Fruit, Vegetable and Fat Intake in a Population-Based Sample of African Americans

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Background: African Americans experience high rates of obesity and other chronic diseases, which may be related, in part, to diet. However, little is known about dietary patterns in this population, particularly from population-based data sources.

Methods: A cross-sectional analysis was conducted of 2,172 African-American adults in Project DIRECT (Diabetes Interventions Reaching and Educating Communities Together). A baseline assessment was conducted using a multistaged population-based probability sample from Raleigh and Greensboro, NC. Daily fruit, vegetable and fat intake was evaluated using a modified version of the Block questionnaire, and then stratified results were analyzed by sociodemographic, health and behavior characteristics. STATA Survey commands were used to account for the complex survey design.

Results: Overall, a very small number of participants met national recommendations for ≥2 servings of fruit (8%) and ≥3 servings of vegetables (16%) per day. Many participants reported eating high-fat foods; the average daily fat intake was 86 g, and the average daily intake from saturated fat was 24 g. People with more education and higher incomes had a higher average daily fruit intake (all $p<0.05$).

Conclusions: The data suggest that participants' fruit, vegetable and fat intake deviated greatly from national guidelines; older people, women, participants with higher socioeconomic status and those who were physically active consumed healthier foods. These data may be useful in developing dietary and weight loss interventions for African Americans.

Key words: diet ■ African Americans ■ population-based data

© 2004. From From the Departments of Epidemiology (Gary, Baptiste-Roberts) and Medicine (Miller); the Johns Hopkins Medical Institutions, Baltimore, MD; and the Centers for Disease Control and Prevention, Division of Diabetes Translation (Gary, Gregg, Williams, Beckles, Engelgau), Atlanta, GA. Send correspondence and reprint requests for *J Natl Med Assoc.* 2004;96:1599–1605 to: Tiffany L. Gary, 615 N. Wolfe St., Rm E6034, Baltimore, MD 21205; phone: (410) 614-8280; fax: (410) 955-0863; email: tgary@jhsph.edu

African Americans are disproportionately affected by obesity and obesity-related diseases,[1-5] which are related, in part, to dietary factors.[5] Nonetheless, studies evaluating dietary patterns among this population have been limited.

Smaller studies have reported poorer nutritional intake among African Americans compared with whites; African Americans consumed high-fat foods and foods with high caloric content but low nutritional value compared to whites.[6-10]

Data from national studies have provided a general picture regarding dietary patterns in African Americans. A study using the Second National Health and Nutrition Examination Survey (NHANES II) data reported that African Americans had lower intake of energy and fats but higher levels of dietary cholesterol than did whites.[11] Studies using the NHANES III dataset reported similar energy intake by race but higher cholesterol levels in African Americans compared to whites.[12,13] A study which examined trend data from the 1965, 1977–1978 and 1989–1991 Nationwide Food Consumption Surveys documented a change in dietary patterns by race and socioeconomic status (SES); in 1965, African Americans and whites of low SES had better diets (with respect to eight dietary domains) than did whites of higher SES.[14] Although the gaps between the racial groups narrowed over time, African Americans and people with low incomes improved to a lesser degree than did whites and people with higher incomes.[15]

The present study described current fruit, vegetable and fat intake by sociodemographic characteristics in African Americans using a population-based data source. Considering that data on dietary intake among this population is limited, these data should be useful for understanding dietary patterns and developing weight-loss interventions.

METHODS

Data Source and Study Population

We analyzed data from the baseline assessment of Project DIRECT (Diabetes Interventions Reaching

Table 1. Selected Characteristics among 2,172 African Americans in Project DIRECT at Baseline

Characteristics	N=2,172
Sociodemographic Variables	
Age (years)	46.3 ± 0.59 (18-97)
Sex	
Female	1,391 (62.1)
Education	
<High school	628 (26.3)
High school	764 (36.6)
Some college	498 (23.7)
College graduate or higher	282 (13.4)
Marital status	
Married	836 (38.1)
Separated, divorced, or widowed	748 (30.5)
Never been married	588 (31.4)
Employment status	
Employed	1,241 (61.3)
Retired	690 (26.3)
Unemployed	166 (8.9)
Homemaker	75 (3.5)
Yearly income[a]	
<$10,000	556 (25.4)
$10,000–$24,999	741 (38.3)
$25,000–$49,999	489 (26.5)
≥$50,000	171 (9.8)
Health Variables	
Health status	
Excellent	296 (16.3)
Very good	532 (27.2)
Good	813 (37.4)
Fair	403 (15.1)
Poor	128 (4.0)
BMI (kg/m²)[b]	
Optimal/underweight	470 (33.4)
Overweight	552 (36.4)
Obese	439 (25.4)
Extremely obese	84 (4.8)
Doctor recommend weight loss[c]	
Yes	571 (20.8)
Diabetes	
Yes	617 (10.8)
Behavior Variables	
Attempting weight loss[d]	
Yes	819 (36.2)
Physical activity level (past month)	
Active	1,305 (62.8)

All results presented as n (%) or mean ± standard error. BMI: body mass index; [a] N=1,957, [b] N=1,545, [c] N=2,170, [d] N=2,130

and Educating Communities Together); methods are described in detail elsewhere.[16-19] Briefly, a baseline assessment was conducted in 1997 using a multistage, population-based probability sample from U.S. census files in predominately African-American neighborhoods in Raleigh and Greensboro, NC. Trained field interviewers visited each household and selected eligible persons according to a specified protocol. Individuals who were eligible were invited to complete a personal interview; the overall response rate was 87%. The total study sample included 2,310 people (2,210 African Americans, 65 whites and 35 members of other races). In this cross-sectional analysis, we evaluated only those individuals who self-identified race as African-American. Individuals who had missing data on sociodemographic (not including income) or dietary variables were excluded, yielding a final study population of 2,172 African Americans.

Study Variables and Measures

Sociodemographic variables (age, sex, education, income, marital status, employment status), health variables (health status, height, doctor recommendation of weight loss, diabetes status) and behavior variables (attempting weight loss, physical activity level [active was determined by report of any physical activity in the past month]) were determined by self-report. Weight was measured, and body mass index (BMI) was calculated in kg/m² and categorized according to National Institutes of Health guidelines[20]: optimal/underweight <25, overweight 25–<30, obese 30–<35, extremely obese (obesity II) ≥35.

Fruit, vegetable and fat intake were the main focus of this analysis and were assessed using a modified version of the Block questionnaire. The original Block questionnaire (100 items) was developed into shorter screeners (22 items) to assess fat (15 items) and fruit and vegetable intake (seven items), and validated against the original version.[21-23] Project DIRECT included six questions to estimate fruit and vegetable intake[24] and 13 questions regarding fat intake that were modified from the Block short-screeners that were used in the Behavioral Risk Factor Surveillance System (BRFSS) telephone survey.[25] Using these data, variables were calculated to estimate several dietary domains according to methods outlined for the short Block screener questionnaire:[23] fruit and vegetable intake in daily servings and daily total and saturated fat intake in grams.

Statistical Analysis

To account for the complex survey design, all analyses were conducted using STATA Survey commands (STATA Statistical Software, Release 7.0, College Station, TX 2003). Descriptive analyses (means and frequencies) were conducted for sociodemo-

Table 2. Dietary Fruit and Vegetable Patterns by Sociodemographic and Health Variables in Project DIRECT at Baseline (N=2,172)

		Daily Fruit (Servings[a])	Daily Vegetable (Servings[a])	Daily Fruit & Vegetable[b] (Servings[a])
Sociodemographic Variables				
Total		0.7 ± 0.02	1.9 ± 0 .05	3.9 ± 0.05
Age (years)				
50+	(Ref)	0.8 ± 0.03	1.9 ± 0.06	4.3 ± 0.06
<50		0.6 ± 0.03**	1.8 ± 0.05	3.7 ± 0.07**
Sex				
Male	(Ref)	0.6 ± 0.03	1.8 ± 0.06	4.2 ± 0.07
Female		0.7 ± 0.03*	2.0 ± 0.05**	3.7 ± 0.06**
Education				
<High school	(Ref)	0.7 ± 0.05	1.7 ± 0.06	3.7 ± 0.09
High school		0.6 ± 0.03	1.8 ± 0.05	3.7 ± 0.07
Some college		0.6 ± 0.03	1.9 ± 0.06*	4.1 ± 0.08*
College graduate or higher		0.8 ± 0.05	2.5 ± 0.13**	4.6 ± 1.00**
Yearly Income[c]				
<$10,000	(Ref)	0.6 ± 0.04	1.7 ± 0.05	3.6 ± 0.08
$10,000–$24,999		0.7 ± 0.04	1.9 ± 0.06*	3.9 ± 0.07*
$25,000–$49,999		0.6 ± 0.04	1.9 ± 0.08*	4.0 ± 0.09*
≥$50,000		0.7 ± 0.06	2.1 ± 0.12**	4.4 ± 0.13**
Health Variables				
Health status				
Poor	(Ref)	0.7 ± 0.13	1.8 ± 0.13	3.6 ± 0.19
Fair		0.7 ± 0.05	1.8 ± 0.09	3.8 ± 0.12
Good		0.6 ± 0.03	1.8 ± 0.05*	3.8 ± 0.07
Very good		0.7 ± 0.04	2.0 ± 0.06	4.0 ± 0.08
Excellent		0.6 ± 0.04	2.0 ± 0.07	4.1 ± 1.00*
BMI (kg/m^2)[d]				
Optimal/underweight	(Ref)	0.6 ± 0.03	1.7 ± 0.06	3.7 ± 0.08
Overweight		0.6 ± 0.04	1.9 ± 0.05*	4.1 ± 0.09**
Obese		0.7 ± 0.04*	1.9 ± 0.07*	3.8 ± 0.09
Extremely obese		0.7 ± 0.10	2.2 ± 0.19*	3.6 ± 0.19
Doctor requested weight loss[e]				
Yes	(Ref)	0.8 ± 0.05	2.1±0.10	4.0±1.00
No		0.6 ± 0.02*	1.8±0.04*	3.9±0.05
Diabetes				
Yes	(Ref)	0.8 ± 0.03	2.0 ± 0.06	4.1 ± 0.08
No		0.6 ± 0.02**	1.9 ± 0.05	3.9 ± 0.05
Behavior Variables				
Attempting weight loss[f]				
Yes	(Ref)	0.8 ± 0.04	2.1 ± 0.07	4.0±0.07
No		0.6 ± 0.02**	1.8 ± 0.04**	3.9±0.06
Physical activity level (past month)				
Sedentary	(Ref)	0.6 ± 0.03	1.7 ± 0.05	3.6 ± 0.07
Active		0.7 ± 0.35**	2.0 ± 0.06**	4.1 ± 0.05**

All results presented as means ± standard error; (Ref) indicates the reference group to which all groups are compared using t-tests; BMI: body mass index; [a] USDA Food Pyramid definitions of servings; [b] Estimated using prediction equations for daily nutrient intake based on fruit and vegetable intake screener scores and sex[23]; [c] N=1,957; [d] N=1,545; [e] N=2,170; [f] N=2,130; * p<0.05; ** p<0.001

graphic, dietary, health and behavior variables.

Daily servings of fruits and vegetables were calculated by summing the scores assigned to the frequency of intake of each food item; higher scores indicate greater intake. A composite measure of fruit and vegetable intake was also estimated using an equation outlined by Block et al.[23] This equation estimated food pyramid definitions of servings[26] and incorporated a fruit and vegetable score (based on intake frequency) and sex (female=1):

$$\text{Fruit and vegetable servings} = [-0.23 + 0.37 (\text{fruit/vegetable score}) - 0.55 (\text{sex})]$$

This composite measure of fruit and vegetable intake may differ from the sum of the individual servings because the measure is standardized by sex. The range of standardized fruit and vegetable servings was -0.8–8.7.

Similarly, equations[23] were used to estimate grams of daily total and saturated fat intake and incorporated a meat/snack score (based on intake frequency; higher scores indicate greater intake) and sex (female=1):

$$\text{Total fat (grams)} = [32.7 + 24 (\text{meat/snack score}) + 11.2 (\text{sex})]$$

$$\text{Saturated fat (grams)} = [9.4 + 0.88 (\text{meat/snack score}) - 3.5 (\text{sex})]$$

The mean total fat and saturated fat grams ranged from 35.1–144.7 and 5.9–48.1, respectively.

To evaluate correlates of dietary patterns, the different dietary domains stratified by sociodemographic, health and behavior variables were evaluated. T-tests were used to determine whether there were statistically significant differences in mean daily intake of servings of fruits and vegetables and the mean daily intake of grams of fat across these groups (comparing each group to the reference group). Based on this intake, the proportion of individuals meeting national guidelines for daily fruit, vegetable and fat intake was calculated. Multiple linear regression analyses were also conducted to determine the mean daily intake of fruit, vegetable and fat, stratified by correlates, after adjustment for age and sex. Results were similar after adjustment; therefore, crude results are presented.

RESULTS

Characteristics of the Study Sample

The 2,172 African-American participants in Project DIRECT were predominately female (62%) and had a mean age of 46 years (see Table 1). About 38% of participants were currently married, and the majority were employed (61%). Most participants had completed high school (>70%) and about one-third had yearly incomes ≥$25,000.

Most participants (81%) rated their overall health as being excellent, very good or good. However, about two-thirds of participants were overweight or obese. About one-third reported that they were attempting to lose weight, and 21% had a doctor recommend that they lose weight. About 11% indicated that they had diabetes. Many participants (63%) reported that they had engaged in some type of physical activity or exercise, such as running, calisthenics, golf, gardening or walking, in the past month.

Fruit, Vegetable and Fat Intake

Dietary patterns, according to sociodemographic, health and behavior variables, are summarized in Table 2 (fruit and vegetable intake) and Table 3 (fat intake). Mean total daily fruit and vegetable intake was estimated at about four servings per day. Daily fruit and vegetable intake was significantly greater in older individuals and women. Participants who had some college or who were college graduates reported significantly more daily vegetable intake than those with less than a high-school education. Similarly, participants who earned $10,000 or more per year reported significantly more daily vegetable intake than those earning <$10,000.

Overall, the evaluation of fruit and vegetable intake stratified by health status showed no significant patterns. However, participants who were overweight or obese, who were attempting weight loss or who had a doctor recommend that they lose weight reported significantly more daily fruit and vegetable intake than participants who did not experience these concerns. Those who had been physically active in the past month had a significantly higher intake of fruits and vegetables than those who had not been physically active ($p<0.001$).

Total daily fat and saturated fat intake in this population were estimated at 86 g and 24 g, respectively; the 75th percentile of intake was 96.7 and 28.8, respectively. Older participants reported significantly less daily total and saturated fat intake than did younger participants ($p<0.001$). While women reported a higher daily total fat intake than did men ($p<0.001$), they reported a significantly lower intake from saturated fat ($p<0.001$). Daily total fat and saturated fat intake were significantly lower in participants who had at least a college degree than in those with less than a high-school education. Participants with yearly incomes of $50,000 and higher reported less total fat intake than did those with yearly incomes <$10,000.

Participants with better health status (excellent, very good) reported more total and saturated fat

Table 3. Dietary Fat Patterns by Sociodemographic and Health Variables in Project DIRECT at Baseline (N=2,172)

		Daily Fat Intake[a]	
		Total Fat (grams)	Saturated Fat (grams)
Sociodemographic Variables			
Total (mean)		85.9 ± 0.60	24.2 ± 0.21
25th percentile		70.3	17.3
50th percentile		83.1	23.5
75th percentile		96.7	28.8
Age (years)			
50+	(Ref)	76.9 ± 0.61	20.7 ± 0.26
<50		91.7 ±0 .78**	26.4 ± 0.28**
Sex			
Male	(Ref)	83.5 ± 0.87	28.0 ± 0.32
Female		87.3 ± 0.72**	21.8 ± 0.26**
Education			
<HS	(Ref)	85.8 ± 0.97	24.1 ± 0.39
HS		88.3 ± 0.92	24.9 ± 0.35
Some college		86.0 ± 1.00	24.4 ± 0.35
College graduate or higher		79.0 ± 1.08**	21.6 ± 0.47**
Yearly Income[b]			
<$10,000	(Ref)	87.4 ± 1.09	23.7 ± 0.42
$10,000-$24,999		86.4 ± 0.91	24.4 ± 0.34
$25,000-$49,999		85.3 ± 1.00	24.5 ± 0.36
≥$50,000		83.5 ± 1.60*	24.0 ± 0.67
Health Variables			
Health status			
Poor	(Ref)	78.0 ± 2.63	20.4 ± 1.01
Fair		83.8 ± 1.20	22.9 ± 0.45
Good		85.7 ± 0.81*	23.9 ± 0.29
Very good		87.2 ± 1.01*	24.7 ± 0.39**
Excellent		87.7 ± 1.17*	25.7 ± 0.44**
BMI (kg/m^2)[c]			
Optimal/underweight	(Ref)	88.8 ± 1.14	25.6 ± 0.41
Overweight		84.7 ± 1.11*	24.3 ± 0.42*
Obese		86.1 ± 0.99	23.4 ± 0.38**
Extremely obese		88.8 ± 2.23	22.6 ± 0.82**
Doctor recommend weight loss[d]			
Yes	(Ref)	81.9 ± 0.86	21.4 ± 0.30
No		86.9 ± 0.67**	24.9 ± 0.25**
Diabetes			
Yes	(Ref)	76.4 ± 0.74	20.6 ± 0.33
No		87.0 ± 0.66**	24.6 ± 0.24**
Behavior Variables			
Attempting weight loss[e]			
Yes	(Ref)	83.7 ± 0.89	22.4 ± 0.34
No		87.2 ± 0.69*	25.2 ± 0.26**
Physical activity level (past month)		86.8 ± 0.89	23.9 ± 0.31
Sedentary	(Ref)	85.3 ± 0.67	24.3 ± 0.26
Active			

All results presented as means ± standard error; (Ref) indicates the reference group to which all groups are compared using t-tests; [a] Estimated using prediction equations for daily nutrient intake based on fat intake screener scores and sex[23]; [b] N=1,957, [c] N=1,545, [d] N=2,170, [e] N=2,130; * p<0.05, ** p<0.001

intake than did those with poor health status (all $p<0.05$). Overweight or obese participants, those trying to lose weight, those who had a doctor recommend that they lose weight and those who had diabetes, tended to report less daily fat intake than did those who did not experience these concerns. Physically active and sedentary individuals reported similar daily total and saturated fat intake.

DISCUSSION

Results from the study suggest that in this population of African-American adults, older participants, women, those with higher socioeconomic status and those who were physically active tended to report better dietary patterns. These findings were not explained by age and sex differences.

National recommendations put forth by the U.S. Department of Agriculture (USDA) and the Department of Health and Human Services (DHHS)[26] advise that for a 2,200-calorie diet, daily fat intake should not exceed 73 g of total fat and that not more than 24 of those grams should be obtained from saturated fat. Recommendations also specify two-to-three servings of fruits and three-to-four servings of vegetables per day. Only 8% of 2,172 Project DIRECT participants reported eating at least two servings of fruit per day, and only 3% reporting eating three or more. Likewise, only 16% reported eating at least three servings of vegetables per day, and 6% reported eating four or more. Overall, the dietary patterns of participants fell far below recommendations.

The data in this study were similar to the 1994–1996 USDA Continuing Survey of Food Intakes by Individuals (CSFII) data for non-Hispanic blacks with respect to total fat intake[27]; USDA reported that 25% of the non-Hispanic blacks met the recommendation of <30% of calories from total daily fat intake. Comparison of data for our participants with USDA data for non-Hispanic blacks on mean food pyramid servings of fruit and vegetables showed somewhat poorer dietary patterns for our participants. USDA reported a mean of 4.5 servings of fruit (1.4) and vegetables (3.1) compared with our standardized mean of 3.9 servings of fruit and vegetables.

Our study has several strengths. First, the study evaluated a population-based sample (with high response rates) from Raleigh and Greensboro, NC derived from a probability sample of U.S. Census files. In addition, our assessment of fruit, vegetable and fat intake in African-American adults adds to the limited data in this area. Furthermore, we had comprehensive data to assess various sociodemographic, health and behavior correlates of fruit, vegetable and fat intake.

Nonetheless, several limitations should be noted. First, all of our data were self-reported except for measured weight. However, many of the questions included on the Project DIRECT questionnaire were derived from national health surveys, such as the BRFSS, where various validation studies of self-reported data have been ongoing.[28-30] Second, because the study was cross-sectional, no inferences could be made about causal associations. For example, our findings related to differences in dietary patterns by obesity and diabetes status cannot be interpreted as changes that participants made as a result of having these health conditions. Third, because three dietary questions needed for calculations for the short-screener version of the Block questionnaire were missing, our estimates for fruit, vegetable and fat intake are probably underestimated. For example, our assessment did not account for intake of pizza and ice cream, both high-fat food items. Similarly, our assessment did not allow us to estimate total calorie intake. Previous evaluation of this short fat screener has estimated that the screener accounted for only half of the fat intakes of the study populations.[25] Therefore, our conclusion that fat intakes were higher than national recommendations is extremely conservative. Fourth, all participants in the study resided in one of two cities in the southeastern United States. A recent study conducted among areas in the southern region also found that fat intake was higher, and fruit and vegetable intake was lower, when compared to national recommendations.[10] Another study found significant differences in dietary risk factors according to region of birth, with southern-born respondents having the highest-risk diets.[31] Therefore, our data may have limited generalizability to populations in other regions of the United States. Finally, this was an exploratory study with multiple comparisons, so the risk of type-1 error is high.

As a nation, the American public has a long way to go to achieve a healthful diet. The study of trend data from Nationwide Food Consumption Surveys reported that fewer than one-fourth of participants overall met even four of the eight recommendations outlined in the study.[15] Data from the present study support these patterns in African Americans. Given the high rates of obesity in this population, focusing on these dietary shortcomings is particularly important when attempting to design weight-loss interventions. Future research should examine specific nutritional, weight loss and cultural components that may contribute to dietary patterns in African Americans; for example, perceptions, attitudes, and behaviors regarding food preferences, food preparation, food availability, body image, weight and nutrition during pregnancy, weight-loss attempts and participation in weight loss programs. Improvements in these diet-related factors along with an increase in physical activity and other lifestyle changes are crucial components in preventing diabetes and other chronic diseases in this population.[32]

ACKNOWLEDGEMENTS

The authors would like to thank the Project DIRECT staff, executive board and community members for their work on the study. We also thank the study participants for their cooperation.

This work was funded by the Centers for Disease Control and Prevention, Division of Diabetes Translation, Atlanta, GA.

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CAREER OPPORTUNITY

Interventional Cardiologist - The Cardiology Division at the University of Maryland School of Medicine is seeking an invasive cardiologist for a tenure track faculty appointment at the Assistant Professor level. Candidates must be graduates of an LCME-accredited medical school, board certified and committed to teaching residents and fellows. The successful candidate will have expertise in both coronary and peripheral-arterial intervention, possess a strong interest in performing clinical/basic science research, and be expected to participate in outreach initiatives. Salary commensurate with experience. Interested candidates please submit current CV and list of four references to the attention of Mark Kelemen, MD, Cardiology Division, c/o JoAnn Gibbs, Academic Programs Office, Department of Medicine, Room N3E10, University of Maryland Medical Center, 22 S. Greene St., Baltimore, MD 21201. The UM,B encourages women and members of minority groups to apply and is an AA/EEO/ADA Employer. Reference Position #03-309-414.