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Beverage Consumption Patterns and Associations with Metabolic Risk Factors Among Low-Income Latinos with Uncontrolled Type 2 Diabetes

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Abstract

In the U.S., Latinos experience disproportionately higher rates of type 2 diabetes and diabetes-related complications than non-Latino whites. Sugar-sweetened beverage (SSB) consumption is strongly associated with increased risk of developing type 2 diabetes. Reducing caloric intake, particularly from energy-dense, low-nutrient foods or beverages, can be an effective and key strategy for metabolic and weight control. However, little is known about the contribution of various types of beverages, including but not limited to SSBs, to total caloric intake among Latinos with type 2 diabetes. Low-income Latinos (87.7% Puerto Rican) participating in a diabetes self-management intervention trial (N=238) provided cross-sectional, descriptive data on beverage consumption patterns, anthropometric outcomes, and metabolic characteristics. Beverages accounted for one-fifth of the total daily caloric intake. SSBs and milk beverages, respectively, contributed 9.6% of calories to overall daily caloric intake. Interventions directed at diabetes risk factors among low-income Latinos with diabetes may benefit from consideration of beverage consumption behaviors as an important strategy to reduce caloric and sugar intake.

Keywords

beverage consumption; Latinos; low-income; type 2 diabetes

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INTRODUCTION

Latinos comprise the largest (50.5 million) and fastest growing ethnic group (43% increase from 2000-2010) in the U.S.¹ Compared to non-Latino whites, both Latino men and women have twice the risk of developing type 2 diabetes, and Latinos with diabetes also exhibit poorer diabetes self-management.^{2,3} Findings from recent reviews indicate that elevated blood glucose is significantly higher among Latinos with type 2 diabetes than other racial/ethnic groups.³⁻⁵ Over half (62%) of Latinos with diabetes have uncontrolled glycosylated hemoglobin (HbA1c) ($\geq 7\%$) levels.⁵ Likewise, compared to non-Latino whites, Latinos experience higher rates of diabetes-related complications at these levels, including heart disease, stroke, kidney disease, blindness, amputations, and mortality.^{2,3}

The majority of studies that have examined beverage intake patterns among those with or at high risk for type 2 diabetes have focused primarily on sugar-sweetened beverage (SSB) intake and in particular SSB intake among children and adolescents.^{6,8,9} SSBs are any type of beverages that contain added caloric sweeteners (i.e., sucrose, high-fructose corn syrup, fruit-juice concentrates) and include soft drinks, fruit juices and drinks, sports drinks, energy and vitamin water drinks, sweetened iced tea and lemonade, and specialty coffee drinks or shakes with added sugars or syrup.¹⁰ Of particular importance is that while soda consumption has decreased over the past decade among youth in the U.S., overall SSB consumption has increased among youth and adults.¹¹ SSBs are the primary source of added sugars and the largest source of calories from beverages in the American diet.¹² While the American Heart Association (AHA) and American Diabetes Association (ADA) recommend limiting added sugars,¹² the prevalence and amount of total SSB consumption and fruit drink consumption among U.S. adults aged 35 years and older have increased significantly over the past decade,^{11,13} with adults from low socioeconomic backgrounds having higher odds of heavy consumption (≥ 500 kcal/day) of total SSBs, soda, and fruit drinks.¹¹

In addition to contributing to elevated blood glucose levels, SSB consumption is strongly associated with increased risk for developing type 2 diabetes.¹⁴ Other health conditions or outcomes associated with SSB consumption include overweight or obesity, metabolic syndrome, and cardiovascular disease. Individuals diagnosed with diabetes are strongly encouraged to limit SSB intake.¹⁵ However, 45% of adults with type 2 diabetes consumed SSB on a given day¹⁶ (average of 202 kcal/day), and adults with undiagnosed type 2 diabetes were more likely to consume SSBs (60%) than diagnosed/uncontrolled adults (38%) and diagnosed/controlled adults (43%). Identifying contributing factors that can be incorporated into diabetes intervention and prevention programs is critical to address the needs of this fast-growing, high-risk population. Reducing caloric intake, particularly from low-nutrient, high-calorie foods or beverages, may be key for controlling glucose levels and achieving or maintaining a healthy weight. However, to the authors' knowledge, no study to date has examined the relative contribution of calories from a wide variety of beverages (not limited to SSBs) to the overall daily caloric intake among low-income, Latino adults with type 2 diabetes.

Few epidemiologic studies have examined SSB intake among adult Latino populations without diabetes. Bleich and colleagues found that among Mexican American adults, the current prevalence of regular soda consumption was 70%, for juice 21%, and for alcohol 20%. These levels increased across all age-groups from 1988-1994 to 1999-2004, with adults aged 20-44 years experiencing the greatest increase in SSB consumption.¹³ A recent study found that Hispanic adults were 1.6 times more likely to consume fruit drinks than non-Hispanic white adults.¹¹ Results from a case control study of Latina women¹⁷ found that those with type 2 diabetes consumed artificially sweetened soft drinks (e.g., diet soda) more frequently and regular soft drinks less frequently than those without diabetes; however,

specific information on calories and other types of beverages consumed were not available. Obtaining comprehensive understanding of overall beverage consumption patterns among this population can help identify strategies to improve self-management of diabetes and reduce diabetes-related complications. This study examines beverage consumption patterns, caloric contribution of various types of beverages to total caloric intake, and comparisons between percent caloric intake from beverages and metabolic risk factors among a sample of low-income Latinos participating in a diabetes self-management intervention trial.

METHODS

Participants and Setting

Participants were recruited from a randomized clinical trial, Latinos en Control, a diabetes self-management intervention. Specific details regarding the study design and methods for this trial are described previously.¹⁸⁻²⁰ Screening for eligibility and study recruitment were conducted at five urban community health centers in central and western Massachusetts, where the Latino population is predominantly of Caribbean origin (87.7% Puerto Rican). Criteria for participant inclusion in this study were: Latino/Hispanic ethnicity; 18 years of age or older; clinical diagnosis of type 2 diabetes; last HbA1c level at or above 7.5% (within seven months prior to screening); functionally capable of meeting the diabetes self-management intervention goals (able to walk, no evidence of cognitive impairments, no medical contraindications); no current or recent (past 2 years) history of alcoholism/drug abuse; no psychiatric hospitalization or suicidality within past 5 years; physician approval to participate in the study; and not planning to move out of the area. This study was approved by the Institutional Review Boards (IRBs) at the University of Massachusetts Medical School and Baystate Health Systems.

Measures

Data for all measures were collected from participants at baseline prior to randomization and the start of the diabetes self-management trial. Trained bilingual and bicultural research staff blinded to the study condition conducted assessments on clinical and dietary outcomes using standardized protocols. Patients indicated language of preference (English or Spanish) for oral administration of survey measures and for the 24-hour dietary recalls. Further details regarding study measures have been described previously.¹⁸⁻²⁰ Data from this study are from baseline assessments.

Metabolic and Medication Measures—Fasting blood samples were collected by trained medical staff for determination of HbA1c and lipid profiles. Blood pressure was determined using the mean of two measures taken with a Dynamap XL automated BP monitor. Diabetes medication (insulin, oral, combination of insulin and oral, or none) and dose were collected directly from participant medication labels. Participants' diabetes medication intensity score was constructed by assigning a low score (1) for regimens based on monotherapy with oral agents; scores increased by units ranging from 1-2.5 based on each additional number of oral agents and taking into consideration total daily dose of insulin (see Appendix 1).¹⁹ The highest score (6.5) corresponded to diabetes medication regimens that included a combination of fast-acting and basal insulin; regimens with a total daily dose of insulin of >1 unit/kg of the patient's weight received higher scores. ENREF 19 Adherence to medication as prescribed was unknown.¹⁹

Anthropometric Measures—Participants' height (inches), weight (pounds), and waist circumference (cm) were determined using the mean of two measures obtained using standard methods. Height and weight were used to calculate BMI.

Beverage Consumption Patterns—Data on beverage consumption patterns were collected by a trained registered dietitian who made three unannounced telephone calls assessing participants' 24-hour dietary recalls at baseline. Dietary intake data were collected using Nutrition Data System for Research (NDSR), developed by the Nutrition Coordinating Center, University of Minnesota, Minneapolis, which is annually updated to reflect the marketplace.²¹ The purpose of the dietary assessment was to examine all aspects of diet, including: caloric intake, types of carbohydrates, fats and proteins, dietary fiber, other macronutrients and micronutrients. Because a single 24-hour recall cannot assess day-to-day variation in an individual's dietary intake,^{22,23} three unannounced 24HRs were conducted on randomly selected days within a 3-week period (two weekdays and one weekend). Beverage intake patterns assessed included serving size and type of beverage consumed, which were then summarized as percentage of calories from beverages from total caloric intake using the following beverage categories: all beverages, all SSBs, all dairy products, coffee/tea additives, alcohol, and specific types of SSBs and dairy beverages. NDSR features a multiple-pass approach that: (1) prompts for complete food and beverage descriptions (including brands), diverse amount descriptions, detailed food preparation methods, and additions; and (2) cautions the dietitian when outliers are detected. Defaults are provided for unknown preparation or ingredients to mixed foods, ensuring standardized treatment of unknowns.²¹ Dietary intake from this type of assessment has been previously validated among men,²⁴ low-income Latinos,^{18,25} and African American adults with diabetes.²⁶ The 24-hour recall derived data were averaged for each participant to indicate daily intake.

Sociodemographics—Trained research staff administered an oral survey to collect information on socio-demographic data, including: age (years); gender (male/female); education (highest level or grade completed); country of origin (birth place); annual household income; and number of years since type 2 diabetes diagnosis.

Statistical Analysis

Analysis was restricted to persons with complete dietary data at baseline. Descriptive statistics for socio-demographic, anthropometric, metabolic, and beverage consumption data were computed. Frequencies and percents are presented for categorical or binary variables; means and standard deviations are provided for continuous variables. T tests were used to compare mean percentages of total beverage calories from overall caloric intake between participants who exceeded or did not meet recommended guidelines or cutoff points and participants who did meet recommended guidelines or cutoff points for various metabolic and anthropometric indicators.

RESULTS AND DISCUSSION

The final analytic sample consisted of 238 participants (94% of the original sample; 77.3% female) with complete dietary data. The majority of participants (87.7%) identified Puerto Rico as their country of origin, over half (57.2%) had less than a 9th grade level education, and almost all participants had public health insurance such as Medicaid or received free care. Data on other socio-demographic characteristics are presented in Table 1. Most participants were obese (73.9%) and had above-target HbA1c levels (89.1%), SBP (66.8%), LDL levels (52.1%), and waist circumference (90.8%) at study enrollment. Nearly all participants had some type of prescribed diabetes medication (9.1% insulin alone, 44.4% oral medication alone, 39.7% insulin plus oral medication). Participants' mean caloric intake was 1,698 kcal/day (SD $\pm$ 568.2). Calories from total sugar and added sugar comprised 16.6% (SD $\pm$ 6.0) and 7.4% (SD $\pm$ 4.9), respectively, of participants' overall daily caloric intake. Additional data on sociodemographics and dietary intake are presented in Table 1.

Participants' average daily intake from all beverages was 344.2 calories (SD $\pm$ 222.9), which constituted over one-fifth of their total daily caloric intake. The largest sources of beverage calories in this sample were SSBs and milk beverages (excluding coffee or tea additives), each contributing approximately 9.6% of calories from total daily caloric intake. In particular, juices, regular sodas, and fruit drinks contributed the highest percentages of beverage calories out of all SSBs, and whole milk, 2% milk, and 1% milk contributed the highest percentage of beverage calories out of all milk beverages. See Table 2 for additional findings. The mean percentage of total beverage calories consumed relative to total caloric intake varied by whether or not participants met recommended or cutoff guidelines for select metabolic and anthropometric markers. Participants who exceeded or did not meet recommended or cutoff guidelines for DBP ($p=0.005$), LDL ($p=0.04$), BMI ($p=0.01$), and waist circumference ($p=0.05$) had a higher mean percentage of daily caloric intake from beverages than those who met recommended or cutoff guidelines for those measures. See Table 3 for additional findings.

Consistent with existing epidemiologic findings on beverage patterns among Latinos,¹³ SSBs were a large source of beverage calories in this study sample. The mean number of calories from SSBs (163 kcal/day; 9.6% of total caloric intake) in this study population is higher than previous findings on SSB consumption among Latino adults with diabetes (estimated to be between 65-78 kcal/day).¹⁶ In the current study, over half (68.7%) of caloric intake from SSBs were from citrus juice, other juices, and fruit drinks, and 31.3% of caloric intake from SSBs were from sodas, shakes, and cocoa. As might be expected from a population of patients with uncontrolled diabetes who may have previously received dietary recommendations (including treatment and prevention of hypo- and hyperglycemia), study participants' energy intake from juice and fruit drinks (101 kcal/day) and regular sodas (39 kcal/day) was lower compared to energy intake estimates among a more general population of Latino adults (209 kcal/day and 219 kcal/day, respectively).¹¹ While the overall caloric intake among this study population (1,689 kcal/day) was lower than previous estimates of overall caloric intake among Puerto Rican adults (ranging from 2,177 to 2,327 kcal/day),²⁷ the percentage of daily caloric intake from all beverages (~20%) in this study population is comparable to previous research on beverage consumption patterns among Mexican adults.²⁸ The lower caloric intake among this population may be driven by the large percentage of females in this study (77.3%), as females generally consume fewer calories than males.^{29,30}

The current study presents the novel finding that milk beverages, particularly whole and reduced fat milk, contributed approximately the same amount of calories as SSBs relative to overall caloric intake among low-income Latinos with type 2 diabetes. Study participants also reported consumption of sugared milk, whereas most studies reporting information on sugared or flavored milk intake have been conducted among children.³¹⁻³³ The higher average percent of daily caloric intake from beverages among participants who have additional risk factors (i.e., obese weight status, large waist circumference) indicates that targeting beverage consumption patterns may be an important strategy to include in diabetes management. These results suggest that consuming lower-fat milk beverages (i.e., replacing whole and 2% milk with skim or 1% milk) and avoiding sugared milk, in addition to replacing SSBs with noncaloric beverages,^{15,16} can be a simple and low-cost strategy to reduce caloric and sugar intake as a means to achieve healthy weight and metabolic levels among adults with type 2 diabetes.

Expert committee recommendations for beverage consumption are based on caloric content, nutritional value, and health risks that have been developed for the Mexican population, which has a similar proportion of caloric intake from beverages (one-fifth of overall caloric intake) as participants in this sample.²⁸ These recommendations range from most healthy

(Level 1) to least healthy (Level 6) and are described as follows: “Level 1: water; Level 2: skim or low fat (1%) milk and sugar free soy beverages; Level 3: coffee and tea without sugar; Level 4: non-caloric beverages with artificial sweeteners; Level 5: beverages with high caloric content and limited health benefits (fruit juices, whole milk, and fruit smoothies with sugar or honey; alcoholic and sports drinks), and Level 6: beverages high in sugar and with low nutritional value (soft drinks and other beverages with significant amounts of added sugar like juices, flavored waters, coffee and tea)”.²⁸ The beverage consumption recommendations developed by this committee suggest consuming water as a first choice, followed by a zero or low-calorie drink, and skim milk. Similar recommendations need to be developed for populations in the U.S., particularly those who are at risk for obesity and type-2 diabetes, or have been diagnosed with type 2 diabetes. Recommendations regarding beverage intake for adults with diabetes for treatment of hypoglycemia and avoidance of hyperglycemia need to be particularly clear to accurately treat and prevent abrupt swings in range of blood sugars.

Targeting beverage consumption behaviors through culturally-appropriate messages that are sensitive to the literacy levels and linguistic preferences of low-income Latinos are needed to improve glucose and metabolic control and reduce diabetes-related complications among this high risk group. While the successful management of diabetes requires multiple behavior changes, strategies and messages that promote healthy beverage intake behaviors and that are not limited to reducing SSB intake are highly relevant and need to be explicitly incorporated into dietary interventions. Future prevention programs and interventions that target populations of Latino ethnicity with type 2 diabetes may benefit from inclusion of specific recommendations regarding a wide variety of beverages, including SSB and milk beverage intake, into the curriculum.

CONCLUSION

The high proportion of daily calories from beverage sources and consumption of SSBs and sugared milk among low-income Latino adults diagnosed with diabetes (uncontrolled for the majority of participants) is concerning given the immediate metabolic and long-term health risks associated with the observed patterns of beverage consumption. Significant reductions in overall energy intake and added sugar intake from beverages may be achieved by improving beverage consumption patterns (i.e., reducing SSB intake, replacing sugared or flavored milk with low- or non-fat unflavored milk). Thus, strategies and messages that address beverage intake should be an integral component of interventions that aim to improve glucose control and reduce risk of diabetes-related complications among low-income Latinos.

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Appendix 1: Diabetes Type 2 Medication Intensity Scoring Protocol

STEP 1 THERAPY WITH 1 MEDICATION

Therapy options include any 1 of the following:

Biguanides, Sulfonylureas, Alpha-glucosidase inhibitors,
Dipeptidyl-peptidase-4-inhibitors, Glucagon-like peptide-1 agonist,
Meglitinides, Thiazolidinediones.

If the pill is a combination of any of the above, it will be considered dual
therapy (step 2)

Score is 1.0 for monotherapy using medications listed above, regardless of dose.

STEP 2 THERAPY WITH 2 MEDICATIONS

Therapy options include any 2 of the following:

Any dual medication combination from STEP 1

Score is 2.0 for any above dual therapy listed above, regardless of dose.

Dual therapy may include basal insulin:

Intermediate-acting insulin (NPH)	Used for basal insulin
Long-acting insulin	Used for basal insulin

Score is 2 with basal insulin as part of dual therapy if the dose is below 1 unit/kg.

Score is 2.5 if the dose is above 1 unit/kg.

STEP 3 THERAPY WITH 3 MEDICATIONS

Therapy options include any 3 of the following:

Any triple or more medication combination from STEP 1, excluding the use of
short or fast acting insulin (in that case proceed to step 4)

Score is 3.5 for any triple therapy with medications listed above.

Triple therapy may include basal insulin:

Intermediate-acting insulin (NPH)	Used for basal insulin
Long-acting insulin	Used for basal insulin

Score is 3.5 with basal insulin as part of triple therapy if the dose is under 1 unit/kg.

Score is 4 if the dose is above 1 unit/kg.

STEP 4 THERAPY WITH INTENSIVE INSULIN/AMYLIN ANALOGUE

Therapy options include:

Mixed insulin combination (include premixed and non-premixed NPH+fast-or rapid acting insulin in this category)

Rapid-acting insulin plus basal insulin

Short-acting insulin plus basal insulin

Score is 5 if the total daily dose of insulin is under 1 unit/kg.

Score is 5.5 if the total daily dose of insulin is between 1 and 1.5 unit/kg.

Score is 6 if the total daily dose of insulin is above 1.5 unit/kg

Insulin U-500

Score is 6.5 with U-500 insulin.

Amylin analogue with basal insulin only (Score is 5).

Amylin analogue with any insulin combination that includes short acting or fast acting insulin; score depends on the total daily dose of insulin described above.

Insulin pump

Score is 6.5

TOTAL DAILY DOSE OF INSULIN:

- If the regimen includes combinations of intermediate/long-lasting insulin, and fixed doses of short-acting/fast-acting insulin: add all doses together and divide by weight in kg
- If the regimen includes combinations of intermediate/long-lasting insulin, and “sliding-scales” of short-acting/fast-acting insulin: add the total amount of long-lasting/intermediate-acting insulin plus a 15% of that number, and divide by weight in Kg.

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Table 1

Baseline Characteristics of Low-income, Latino Adults Participating in a Diabetes Self-Management Intervention (N=238)

<i>Sociodemographic Measures</i>	<i>N (%)</i>	
Age (years)		
18-44	39 (14.6)	
45-54	65 (27.3)	
55-64	81 (34.0)	
65	53 (22.3)	
Gender		
Female	184 (77.3)	
Male	54 (22.7)	
Country of origin		
Puerto Rico	221 (87.7)	
Highest level of education		
< 4th grade	68 (28.6)	
4 th -8 th grade	68 (28.6)	
9 th -12 th grade (not a high school graduate)	45 (18.9)	
> 12 th grade (high school degree or GED obtained)	57 (23.9)	
Annual household income		
< \$10,000 per year	113 (47.5)	
Year since Type 2 diabetes diagnosis (N=229)		
< 5	74 (32.3)	
6-10	57 (24.9)	
11-15	43 (18.8)	
> 15	55 (24.0)	
Diabetes Medication Regimen (N=252)		
	N (%)	
Insulin alone	23 (9.1)	
Insulin plus oral medication	100 (39.7)	
Oral medications alone	112 (44.4)	
No medications	17 (6.7)	
	Mean ± SD	
Medication Intensity Score	2.9 ± 1.7	
Metabolic and Anthropometric Measures		
	N (%)	Mean ± SD
HbA1c 7.0%	212 (89.1)	9.3 (1.8)
SBP 120 mmHg	189 (66.8)	143.6 (16.9)
DBP 80 mmHg	64 (26.9)	87.5 (7.5)
LDL cholesterol 100 mg/dL	124 (52.1)	132.4 (31.7)
HDL cholesterol < 50 for men; < 40 for women	72 (30.3)	34.9 (3.2)
Triglycerides 150 mg/dL	96 (40.3)	244.9 (128.1)
BMI 30 (obese)	176 (73.9)	37.3 (6.0)
Waist circumference 40" for men; > 35" for women	216 (90.8)	44.5 (5.1)

<i>Sociodemographic Measures</i>	<i>N (%)</i>
<i>Dietary Measures (from 24-hour Dietary Recalls)</i>	Mean ± SD
Energy intake (kcal/day)	1,698.4 ± 568.2
% Fat	30.1 ± 5.9
% Saturated fatty acids	9.6 ± 2.5
% Trans-fatty acids	2.9 ± 1.9
% Carbohydrates	52.9 ± 7.1
% Total sugar	16.6 ± 6.0
% Added sugar	7.4 ± 4.9
Total dietary fiber (g)	15.0 ± 6.25
Sodium intake (mg)	3361.9 ± 1345.3
Total sugar (g)	72.5 ± 37.4
Added sugar (g)	32.3 ± 29.3

SBP, systolic blood pressure; DBP, diastolic blood pressure; LDL, low density lipoprotein; HDL, high density lipoprotein; BMI, body mass index

Table 2

Caloric Intake (number and percent) from Beverages Reported via 24-hour Dietary Recalls from Low-income, Latino Adults Participating in a Diabetes Self-Management Intervention (N=238)

	Daily caloric intake (kcal/day) Mean (SD)
Calories from beverages	344.2 (222.9)
Beverage Type	% of total caloric intake Mean (SD)
<i>All beverages</i> (sum of SSBs, milk, coffee/tea, and alcohol)	20.1 (11.8)
<i>Sugar-sweetened beverages</i> (SSBs) ^a	9.6 (9.2)
Citrus juices	2.8 (4.9)
Other juices	2.2 (4.9)
Fruit drinks	1.6 (3.7)
Regular soda	2.3 (4.3)
Diet soda	0.1 (.2)
Shakes	0.2 (2.2)
Cocoa	0.4 (1.7)
<i>Milk beverages</i> (excluding coffee/tea additives) ^b	9.6 (11.8)
Whole milk	3.9 (6.4)
2% milk	3.0 (5.6)
1% milk	2.3 (4.6)
Skim milk	0.06 (.53)
Sugared milk	0.3 (2.1)
Soy milk	0.05 (0.8)
<i>Coffee/tea additives</i>	0.6 (1.3)
<i>Alcohol</i>	0.3 (1.9)

^a Includes 100% fruit juice that was minimally reported by participants.

^b Coffee/tea additives refer to beverages, including various types of milk and cream, that are added to coffee or tea.

Table 3

Mean Percentage of Daily Caloric Intake from All Beverages by Recommended/Cutoff Guidelines of Metabolic and Anthropometric Characteristics among Low-income, Latino Adults Participating in a Diabetes Self-Management Intervention (N=238)

	% Daily Caloric Intake From All Beverages by Metabolic and Anthropometric Status ^a		p-value ^b
	Yes	No	
	Mean (SD)	Mean (SD)	
HbA1c 7.0%	20.5 (12.1) (N=212)	21.7 (9.7) (N=26)	0.60
SBP 130 mm Hg	21.4 (12.0) (N=189)	19.2 (11.3) (N=49)	0.20
DPB 80 mm Hg	24.2 (13.2) (N=64)	19.3 (11.0) (N=174)	0.005
LDL cholesterol 100 mg/dL	22.2 (12.3) (N=124)	19 (11.1) (N=114)	0.04
HDL cholesterol < 40 mg/dL for men; < 50 mg/dL for women	20.3 (12.2) (N=72)	21.3 (10.9) (N=166)	0.50
Triglycerides 150 mg/dL	20.9 (12.3) (N=96)	20.5 (11.5) (N=142)	0.80
BMI 30	21.8 (12.0) (N=176)	17.5 (10.8) (N=62)	0.01
Waist circumference > 40" for men; > 35" for women	21.1 (12.0) (N=216)	15.9 (9.2) (N=22)	0.05

^a yes = exceeded or did not meet recommended guidelines; no = met or fell within recommended guidelines

^b p-values are from t-tests

SBP, systolic blood pressure; DBP, diastolic blood pressure; LDL, low density lipoprotein; HDL, high density lipoprotein; BMI, body mass index