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Nut Intake Among Overweight/Obese African-American Women in the Rural South

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Abstract

Objective—Nut consumption decreases risk for obesity and chronic diseases, which are prevalent among African-American women in the rural Southeast US. The quantity and quality of nut intake in this population is unclear. We examined the amount, source, and quality of nut consumption among overweight/obese African-American women in rural Alabama and Mississippi.

Methods—Two 24-hour dietary recalls were administered to 426 women. Mann-Whitney tests, t-tests, and linear regression models observed: differences in added sugar and sodium intake between nut consumers and non-consumers; differences in mean nut, added sugar, and sodium intake between stand-alone and incorporated nut sources; relationship between nut intake and added sugar and sodium intake.

Results—Forty-two percent of participants consumed nuts, and 16% met federal recommendations for nut intake. Nut consumption was mainly from incorporated sources (65%), which were higher in added sugar ($p < .001$) and sodium ($p < .001$), and lower in nut quantity ($p < .001$) than stand-alone sources. Nut consumers consumed more daily added sugar ($p = .004$) and sodium ($p = .04$) than non-consumers.

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Human Subjects Statement
This research project was approved by the Institutional Review Board at the University of Alabama at Birmingham. All participants provided written informed consent.

Conflict of Interest Statement
All authors of this article declare they have no conflicts of interest.

Conclusion—Suboptimal quantity and quality of nut intake may impede the health benefits of nut consumption among African-American women in the rural South.

Keywords

obesity; women; nuts

INTRODUCTION

The Problem of Obesity

African-American women in rural Southern regions of the United States are an understudied population, yet their risks for obesity and obesity-related diseases are the greatest in the country. Although obesity continues to be a problem throughout the United States (35% of adults), it is most prevalent among rural residents (40%), African-Americans in the South (39%), and African-American women (58%).[1–3] Consequently, African-American residents in the rural counties in the South, such as those living in the Black Belt counties of Alabama, have higher rates of obesity-related deaths like heart disease and stroke than residents in the United States.[4] Adherence to a Southern-style diet, characterized by a high intake of sweetened beverages and fried/processed foods, may put African-Americans in the rural South at greater risk for obesity and its related diseases.[5–7]

Benefits of Nut Intake for a Healthy Weight

Regular consumption of tree nuts (including almonds, cashews, and pecans), seeds, and peanuts is associated with optimal diet quality[8–10] and may decrease obesity risk and facilitate a healthy weight status.[8,11] Nut consumption has also been shown to decrease risk of various obesity-related chronic diseases, including heart disease and certain cancers.[12,13] The Food and Drug Administration (FDA) recommends that adults eat 1.5 oz of nuts per day as part of a healthy diet.[14]

Nut Consumption among African-Americans in the South

Data from the National Health and Nutrition Examination Survey (NHANES) 2009–2010 suggest that the intake of nuts on a given day is lower among African Americans as compared to Whites and Hispanics,[15] and further, that only 25% of African-American women in the United States consume nuts on a given day.[15] It is unknown if these findings extend to African-American women in the rural South. The Southeast region of the United States, including Georgia, Florida, Alabama, and Mississippi, represents the hub of nut production in the country, producing 72% of all U.S. produced peanuts in 2013.[16,17] Further, Alabama ranks 8th in pecan production in the nation.[17] However, it is unclear if nut consumption among African-American Southerners is adequate despite high availability.

It is also unknown if nuts are eaten in a healthful way by African-Americans in the South. King et al identified the need for research to evaluate the placement of nuts in the diets in various populations (ie, how individuals primarily use nuts in their diets).[10] Among women in the United States, the majority of nut consumption (80%) is from stand-alone sources like nut butters and plain nuts.[15] Only 20% of nut intake is from processed sources like

candies.[15] Although no study has examined the context of nut consumption in this population, popular Southern cuisine includes traditional nut foods like pecan candies (pralines) and pecan pies, which may be high in sodium and/or added sugar.[18] Further, African-Americans generally consume a large amount of added sugar daily (14–15 teaspoons)[19] and are advised to limit sodium intake to no more than 1500 mg per day to prevent hypertension.[20] Thus, the encouragement of healthful nut consumption in this population may be needed. The objective of this study was to examine the amount, source, and quality (extent of added sugar and sodium) of nut intake among overweight and obese African-American women living in rural Alabama and Mississippi.

METHODS

Participants and Study Design

The Deep South Network for Cancer Control (DSN) is an ongoing academic and community partnership that began in 2000 with the aim of eliminating cancer disparities in rural Alabama and Mississippi.[21] The network utilizes local, trained community health advisors to conduct cancer awareness and outreach, and to deliver evidence-based interventions.[21]

The present study included a subgroup of 426 overweight and obese participants from a larger weight loss intervention for African-American women.

The women lived in one of 8 rural counties, evenly distributed between the Alabama Black Belt and the Mississippi Delta. These counties have high levels of poverty and limited access to health care.[21] Four of the 8 counties were randomized to receive the group intervention[22] and the other 4 received the intervention coupled with evidence-based community strategies for obesity prevention.[23] The present research project was approved by the Institutional Review Board at the University of Alabama at Birmingham (Protocol number: F100708003). All participants provided written informed consent.

Women were recruited between January 2011 and September 2013 by local DSN staff through networking, word of mouth, and announcements in churches, health departments, schools, and other local facilities. Women were included in the study if they self-identified as African-American, were aged 30 and 70 years, and had a measured BMI of 25 kg/m^2 or greater. Women were excluded if they reported being a smoker or having a history of weight loss surgery, an eating disorder, recent cardiac event, or mobility impairment. In the larger study, participants were also excluded if they had elevated fasting blood glucose (>126 mg/dL) or blood pressure (systolic >160 mmHg or diastolic >100 mmHg) at baseline. Sensitivity analysis revealed no difference in nut intake, added sugar, or sodium intake between women who were enrolled in the larger study and those who were not; therefore, the present study includes baseline data for enrolled and non-enrolled women who provided 2 baseline dietary recalls.

Trained staff measured height (without shoes) at baseline using a portable stadiometer (SECA 2-in-1 Model #8761321004) to the nearest 0.1cm. Weight was measured with light clothing and no shoes using a digital scale (SECA 2-in-1 Model #8761321004) to the nearest 0.1kg. BMI was calculated by dividing weight in kg by height in m^2. A BMI

between 25 and 29.9 kg/m^2 was classified as overweight, and a BMI of 30 kg/m^2 or higher was considered obese.[24]

Each participant completed a demographic survey that included questions about their age, income, and education level. Age was recorded in years. Education level was categorized as less than high school, high school or general education (GED), some post high school, or college graduate or more. Household income per year was categorized as follows: less than $10,000, $10,000–$19,999, $20,000–29,999, $30,000–49,999, and $50,000 or more.

Dietary Measures

Two 24-hour dietary recalls (one weekday and one weekend) were collected using the National Cancer Institute's (NCI) web-based dietary recall tool, the United States Department of Agriculture's (USDA) Automated Self-Administered 24-hour recall (ASA24).[25] ASA24 uses the Automated Multi-pass Method (AMPM), which is an evidence-based strategy designed to enhance the accuracy of food consumption reporting with the use of 24-hour dietary recalls.[26] After recording a "quick list" of foods consumed on the previous day, participants are asked about forgotten foods. Each food item reported is accompanied by the time eaten and eating occasion (breakfast, lunch, dinner, supper, or snack), and a detailed description of food items and additions are recorded. In the "final probe," participants are given a final opportunity to list foods eaten in the previous day. Thus, the AMPM strategy allows multiple opportunities for all foods eaten the previous day to be captured. The validity of the AMPM strategy was observed in a 2004 study that compared this technique to the doubly-labeled water technique of assessing food intake over 14 days. The AMPM method yielded valid measures of mean energy intake among a large group of participants.[26] In another study, the AMPM method provided valid measures of energy and intakes, while other measures like the Block Food Frequency Questionnaire or Dietary History Questionnaire underestimated these values.[27]

The rationale behind the use of 2 dietary recalls, instead of 3 recalls as is commonly used in other studies, was based on pilot testing in a study population similar to our study group.[7] Participants in the pilot study suggested that our target audience would be willing to participate in one recall, and maybe 2. They doubted our target audience's willingness to provide more than 2 recalls, as this would be viewed as too personal. Another study conducted among African-Americans in the Deep South compared serum carotenoid levels with carotenoid intake using one to 3 dietary recalls. The authors of that study noted the validity of using either one or 3 recalls in this population.[28] Thus, although the use of 3 dietary recalls is generally ideal,[29] it is also advised that the demographic characteristics of the study population (race, geographical region), as well as the method of dietary collection (self-administered or interviewer-administered) be taken into consideration when choosing the dietary intake methodology for a study.[29] Based on these previous studies, we opted to record 2 dietary recalls (one weekend and one weekday).

In this study, trained staff administered the recalls via interviews to reduce barriers related to low literacy level and lack of access to a computer with internet connection. Each participant's information was entered into ASA24 as the interview was administered so that all questions were answered. To improve the accuracy of food quantities reported,

participants were given visual cue cards that contained visual references for common measurements (eg, 1 cup or ½ tablespoon).

Data were retrieved from the ASA24 Researcher website and linked to a separate database containing demographic information. The ASA24 database provided information regarding total amount of nuts eaten as stand-alone foods or incorporated into other foods, amount of added sugar and sodium in nut foods, total daily nut intake, and total daily sodium and sugar intake.

Categories for nut sources were based on individual food descriptions. Stand-alone sources included nuts, seeds, and nut butters, and were placed into the “Nuts” category. Food descriptions of cakes, cookies, pies, ice-cream, sugar-coated popcorn, sweetbreads, and candies (including nut-containing chocolates, toffees, brittles and any other food description of nut-containing candies) were placed in the “Desserts” category. The “Crackers” category included nut-containing crackers, and the “Cereals” category included breakfast cereals and cereal bars. Mixed foods (eg, trail mix) and nutrition bars were placed in the “Other” category.

Total nut intake was calculated in ounce equivalents by the USDA’s MyPyramid Equivalents Database (MPED) that was linked to the ASA24 database. MPED defines a half-ounce of nuts as nutritionally equivalent to one ounce of lean meat, and includes peanuts and seeds in the analysis.[30] MPED was used for data analysis because it was used for data collection during the study (ASA24 2011 version). Total daily added sugar intake and added sugar content of nut foods were calculated in teaspoons of white sugar, brown sugar, raw sugar, honey, corn syrup, and other sweeteners.[30] Total daily sodium intake and sodium content of nut foods were calculated in milligrams.[30] Nut-consumers represented participants who reported eating nuts on at least one of the 2 days, and non-consumers represented those who did not consume nuts at all over the 2-day period. All participants who provided 2 complete baseline dietary recalls were included in the analysis (N = 426).

Statistical Analysis

To assess the amount, source, and quality of nut intake among overweight and obese African-American women in rural Alabama and Mississippi, median daily nut intake, mean added sugar intake, and mean sodium intake were calculated for each participant to determine average nut consumption and to observe adherence to federal daily recommendations. We also accounted for total energy consumed by reporting nut and nutrient intakes as amount consumed per 1000 kilocalories.[31] The percentage of daily nut intake from stand-alone sources (nuts, seeds, and nut butters) and incorporated foods (desserts, crackers, cereals, and other foods) was also calculated. Chi-square tests were performed to observe demographic differences between nut consumers and non-consumers, and the likelihood of meeting federal recommendation for nut intake from stand-alone and incorporated sources.

In order to account for underlying data distribution, we used Mann-Whitney tests to evaluate the difference in median nut, added sugar, and sodium intake from stand-alone and incorporated nut sources. The differences in BMI, mean daily kilocalories, added sugar, and

sodium intake between nut consumers and non-consumers were observed using t-tests after the dependent variables were transformed to a normal distribution using the Johnson SI transformation. Age differences between nut consumers and non-consumers were also compared using t tests. Simple linear regression models determined the relationship between daily nut intake and the daily intake of added sugar and sodium. Neither BMI, age, income, nor education were included in the models due to either absence of an association with the dependent variables or the presence of collinearity with the predictor variable. All statistical analyses were performed using JMP Pro 12.1 statistical software, and an alpha level of 0.05 was used for all statistical tests.

RESULTS

Demographic Characteristics of Participants

Demographic characteristics of the study group are presented in Table 1. Forty-two percent (42%) of the 426 participants consumed nuts over the 2-day period and were classified as nut consumers. Nut consumers reported a median nut intake of 0.41 oz/day (25^{th} percentile, 0.09 oz; 75^{th} percentile, 1.08 oz), and consumed 0.28 oz/1000 kcal (25^{th} percentile, 0.06 oz; 75^{th} percentile, 0.64 oz). Only 16% of nut consumers met or exceeded the federal recommendation of 1.5 oz/day.

Overall, there were no statistically significant differences in BMI ($p = .60$), age ($p = .13$), education ($p = .24$), or income ($p = .08$) between nut consumers and non-consumers. However, nut consumers were more likely than non-consumers to report a household income of $40,000/year or more ($p = .03$). Twenty-four percent of nut consumers and 15% of non-consumers reported incomes at or above $40,000/year. Nut consumers who met federal recommendations did not differ in BMI ($p = .48$), age ($p = .15$), education ($p = .09$), or income ($p = .13$) compared with nut consumers who did not meet federal recommendations.

Source of Nut Consumption

Figure 1 illustrates the distribution of nut intake from various sources among nut consumers. Only about 35% of nuts were consumed from stand-alone sources (nuts, seeds, and nut butters). The majority of nut consumption (65%) was from incorporated sources (desserts, crackers, cereals, and other foods), which were significantly higher in both added sugar and sodium as compared to stand-alone sources (Table 2). Stand-alone nut sources were comprised mainly of peanuts and peanut butters (47%), almonds (16%), and mixed nuts (8%). Other nuts included cashews, walnuts, pecans, sunflower seeds, and other nuts (combined, 29%).

Participants were significantly less likely to meet the federal recommendations for nut intake from incorporated sources compared with stand-alone sources ($p < .001$). Older participants (50 years or older) had a higher likelihood of consuming stand-alone sources than younger participants (under 50 years), but this trend was not significant ($p = .06$). There was also no difference in likelihood of meeting federal recommendations between older and younger participants ($p = .13$).

Source of Nut Consumption Stratified by Income

Since nut consumers were more likely to report a household income of at least $40,000/year than non-consumers, we illustrated differences in nut sources between nut consumers with a household income of less than $40,000/year and those with a household income of $40,000/year or more in Figure 2. For nut consumers with a household income of less than $40,000/yr, 67% of nut intake was from incorporated sources, and 33% from stand-alone sources. The main stand-alone sources of nut consumption were peanuts and peanut butters (47%). Other nuts included almonds (16%), mixed nuts (8%), and other nut varieties (combined, 29%).

For nut consumers with household incomes of $40,000/year or more, 61% of nut intake was from incorporated sources, and 39% from stand-alone sources. Participants in this group consumed similar amounts of peanuts/peanut butters (30%) and almonds (27%) as stand-alone sources. Other nuts included walnuts (10%), mixed nuts (10%), and other nut varieties (combined, 23.5%).

There was no difference in likelihood of consuming stand-alone sources ($p = .34$) or meeting federal recommendations ($p = .92$) between the two groups. However, nut consumers with household incomes of $40,000/year or more were less likely to report consuming peanuts or peanut butter than nut consumers with incomes of less than $40,000/year ($p = .008$).

Sugar and Sodium Intake among Nut Consumers and Non-Consumers

Among all participants in the present study, mean daily intakes for both added sugar and sodium were approximately 2 times higher than the federally recommended amounts (Table 1). Overall, total daily kilocalories, added sugar, and sodium were higher in nut consumers than in non-consumers ($p < .0001$, $p = .004$, and $p = .04$, respectively) (Table 1). When adjusting for kilocalories, mean daily added sugar intake was similar for nut consumers (8.3 ±3.8 t/1000 kcal) and non-consumers (8.3 ± 4.8t/1000 kcal) ($p = .58$). However, with the same adjustment for kilocalories, nut consumers reported a lower intake of sodium (1705 ± 360 mg/1000 kcal) than non-consumers (1860 ± 389 mg/1000 kcal) ($p < .001$).

Both added sugar and sodium intake increased with nut intake in the regression analyses, although these results were not significant ($p = .09$ and $p= .06$, respectively). However, when adjusting the model for kilocalories consumed, there was a negative relationship between nut intake and sodium intake ($p < .001$), and no relationship between nut intake and added sugar intake ($p = .19$). There was no difference in daily added sugar or sodium intake between nut consumers who met federal daily recommendations and nut consumers who did not ($p = .27$ and $p = .62$, respectively).

DISCUSSION

This study examined the amount, source, and quality of nut intake among overweight and obese African-American women in rural Alabama and Mississippi. Although nut production is abundant in rural regions of these 2 states, nut consumers did not consume enough to meet the federal recommendations. Failure to meet food group recommendations is common in lower income rural Southern communities where food insecurity is widespread.[7,32] Thus,

although a food item like nuts may be part of Southern cuisine, scarcity of economic resources may prevent residents from consuming quantities necessary to see health benefits.

The role that economic resources may play in nut consumption in this community is further illustrated by observations from our study. The majority of stand-alone nuts that were consumed were peanuts and peanut butters, which were consumed mostly by nut consumers with household incomes of less than $40,000/year. Peanuts tend to be more cost-effective than other types of nuts,[33] which may encourage nut consumers in low-income neighborhoods to purchase these nuts more frequently than more expensive nuts. Further, although nut consumers were more likely than non-consumers to report a household income of $40,000/year or more, still, 76% of nut consumers reported household incomes below $40,000/year, which may have played a role in the amount of nuts they were able to consume. Failure to meet federal daily nut intake recommendations may partially explain some of the disparities in obesity among African-American women in the rural South compared with women in other regions of the country.

A key finding from this study was that in addition to an insufficient quantity of nuts consumed, the source and quality of nut consumption were suboptimal. Approximately 65% of nut consumption was from incorporated sources, including desserts, crackers, and cereals. In contrast, data from the National Health and Nutrition Examination Survey (NHANES) 2009–2010 revealed that only 20% of nut consumption among women in the general population was from incorporated sources (grains, 8%; candy, 8%; other, 3%), and 80% was from stand-alone sources (nuts, seeds, and nut butters).[15] Overweight and obese African-American women in rural Alabama and Mississippi appear to consume more nuts from incorporated sources than women in the general population.

Further, consumption of incorporated nut sources was associated with reduced quality of nut intake, as these sources contained significantly higher amounts of added sugar and sodium than stand-alone sources. In our study, more than 30% of nut consumption was from dessert foods and 12% from cereals, which can contain moderate to large amounts of added sugars and/or sodium. Participants were also less likely to meet the federal recommendations from incorporated sources than from stand-alone sources. Among women in our study, nuts are generally not consumed in a way that is ideal; nut consumption is frequently accompanied by added sugar and/or sodium, as a result of being incorporated into highly processed foods.

The food environment in rural communities may facilitate a higher consumption of processed foods. Accessible convenience stores in rural neighborhoods are less likely to offer fresh fruits, vegetables, and healthier options than in other communities.[32] If these food items are available, they are usually more expensive than in a traditional supermarket.[32] Highly processed foods are often the cheapest option,[32] which may lead to adherence to an unhealthy diet.

In this study, all participants consumed more than twice the recommended daily limit for added sugar. Nut consumers reported higher intakes of added sugar than non-consumers, and similar intakes when adjusting for kilocalories. A diet high in added sugar has been linked to obesity and cardiovascular disease.[34]

One positive finding was that, when adjusting for kilocalories, sodium intake was lower among nut consumers and decreased with increasing nut intake in the regression analysis. However, nut consumers still reported consuming almost two times the recommended daily limit for sodium. A high sodium diet increases hypertension and heart disease, insulin resistance, and obesity risks.[20,35] These findings suggest that nut consumption may not be associated with healthy eating behaviors among women in this population. It is possible that the accompaniment of high added sugar and sodium with nut consumption may neutralize the benefits of eating nuts.

Strengths and Limitations

One strength of this study was that it utilized a large sample size, which was also homogeneous in race, weight status, geographic location, and gender. Therefore results provide a reliable estimate of nut intake among overweight and obese African-American women in the rural South. However, caution should be used when generalizing the findings to women of other races, age groups, and regions of the country.

The findings of our study were limited by the instrument used to assess diet. The use of a 24-hour recall to assess dietary intake is limited in accuracy because it may not reflect long-term dietary intake.[36] However, due to financial constraints, a 24-hour recall was the most feasible method for this study. To account for this limitation, 2 24-hour recalls were also used to identify typical weekday and weekend diet. The use of 2 recalls has been considered ideal for assessing diet in this population.[7] In addition, ASA24 attempts to capture all foods eaten over the recall period by using the Automated Multi-pass Method, which probes participants for foods that are commonly forgotten like candy or snacks.[25]

Future Directions

Dietary interventions that focus on limiting added sugar and sodium intake would be of great benefit in rural communities in the southern region of the US. Further, African-American women in the rural South should be encouraged to increase nut intake and to consume more nuts from stand-alone sources because these sources are less likely to contain high amounts of added sugar and sodium, and further, to choose unsalted nuts rather than salted varieties.

Larger-scale efforts in this community are also encouraged. In addition to encouraging nut consumption through individual and community education, it would be beneficial for community strategies to focus on lowering costs of nuts, other than peanuts, in this region. Peanut allergy is the second most common food allergy,[37] and African-American children seem to be more susceptible to peanut allergies than children of other ethnicities.[38] This may prevent residents in African-American communities from purchasing peanuts. If other types of nuts are not available at comparable prices, nut consumption may be hindered. Therefore, the accessibility of other nuts at affordable prices within lower-income communities may increase nut intake in this population. These modifications may encourage the health benefits of nut intake in decreasing risk for obesity and other co-morbid conditions.

Although nut consumption may help to lower chronic disease risk, the amount, source, and quality of nut intake among overweight and obese African-American women in rural Alabama and Mississippi are suboptimal. Nuts are most often incorporated into highly

processed foods, which are high in added sugar and sodium. Further, nut consumption is not accompanied by a low daily sugar and sodium intake. Nutrition education strategies among women in this community should encourage consumption of unsalted and unsweetened nuts from stand-alone sources, and fewer nuts from incorporated sources.

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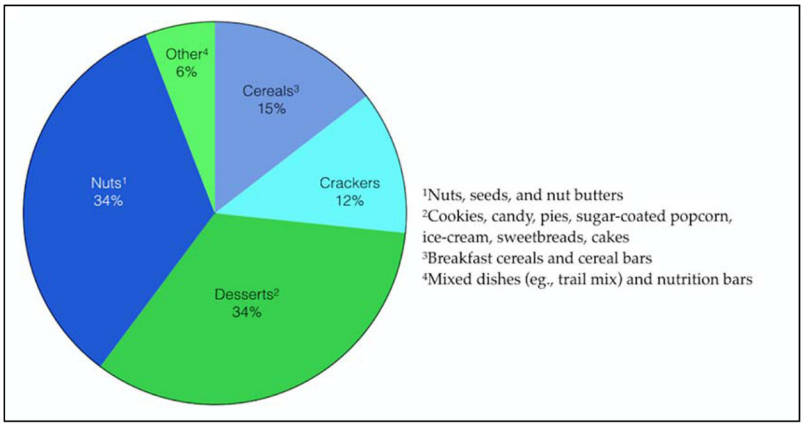

Figure 1.

Distribution of nut intake from various sources among 180 overweight and obese African-American women in rural Alabama and Mississippi (2011–2013)

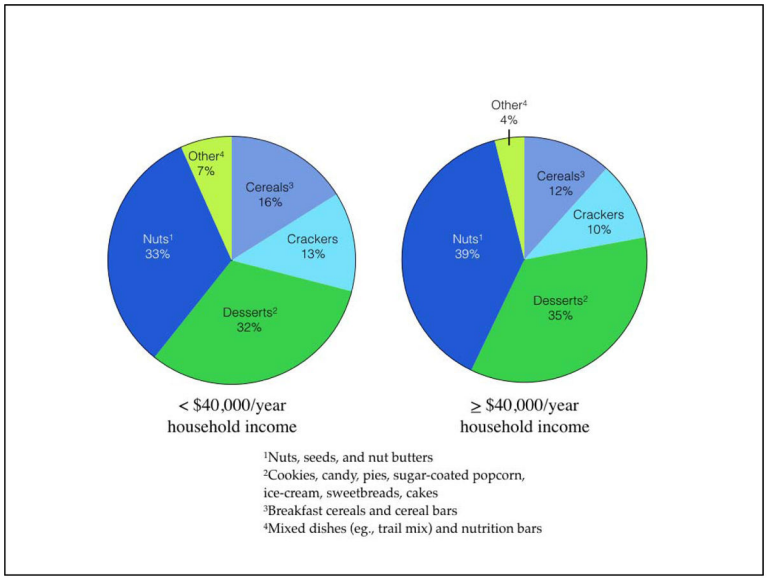

Figure 2.

Distribution of nut intake from various sources, stratified by income, among 180 overweight and obese African-American women in rural Alabama and Mississippi (2011–2013)

Table 1

Demographic characteristics of 426 overweight and obese African-American women living in rural Alabama and Mississippi (2011–2013)

Description	Total N = 426	Nut consumers N = 180	Non-consumers N = 246
	Mean (SD)	**Mean (SD)**	**Mean (SD)**
BMI, kg/m[2] [1]	38.6 (8.2)	38.2 (7.7)	38.9 (8.5)
Age, years[1]	47 (10)	47.9 (10.7)	46.5 (9.4)
Income	**N (%)**	**N (%)**	**N (%[2])**
< $10,000	83 (20)	26 (15)	57 (24)
$10,000–$19,999	98 (23)	46 (26)	52 (21)
$20,000–$29,999	85 (20)	36 (20)	49 (20)
$30,000–$39,999	60 (14)	24 (13)	36 (15)
$40,000–$49,999	36 (9)	21 (12)	15 (6)
$50,000 or more	39 (9)	20 (11)	19 (8)
Don’t know/unsure	19 (5)	5 (3)	14 (6)
N missing	6 (1)	2 (1)	4 (2)
Education	**N (%)**	**N (%)**	**N (%[2])**
Less than High School	26 (6)	7 (4)	19 (8)
High School graduate/GED	142 (34)	56 (32)	86 (36)
Some post High School	80 (19)	35 (20)	45 (19)
College graduate or more	169 (40)	79 (45)	90 (37)
Don’t know/Unsure	1 (0)	0 (0)	1 (0)
N missing	8 (2)	3 (2)	5 (2)
Mean daily kilocalories, added sugar and sodium	**Mean±SD (95% CI)**	**Mean±SD (95% CI)**	**Mean±SD (95% CI)**
Mean daily kilocalories	1545 ± 586 (1489–1601)	1698 ± 628 (1605–1790)	1433 ± 527 (1367–1500)[3]
Mean daily added sugar, tsp	13.1±8.8 (12.3–13.9)	14.5±9.8 (13.1–15.9)	12.1±7.8 (11.1–13.0)[4]
Mean daily sodium, mg	2721±1059 (2620–2822)	2836±1089 (2676–2997)	2636±1032 (2507–2766)[5]

[1] Total N missing=1

[2] Percentages may not total 100 due to rounding error

[3] Difference between nut consumers and non-consumers: t-ratio=4.64; p < .001

[4] Difference between nut consumers and non-consumers: t-ratio=2.88; p = .004

[5] Difference between nut consumers and non-consumers: t-ratio=2.05; p = .04

Table 2

Median nut, added sugar, and sodium intake from stand-alone and incorporated food sources among 180 overweight and obese African-American female nut consumers in rural Alabama and Mississippi (2011–2013)

	Stand-alone Median (25th percentile, 75th percentile)	Incorporated Median (25th percentile, 75th percentile)	p value[1]
Nut intake, oz	1.4 (1.0, 2.5)	0.2 (0.1, 0.7)	< .001
Added sugar, tsp	0.0 (0.0, 0.1)	2.0 (1.1, 4.1)	< .001
Sodium, mg	36 (1, 102)	129 (48, 251)	< .001

[1]The difference in median nut, added sugar, and sodium intake from stand-alone and incorporated sources was determined by Mann-Whitney tests.