearson's *r* reported for correlations between accelerometer and CALQ; Boldface indicates significant ($P < .05$) correlation between measures

Table 3

Bivariate correlations among dietary habits measures

	FV screener	Fat screener	VF log fruit	VF log vegetables	VF log total FV
DHQ food energy	**.156**[*]	**.218**	.083	.026	.054
DHQ protein	.116	**.168**	.119	.053	.087
DHQ carbohydrate	.277	.052	**.153**	.058	.106
DHQ dietary fiber	**.322**	−.015	**.278**	**.231**	**.271**
DHQ total fat	.034	**.318**	−.006	−.012	−.011
DHQ cholesterol	.018	**.317**	.024	−.016	.001
DHQ vegetable servings	**.226**	.079	**.200**	**.335**	**.302**
DHQ fruit servings	**.523**	**−.205**	**.338**	**.224**	**.293**
DHQ protein % intake	.007	−.053	.141	**.144**	**.154**
DHQ carbohydrate % intake	**.226**	**−.347**	.108	.008	.054
DHQ total fat % intake	**−.214**	**.307**	**−.152**	−.058	−.105
FV screener	1.000	**−.099**	**.204**	**.121**	**.164**
Fat screener	**−.099**	1.000	**−.103**	−.064	−.084
VF log fruit	**.204**	**−.103**	1.000	**.792**	**.926**
VF log vegetable	**.121**	−.064	**.792**	1.000	**.963**
VF log total FV	**.164**	−.084	**.926**	**.963**	1.000

[*] Pearson's *r* reported for all correlations; boldface indicates significant ($P < .05$) correlation between measures

Table 4

Bivariate correlations between physical activity and dietary habits measures

	IPAQ work	IPAQ transportation	IPAQ domestic	IPAQ leisure	IPAQ walking	IPAQ moderate	IPAQ vigorous	IPAQ total	Accelerometer	CALQ
FV screener	**.111**[*]	**.104**	.084	**.127**	**.183**	.093	**.128**	**.161**	.018	.017
Fat screener	−.007	−.052	−.021	−.085	−.092	.023	−.016	−.049	**.164**	.021
VF log fruit	.042	.072	.091	−.007	−.008	.069	.031	.024	.020	−.006
VF log vegetable	.028	.078	**.105**	.005	−.013	.083	.032	.025	.049	.011
VF log total FV	.038	.081	**.103**	.003	−.009	.080	.034	.029	.039	.004
DHQ food energy	.004	−.078	−.030	−.054	−.060	.005	−.066	−.011	−.044	.004
DHQ protein	−.054	−.050	−.032	−.062	−.081	.004	−.104	−.054	−.018	−.025
DHQ carbohydrate	.037	−.057	−.017	−.005	−.002	.007	−.023	.034	−.115	.013
DHQ dietary fiber	.019	−.008	−.063	.011	.038	−.045	−.023	.035	.006	−.019
DHQ total fat	.000	−.085	−.030	−.075	−.083	.009	−.060	−.027	−.024	.005
DHQ cholesterol	−.071	−.078	−.006	−.056	−.115	.022	−.077	−.076	.003	−.007
DHQ vegetables	.061	.011	−.029	.046	.063	−.007	.023	.058	.168	.000
DHQ dark green vegetables	.102	.090	−.031	.043	**.148**	−.020	−.006	.074	**.307**	−.032
DHQ deep yellow vegetables	**.142**	.120	.026	.062	**.168**	.047	.102	.129	.001	−.047
DHQ starchy vegetables	.049	.044	.057	.066	.044	.049	**.155**	**.086**	.038	−.047
DHQ fruit	.002	.023	−.081	.098	.053	−.091	−.024	.004	−.078	.043
DHQ whole grain servings	.015	−.100	−.051	.052	−.060	−.018	.040	−.006	−.015	−.034
DHQ protein % intake	−.078	.099	.023	−.049	−.029	.027	−.093	−.059	.042	−.063
DHQ carbohydrate % intake	.105	.057	−.042	.073	.135	−.062	.078	.071	−.144	.017
DHQ fat % intake	−.037	−.061	.076	−.046	−.069	.096	−.016	.000	.029	.013

[*] Spearman’s rho reported for all IPAQ correlations; Pearson’s rho reported for all accelerometer and CALQ correlations; boldface indicates significant ($P < .05$) correlation between measures

Table 5

Baseline physical activity by ethnicity and weight status

	African American			Hispanic or Latina			Total
	Normal (*n* = 24) *M* (SD)	**Overweight (*n*= 62) *M* (SD)**	**Obese (n = 176) *M* (SD)**	**Normal (*n*= 11) *M* (SD)**	**Overweight (*n*= 33) *M* (SD)**	**Obese (*n* = 102) *M* (SD)**	**Grand mean *M* (SD)**
Self-reported PA							
IPAQ PA per week (MET-min)							
Work-related	645.4 (1,320.9)	1,521.3 (4,256.9)	947.2 (2,557.4)	1,702.5 (4,734.6)	868.2 (1,833.1)	1,351.3 (3,084.1)	1,126.2 (2,973.7)
Transport-related	195.3 (566.4)	75.3 (162.2)	294.2 (1,135.2)	104.9 (234.6)	105.3 (190.3)	147.0 (356.9)	197.3 (785.5)
Domestic and gardening	500.4 (915.0)	888.8 (1,258.9)	824.7 (1,205.7)	1,109.5 (1,159.4)	1,234.8 (1,753.9)	1,054.4 (1,670.6)	912.6 (1,377.3)
Leisure-time	283.5 (449.5)	227.2 (377.4)	300.5 (676.5)	982.6 (1,809.2)	180.1 (301.4)	292.7 (555.5)	295.9 (638.4)
Walking	687.5 (1,755.6)	686.3 (1,428.1)	884.5 (2,037.8)	930.0 (2,083.5)	544.5 (899.7)	681.7 (1,334.4)	762.4 (1,697.0)
Moderate	623.8 (984.2)	1,102.3 (1,441.6)	1,093.7 (1,501.7)	2,085.9 (2,832.0)	1,345 (1,838.6)	1,693.6 (2,729.3)	1,261.7 (1,933.1)
Vigorous	313.3 (618.8)	923.9 (3,128.5)	388.4 (1,575.8)	883.6 (1,310.4)	498.2(1,113.3)	470.2 (1,598.5)	507.9 (1,832.5)
Total	1,624.6 (2,551.6)	2,712.5 (4,508.4)	2,335.9 (3,447.8)	3,899.5 (4,846.6)	2,388.4 (2,682.0)	2,845.4 (3,824.2)	2,518.8 (3,659.2)
CALQ PA per week							
Total PA per week (MVPA)	47.5 (84.0)	64.6 (141.6)	291.6 (3,391.6)	117.3 (149.7)	110.5 (174.0)	61.3 (141.5)	166.9 (2,224.0)
Measured PA							
Accelerometer PA (MVPA)	**26.8** (20.0)	**23.0** (27.6)	**23.8** (19.4)	**15.7** (3.3)	**11.7** (11.0)	**9.7** (9.4)	19.0 (18.9)

* Boldface indicates significant differences ($P < .05$) between ethnic groups

Table 6

Baseline dietary habits by ethnicity and weight status

	African American			Hispanic or Latina			Total
	Normal (n= 24) *M* (SD)	**Overweight (n = 62) *M* (SD)**	**Obese (n = 176) *M* (SD)**	**Normal (n = 11) *M* (SD)**	**Overweight (n = 33) *M* (SD)**	**Obese (n = 102) *M* (SD)**	**Grand mean *M* (SD)**
Dietary habits							
Fruit and vegetable (svgs per day)	3.2 (2.7)	2.9 (2.0)	3.1 (3.3)	3.2 (2.5)	1.7 (1.3)	2.5 (2.2)	2.8 (2.7)
Fat intake (% kcal from fat per day)	30.1 (3.4)	31.5 (3.9)	32.3 (3.9)	29.4 (4.3)	31.5 (3.9)	31.7 (3.8)	31.8 (3.9)
Fruit and vegetable log							
Total fruit (svgs per week)	6.8 (9.3)	4.4 (8.7)	4.1 (7.1)	4.0 (7.1)	4.1 (6.6)	4.5 (7.2)	4.4 (7.5)
Total vegetables (svgs per week)	7.0 (9.8)	6.3 (12.2)	5.6 (10.3)	7.8 (11.7)	5.5 (7.5)	6.8 (10.8)	6.2 (10.5)
Total FV intake (svgs per week)	13.8 (18.2)	10.7 (20.5)	9.7 (16.5)	11.8 (17.8)	9.7 (13.3)	11.4 (16.8)	10.6 (17.0)
Nutrient intake per day							
Food energy (kcal)	**2,762.0** (1,436.6)	**1,619.3** (739.9)	**1,836.9** (708.3)	**1,236.0** (327.3)	**1,542.3** (663.6)	**2,158.0** (1,110.2)	1,898.1 (910.7)
Protein (g)	**101.5** (51.1)	**61.3** (32.2)	**67.4** (28.9)	**43.7** (14.6)	**63.2** (32.7)	**85.6** (49.2)	72.7 (39.0)
Carbohydrate (g)	**367.3** (185.2)	**202.8** (88.7)	**226.6** (92.2)	**162.3** (33.6)	**175.3** (67.7)	**255.5** (137.1)	230.5 (113.7)
Dietary fiber (g)	**33.0** (17.6)	**16.9** (7.2)	**17.8** (9.6)	**13.8** (6.4)	**14.1** (5.7)	**20.6** (9.7)	18.7 (9.9)
Total fat (g)	**105.8** (73.5)	**65.1** (37.3)	**75.3** (36.3)	**44.2** (15.4)	**66.5** (33.8)	**90.3** (49.2)	78.2 (43.0)
Saturated fat (g)	**28.6** (17.7)	**19.7** (13.0)	**22.7** (11.3)	**13.1** (3.3)	**21.7** (12.2)	**29.4** (17.6)	24.3 (14.3)
Monounsaturated fat (g)	**41.1** (31.3)	**24.5** (13.7)	**29.1** (14.4)	**17.5** (7.6)	**25.8** (13.1)	**34.8** (18.8)	30.2 (16.8)
Polyunsaturated fat (g)	**27.2** (21.4)	**16.1** (9.5)	**18.0** (9.5)	**10.4** (4.6)	**13.8** (6.7)	**19.4** (10.3)	17.9 (10.3)
Cholesterol (mg)	**254.9** (129.7)	**185.4** (136.9)	**207.9** (104.9)	**96.6** (26.6)	**205.7** (123.2)	**276.3** (165.6)	224.9 (135.8)
Vitamin A (meg)	2,026.6 (1,031.2)	1,203.9 (792.4)	1,183.4 (808.6)	960.4 (794.8)	939.9 (775.3)	1,151.9 (692.4)	1,174.4 (789.4)
Vitamin E (mg)	**19.6** (15.9)	**9.5** (4.9)	**10.8** (6.3)	**9.2** (8.1)	**8.4** (5.1)	**11.0** (5.9)	10.8 (6.8)
Vitamin C (mg)	**275.8** (162.2)	**129.2** (79.6)	**136.5** (111.8)	**97.4** (59.0)	**87.8** (54.2)	**124.0** (73.7)	130.7 (98.3)
Thiamin (mg)	**2.3** (1.1)	**1.2** (0.5)	**1.4** (0.5)	**1.2** (0.6)	**1.1** (0.5)	**1.6** (0.8)	1.4 (0.7)
Riboflavin (mg)	**2.3** (0.8)	**1.5** (0.7)	**1.6** (0.6)	**1.4** (0.7)	**1.4** (0.7)	**1.9** (1.0)	1.7 (0.8)
Niacin (mg)	**33.5** (18.0)	**18.4** (8.8)	**21** (9.0)	**17.3** (9.4)	**17.5** (8.0)	**24.9** (14.4)	21.9 (11.6)
Folate (meg)	**604.9** (268.0)	**346.9** (169.8)	**346.0** (170.7)	**319.3** (169.6)	**285.0** (151.4)	**410.9** (193.3)	369.2 (187.6)
Vitamin B6 (mg)	**3.0** (1.2)	**1.7** (0.8)	**1.8** (0.8)	**1.5** (0.9)	**1.4** (0.6)	**2.0** (1.0)	1.9 (0.9)
Vitamin B12 (meg)	4.8 (1.8)	3.6 (2.1)	4.1 (2.2)	2.9 (2.1)	3.9 (2.9)	4.6 (3.3)	4.2 (2.6)
Calcium (mg)	**935.7** (344.4)	**694.7** (371.0)	**643.1** (309.1)	**536.7** (180.2)	**604.6** (340.7)	**795.2** (407.5)	701.9 (357.8)

	African American			Hispanic or Latina			Total
	Normal (n= 24) M (SD)	Overweight (n = 62) M (SD)	Obese (n = 176) M (SD)	Normal (n = 11) M (SD)	Overweight (n = 33) M (SD)	Obese (n = 102) M (SD)	Grand mean M (SD)
Iron (mg)	**22.3** (8.9)	**13.3** (5.6)	**14.0** (5.7)	**12.6** (7.0)	**11.5** (5.2)	**16.0** (8.1)	14.5 (6.8)
Magnesium (mg)	**501.2** (259.9)	**275.4** (124.5)	**288.8** (130.7)	**234.8** (96.8)	**244.7** (99.7)	**329.4** (149.4)	302.0 (145.3)
Phosphorus (mg)	**1,736.7** (807.6)	**1,049.7** (478.7)	**1,085.2** (416.8)	**788.3** (261.0)	**987.7** (448.8)	**1,318.9** (664.9)	1,161.6 (550.2)
Zinc (mg)	**15.3** (7.2)	**8.9** (4.9)	**10.4** (5.0)	**8.3** (5.2)	**9.4** (5.3)	**12.5** (7.1)	10.9 (6.0)
Potassium (mg)	**4,636.1** (2,012.6)	**2,641.4** (1,250.7)	**2,809.2** (1,319.3)	**2,174.8** (921.1)	**2,405.3** (1,008.2)	**3,301.3** (1,423.2)	2,949.9 (1,394.9)
Sodium (mg)	**4,128.7** (2,123.2)	**2,550.1** (1,219.5)	**2,706.8** (1,167.9)	**1,880.6** (726.9)	**2,514.5** (1,199.5)	**3,477.8** (1,813.7)	2,939.1 (1,493.4)
Food group intake per day							
Grains (serving)	**7.0** (3.6)	**4.3** (2.8)	**4.6** (2.2)	**3.7** (1.4)	**4.2** (2.1)	**6.1** (3.7)	5.0 (2.9)
Whole grains (serving)	1.8 (0.8)	1.2 (0.8)	1.2 (0.8)	0.8 (0.7)	0.8 (0.6)	1.1 (1.0)	1.1 (0.8)
Vegetables (serving)	**6.4** (3.7)	**4.3** (2.7)	**3.9** (2.7)	**3.0** (2.4)	**3.1** (2.3)	**4.7** (2.4)	4.2 (2.7)
Dark green vegetables (servings)	0.9 (0.5)	0.6 (0.6)	0.6 (1.2)	0.5 (0.5)	0.4 (1.3)	0.4 (0.6)	0.5 (0.9)
Deep yellow vegetables (servings)	**0.5** (0.4)	**0.2** (0.3)	**0.2** (0.2)	**0.2** (0.3)	**0.2** (0.2)	**0.2** (0.2)	0.2 (0.2)
Dry bean and pea (servings)	**0.3** (0.4)	**0.1** (0.1)	**0.1** (0.2)	**0.2** (0.1)	**0.2** (0.2)	**0.4** (0.4)	0.2 (0.3)
Tomato (servings)	**0.8** (0.6)	**0.4** (0.3)	**0.4** (0.3)	**0.5** (0.3)	**0.5** (0.3)	**0.7** (0.5)	0.5 (0.4)
White potato (servings)	1.0(1.1)	0.5 (0.4)	0.8 (0.6)	0.3 (0.1)	0.5 (0.4)	0.9 (0.7)	0.7 (0.7)
Other starchy vegetables (servings)	**0.9** (0.8)	**0.2** (0.2)	**0.3** (0.3)	**0.2** (0.1)	**0.2** (0.1)	**0.3** (0.3)	0.3 (0.3)
Fruit (serving)	**6.3** (4.1)	**2.5** (1.9)	**3.1** (3.1)	**1.5** (0.8)	**1.8** (1.8)	**2.4** (1.9)	2.8 (2.6)
Citrus, melon, or berry (servings)	2.9 (2.6)	1.1 (1.0)	1.3 (1.4)	0.7 (0.5)	0.9 (1.2)	1.1 (1.0)	1.2(1.3)
Dairy (serving)	1.2 (0.6)	1.2 (0.9)	0.9 (0.6)	0.8 (0.3)	1.0 (0.9)	1.3 (0.9)	1.1 (0.8)
Lean meat or poultry (serving)	**4.9** (3.0)	**32.2** (2.5)	**3.9** (2.3)	**1.9** (1.1)	**3.8** (2.6)	**5.1** (3.8)	4.2 (3.0)
Added sugar (tspn)	18.3 (13.3)	12.8 (7.6)	16.0 (9.9)	11.8 (3.3)	12.7 (8.1)	17.6 (18.6)	15.6 (12.8)
Percent energy intake per day							
Protein (g)	15.5 (3.4)	14.9 (4.1)	14.5 (3.2)	13.9 (1.9)	16.1 (2.7)	15.8 (3.4)	15.2 (3.3)
Carbohydrate (g)	54.5 (7.8)	52.4 (10.2)	50.4 (10.2)	53.7 (7.6)	45.8 (6.4)	47.5 (8.1)	49.5 (9.3)
Total fat (g)	31.9 (8.6)	34.5 (7.8)	36.1 (7.7)	31.5 (5.2)	38.5 (5.0)	37.7 (6.0)	36.4 (7.1)

*Boldface indicates significant differences ($P < .05$) between ethnicity and weight status groups