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Low Adherence to Dietary Recommendations for Saturated Fat, Fiber, and Sodium Found Among American Indians and Other U.S. Adults with Diabetes*

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Abstract

The objective of this article was to evaluate how well American Indians with diabetes met dietary recommendations and to compare adherence to dietary recommendations with those of U.S. adults with diabetes in the National Health and Nutrition Examination Survey (NHANES). Dietary intake in both studies was assessed using a 24-h recall questionnaire. Dietary intakes were evaluated against American Diabetes Association (ADA) dietary recommendations. The analysis sample consisted of 1,008 participants from SHS examined from 1997–1999 and 373 participants from NHANES examined from 1999–2000, all with diabetes. In both samples, intake of protein, polyunsaturated fatty acids (PUFA), monounsaturated fatty acids (MUFA), and carbohydrates met the 1997 ADA dietary recommendations. However, intakes of saturated fatty acid (SFA) as well as sodium were higher and dietary fiber intake was lower than recommended. In the SHS and NHANES, only 4.6% and 8.5% of persons with diabetes met recommendations for both SFA and fiber ($p = 0.02$), respectively. However, only 8.3% of the NHANES sample met the 2006 recommendations for SFA and fiber, and none of the SHS sample met those recommendations.

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This cross-sectional study shows low adherence to ADA dietary recommendations for saturated fat, fiber, and sodium by American Indians with diabetes and by the broader U.S. population of adults with diabetes, and shows that in American Indians with diabetes programs to decrease SFA and increase fiber intakes are warranted.

Diabetes is a growing health problem in the United States and throughout the world. Diabetes and its complications decrease quality of life and cost billions in health care expenditures. In the United States, the annual cost of diabetes increased from $98 billion in 1997 to $132 billion in 2002 (1). Thus, much attention is focused on optimizing therapy for patients with diabetes.

One of the cornerstones of diabetes therapy is diet. The primary recommendations for medical nutrition therapy for diabetes are published by the American Diabetes Association (ADA) and updated annually (2,3). These recommendations are developed to optimize glycemic control, reduce risk factors for macrovascular complications, and to control weight.

Reports on diabetes prevalence and incidence from a longitudinal study of 4,549 American Indians (4) showed that the age-adjusted diabetes prevalence in American Indians ages 45 to 74 y range from 33–72% (5), several times higher than those of other ethnic groups (6). However, little is known about adherence to dietary recommendations among American Indians with diabetes, information that is potentially important for developing nutrition programs appropriate for this population. The purpose of the current study is to evaluate how well American Indians with diabetes met ADA dietary recommendations and to compare their diet and adherence to recommendations to that of persons with diabetes in the general U.S. population in the National Health and Nutrition Examination Survey 1999–2000 (NHANES).

Research Design and Methods

Study population

The Strong Heart Study (SHS) was initiated in 1988 to investigate cardiovascular disease (CVD) and its risk factors in American Indians (4). The SHS design, recruitment, methods, and laboratory techniques have been reported (4,7,8). Briefly, the SHS cohort consisted of 4,549 participants ages 45–79 y undergoing a baseline (1989–1992) and two follow up examinations (1993–1995 and 1997–1999). The age, body mass index (BMI), and self-reported diabetes and hypertension of non-participants were similar to those of participants (8). The Indian Health Service and institutional review boards of the participating tribes and academic institutions approved the study. Written informed consent was obtained from each participant.

The third SHS examination included a dietary recall questionnaire and was conducted on 3197 participants. Of these, 1186 (374 men and 812 women) had diabetes and complete dietary data. Those who had diabetes ≤ 1 y (n = 23); consumed total energy ≤ 2512 kJ/d (n = 57); or had medical conditions affecting energy intake, such as dialysis treatment, kidney transplant, or liver cirrhosis (n = 98), were excluded. The analysis sample consisted of 1008

(316 men and 692 women) participants with diabetes, ages 51 to 83 y. The larger proportion of women in the analysis sample is a reflection of the higher mortality in men in this population, the larger number of women originally recruited into the cohort, and the higher levels of diabetes in SHS women (4).

U.S. Population Data—To compare adherence to nutritional recommendations among American Indians in the SHS with adults with diabetes in the U.S. as a whole, we used data for adults with diabetes, ages 51–84 y, from NHANES 1999–2000 (n = 441) (9), a national survey that was conducted near the time of the third SHS examination. As in the SHS, total energy intake was estimated in NHANES using a single 24-h dietary recall. We applied the same exclusion criteria to the NHANES data set as we did to the SHS data: those who had diabetes ≤ 1 y (n = 7); consumed total energy ≤ 2512 kJ/day (n = 61); or had medical conditions affecting energy intake, such as dialysis treatment, kidney transplant, or liver cirrhosis (n = 0). Fasting blood samples were used in both studies. The NHANES sample for this analysis consisted of 373 (190 men and 183 women) participants with diabetes.

Measurements

Dietary data were collected using a single 24-h dietary recall. Interviewers were centrally trained and certified in data collection and form completion according to standardized methods (10). Dietary intake was analyzed using the Minnesota Nutrition Data System (NDS) (NDS Version 2.1) (11, 12). Because calculation of trans fatty acids (TFA) was not available in NDS Version 2.1, additional calculations were conducted using Nutrition Coordinating Center (NCC) Nutrient Database Version 36 (Nutrition Data System for Research [NDS-R] 2005, Minneapolis, MN) (13). The NDS-R database updates analytic data while retaining nutrient profiles true to the version used for data collection.

Overweight was defined as BMI ≥ 25 and < 30 kg/m^2 and obesity as BMI ≥ 30 kg/m^2 (14,15). At the time of the exam, the National Cholesterol Education Program (NCEP) II lipid goals were LDL-cholesterol < 130 mg/dL, HDL-cholesterol > 35 mg/dL, and triglycerides (TG) < 200 mg/dL (16). JNC VII hypertension was defined as ≥ 140 mm Hg systolic or ≥ 90 mm Hg diastolic, and mild-to-moderate hypertension was defined as 130–139 mm Hg systolic or 85–89 mm Hg diastolic (17). Nephropathy was defined as urinary albumin/creatinine ≥ 30 mg/g. Current alcohol drinkers were defined as persons who indicated that they had consumed alcohol within the last year. Those who had not were considered nondrinkers. Approaches to collection of physical activity data were not comparable across the two studies.

ADA dietary recommendations in 1997 (2) are summarized in Table 1: protein = 10–20%, saturated fatty acids (SFA) < 10%, polyunsaturated fatty acids (PUFA) ≤ 10% and monounsaturated fatty acids [MUFA] ≤ 20% of total caloric intake. No recommendations were made for trans fatty acids (TFA) and total carbohydrates. Recommended fiber intake was 20–35 g/d, cholesterol intake < 200 mg/d, and sodium intake < 2,400 or 3,000 mg/d (6.3–7.8 g/d salt).

Because American Indian diets tend to change little over time, we were also interested in a comparison to the more recent 2006 ADA nutritional recommendations: protein = 10–20%,

SFA < 7%, PUFA and MUFA = 13–28% of total caloric intake, TFA < 2 mg/d , carbohydrate intake > 130 g/d, fiber intake = 14 g/4187 kJ, cholesterol intake < 200 mg/d, and sodium intake < 2,300 mg/d (6 g/d salt) (3).

Because SFA and dietary fiber are two key nutrients related to both diabetes and CVD, we also determined percentage of participants who met the 1997 or 2006 recommendations.

Statistical analysis

Demographic and physical characteristics were summarized for SHS and NHANES and presented as means or percentages ± SEMs or as medians and interquartile ranges if continuous variables were skewed. Macronutrient intake was expressed as percentage of energy, fiber was expressed as grams, and cholesterol was expressed as milligrams (mg). All analyses were performed with SAS version 9.0 (16). NHANES data were analyzed with SAS-Callable SUDAAN software version 9.0 (17), which permits appropriate weighting of NHANES (18). Comparisons between SHS and NHANES were conducted by chi-square test for categorical variables and by t-test for continuous variables (reported energy, fiber, cholesterol, and sodium were log transformed for the analyses). Comparisons between those who met the 1997 ADA recommendations and those who did not were conducted using the logistic regression model, adjusted for age and gender. All *P* values were two tailed, and statistical significance was defined as $P < 0.05$ for all tests.

RESULTS

The SHS analysis sample consisted of 316 men and 692 women with diabetes, and the NHANES sample consisted of 194 men and 186 women with diabetes. The prevalence of diabetes in the SHS was 49.6% (44.6% in men and 52.5% in women), and in NHANES it was 16.3% (17.1% in men and 15.7% in women) for the same age group.

Table 2 presents baseline characteristics of participants with diabetes in SHS and NHANES. SHS men and women had higher HbA1c than their counterparts in NHANES. Men in SHS had higher fasting glucose concentrations than men in NHANES. SHS men and women were more likely to be current smokers. There were 15.2% and 7.3% ($p<0.001$) participants who were younger (age < 65 y) and smokers in the SHS and NHANES, respectively. Women in SHS reported higher SFA, MUFA, and lower PUFA intake. Among both the SHS and NHANES samples of participants with diabetes, mean or median intakes of protein, PUFA, carbohydrates, and MUFA met the 1997 ADA recommendations; saturated fatty acid (SFA) and sodium intakes were higher, and dietary fiber intake were lower than recommended (Table 3). A higher percentage of the SHS sample met the 1997 recommendations for protein, PUFA, carbohydrates, MUFA, alcohol, and dietary fiber, as well as sodium among hypertensive individuals. Recommendations for the combination of SFA and fiber were met by about half as many SHS participants as NHANES participants 4.6% (45/984) vs. 8.5% (21/248), respectively ($p = 0.02$). Individuals with diabetes in the SHS who did not meet the ADA (n=939) recommendations were more obese (BMI= 29.3 ± 0.8 kg/m^2 in those who met recommendations vs. 32.3 ± 0.2 kg/m^2 in those who did not meet recommendations) and reported consuming more fat, SFA, MUFA, and PUFA but less fiber (data not shown).

In comparing intakes to 2006 guidelines, more than half of both the SHS and NHANES samples would not have met recommendations for protein (58.5% in both samples), fat (58.3% vs. 52.6%, respectively), cholesterol (55% vs. 55.6%, respectively), and sodium (63.2% vs. 64.0%, respectively). These proportions were not statistically different from one another. Notably, more than 85% of both samples did not meet recommendations for SFA (91.8 vs. 86.6%). Among the NHANES participants with diabetes plus other risk factors, such as high LDL-cholesterol, a higher percentage consumed the recommended SFA as compared to SHS participants with diabetes and high LDL-cholesterol (12.3% vs. 7.3%, $P = 0.03$). Among participants with elevated TG, a higher percentage of NHANES participants than SHS participants met the recommendations for SFA (40.2% vs. 26.3% respectively, $P = 0.01$), but a lower percentage consumed the recommended PUFA (79.3% vs. 94.0%, respectively, $P < 0.01$).

None of the SHS sample met the 2006 nutritional recommendations for SFA and fiber, and only 31 of the 373 (8.3%) NHANES participants met these recommendations.

DISCUSSION

The present analysis of population-based samples of American Indians with diabetes and the general U.S. population with diabetes showed that adherence to dietary recommendations that were current at the time of the examinations was good, with the exception of saturated fat and fiber. Overall, the SHS sample was at higher risk than those in NHANES: these participants were less educated, more likely to smoke, and consumed less PUFA. SHS men had a higher fasting glucose and women consumed more SFA. The SHS participants consumed more MUFA. The ADA recommendations are based on MUFA from vegetable products and while the main MUFA sources of this population were unknown, the high correlation between MUFA and SFA ($r=0.73$ in the SHS and 0.69 in NHANES) suggests the MUFA were most likely from animal sources.

Compared to NHANES, a higher proportion of the SHS sample met 1997 recommendations for single macronutrients. Although the proportion of both SHS and NHANES diabetic participants met the 1997 guidelines for saturated fat and fiber, about twice as many NHANES participants met this guideline.

To provide insight on whom to target, we compared the characteristics of adherent and non-adherent individuals. The dietary profile of individuals with diabetes in the SHS who did not meet the ADA recommendations (more obese and reported consuming more fat, SFA, MUFA, and PUFA but less fiber) may reflect the fact that American Indians appear to eat more fatty meats and fewer vegetables and whole grains than the general U.S. population (SHS unpublished data). Due to statistically unreliable estimates for the means ± SEMs from the small sample size (only 21 met the 1997 recommendations in NHANES), the characteristics for participants who met the 1997 recommendations and those who did not could not be compared. The low percentage of individuals with diabetes in both populations who met the recommended SFA intake, is clinically significant, because individuals with diabetes have a high risk for CVD.

Taken together, the much higher percentage of diabetes prevalence, the higher risk profile of SHS participants, and the lower percentage meeting the 1997 recommendations for the two key nutrients of SFA and fiber result in a higher risk for CVD among the SHS sample. Importantly, when the 2006 recommendations are applied to the same data, results appear much less favorable, a finding that likely reflects the increased detail and strictness between the 1997 and 2006 recommendations. No previous analyses of adherence to dietary recommendations have been conducted in a population of American Indians with diabetes. Resnick et al. (21) reported that 48.3% of the NHANES population met the recommendations for SFA < 10% of daily intake, as compared with 34.8% in SHS and 23.9% in NHANES in the current analysis. Resnick's analysis consisted of a different sample, age ≥ 18, from NHANES. This may explain the lower prevalence of non-adherence in the current analysis.

Many aspects of the diet composition (carbohydrate, fat, fiber, vitamins, and alcohol) have been considered important to the modulation of insulin resistance, but in the last few years, more attention has been given to the influence of various dietary fats on insulin sensitivity and, throughout this mechanism, the risk of type 2 diabetes. This interest arose from studies performed with animals, in which diets rich in saturated fat worsened insulin sensitivity, while diets rich in unsaturated fat, particularly short and long chain n-3 fatty acids, improved insulin action. Although studies in humans have not been as extensive as those in animals (19), a large trial showed that insulin sensitivity improved when saturated fat was replaced in the diet with monounsaturated fat (20). Thus, we chose to study saturated fat and fiber, the latter because it also reflects intake of vegetables, fruits, and grains, currently viewed as the basis for optimum nutrition.

The current analysis, whether focused on adherence to dietary recommendations or to recommended levels of selected nutrients, showed low adherence to key nutrients related to insulin resistance and CVD risk in both American Indians with diabetes and the entire U.S. population with diabetes. These findings point to the need for strategies to improve adherence to dietary recommendations for both American Indians with diabetes and the entire U.S. population with diabetes.

American Indians have a high prevalence of diabetes. Thus our data indicate that large numbers of individuals in this population need nutritional intervention. Only a few intervention programs have been tested in controlled, randomized trials in different areas, as well as different age groups. Future intervention programs should focus on smoking cessation, increasing physical activity, as well as changes in the Western diet patterns adopted by American Indians. The cultural preferences of this population should also be considered while planning intervention programs.

This study's strengths include the population-based samples and wide range of demographic and nutrient data. Furthermore, the same dietary survey method was used for both populations, including training of staff and standardization of data.

This study was limited by several factors. Dietary patterns, described in the 2006 recommendations (e.g., "people with diabetes are encouraged to eat a variety of fiber-

containing foods such as legumes, fiber-rich cereals, as well as fruits, vegetables, and whole-grain products" [3]), cannot be evaluated in the current study, because we do not have data on food sources for the relevant nutrients from the 24-h recalls that were performed in the mid 1990s (the NDS database at that time did not allow extraction of food data). Because this was a cross-sectional analysis, cause and effect cannot be established. The use of a single 24-h recall is limited because of day-to-day individual variability (21). However, measurement of dietary intake usually is conducted for one of three purposes: to compare average intake of different groups, to rank individuals within a group, and to estimate an individual's usual intake (22). The 24-h recall can provide detailed information on specific foods (23), and, therefore, is considered ideal for intercultural comparisons of mean dietary intake levels, because it is an open-ended method which allows detailed reporting of heterogeneous types of food (22). On the other hand, it tends to underestimate energy intake. Our aim was to compare the NHANES cohort with the SHS cohort. For this objective, we believe it is sufficient to assume that constant scaling bias is of a relatively constant magnitude, as in NHANES (22).

In summary, our data emphasize the importance of developing interventions targeted particularly at saturated fat and fiber intake for those with diabetes, those with diabetes and other risk factors, or at high risk for diabetes. These interventions would contribute to lowering the risk for diabetes-induced complications.

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Table 1

Summary of the 1997 American Diabetes Association nutritional recommendations for people with diabetes[1]

Nutrient	Recommendations 1997 (19)
Protein (% of kcal)	10–20%
Individuals with evidence of nephropathy (% of kcal)	10% or 0.8 g/kg body weight/d
Total fat (% of kcal)	Not mentioned
Fat (high LDL-cholesterol levels)[15] (% of kcal)	If LDL ≥ 3.33 mmol/L than ≤30%
SFA (% of kcal)	<10%
SFA (obesity or high LDL-cholesterol levels)[13–15] (% of kcal)	If LDL ≥ 3.33 mmol/L than < 7%
SFA (if elevated TG)[15] (% of kcal)	If TG > 2.25 mmol/L than <10%
PUFA (% of kcal)	≤ 10%
PUFA (if elevated TG)[15] (% of kcal)	< 10%
MUFA and PUFA (% of kcal)	Not mentioned
MUFA (if elevated TG and non-obese) (% of kcal)[15]	If TG > 225 mmol/L than ≤ 20%
Carbohydrates and MUFA (% of kcal)	60–70%
Carbohydrates (mg/d)	Not mentioned
Cholesterol (mg/d)	<300 mg
Cholesterol (mg/d) (high LDL-cholesterol levels) [15]	If LDL ≥ 3.33 mmol/L than < 200 mg
Trans fatty acids (g/d)	Not mentioned
Dietary fibers (g/d)	20–35 g/d
Plant stanols/sterols	Not mentioned
Sodium (mg/d)	≤ 2400 or 3000
Sodium in people with mild to moderate hypertension[17] (mg/d)	≤ 2,400 mg/d
Sodium in hypertensive individuals[17] (mg/d)	≤ 2,000 mg/d
Patients with symptomatic heart failure (mg/d)	Not mentioned
Alcohol (drinks)	≤1 drink for women and ≤ 2 drinks for men

To convert Kcal to kJ, multiply by 4.187.

Table 2

Baseline characteristics of 316 men and 692 women with diabetes in the SHS[1] and of 190 men and 183 women with diabetes in the NHANES 1999–2000[1]

	Men			Women		
	SHS (n=316)	**NHANES (n=190)**	**P-value[2]**	**SHS (n=692)**	**NHANES (n=183)**	**P-value[2]**
Age (y)	63.5 ± 0.4	64.9 ± 0.6	0.06	63.5 ± 0.3	65.3 ± 0.9	0.06
BMI (kg/m^2)	30.6 ± 0.3	30.5 ± 0.8	0.91	32.8 ± 0.3	32.8 ± 0.8	1.0
Education			<0.01			0.15
Less than high school	48.4 ± 2.8	40.0 ± 5.2		53.2 ± 1.9	51.7 ± 5.0	
High school	27.2 ± 2.5	22.3 ± 5.1		25.3 ±1.6	30.3 ± 5.2	
More than high school	24.4 ± 2.4	37.7 ± 5.1		21.5 ± 1.6	18.0 ± 3.3	
Duration of diabetes (y)[3]	15 (9–24)	N/A		16 (9–25)	N/A	
Physical activity (h/wk) [3]	15.0 (2.6–32.6)	N/A		8.0 (1.6–24.2)	N/A	
HbA^{1c} (%)	8.7 ± 0.1	7.4 ± 0.1	<0.01	8.5 ± 0.1	7.6 ± 0.2	<0.01
Fasting glucose (mmol/L)	10.7 ± 0.2	9.2 ± 0.4	<0.01	10.1 ± 0.1	98 ± 0.5	0.76
Diabetes treatment	n=314	N=159	<0.01	n=690	n=156	<0.01
Both	6.4 ± 1.4	15.7 ± 4.3		4.8 ± 0.8	7.2 ± 3.0	
Insulin only	19.1 ± 2.2	15.9 ± 4.7		27.1 ± 1.7	17.6 ± 4.3	
Oral	46.5 ± 2.8	52.8 ± 5.4		41.4 ± 1.9	60.2 ± 5.8	
No medication	28.0 ± 2.5	15.6 ± 4.2		26.7 ± 1.7	15.1 ± 4.1	
Smoking	n=313		<0.01	n=688		0.02
Never smoking	24.0 ± 2.4	27.4 ± 5.1		51.5 ± 1.9	59.4 ± 6.3	
Former smoking	47.9 ± 2.8	59.4 ± 5.2		29.8 ± 1.7	27.9 ± 4.7	
Current smoking	28.1 ± 2.5	13.2 ± 2.9		18.7 ± 1.5		12.7 ± 2.9
Alcohol drinking		N=174	<0.01		n=175	<0.01
Nondrinking	72.4 ± 2.5	50.2 ± 7.8		89.5 ± 1.2	70.9 ± 4.5	
Current drinking	27.6 ± 2.5	49.8 ± 7.8		10.5 ± 1.2	29.1 ± 4.5	
Reported dietary intake						
Total energy (kcal)	1595 (1207–2050)	1852 (1389–2478)	<0.01	1422 (1070–1840)	1384 (1105–1802)	0.49
Total fat (% kcal)	35.3 ± 0.5	34.7 ± 0.8	0.53	35.9 ± 0.3	33.8 ± 0.8	0.02

	Men			Women		
	SHS (n=316)	**NHANES (n=190)**	**P-value[2]**	**SHS (n=692)**	**NHANES (n=183)**	**P-value[2]**
SFA (% kcal)	11.7 ± 0.2	11.1 ± 0.3	0.11	11.8 ± 0.1	10.7 ± 0.3	<0.01
MUFA (% kcal)	14.2 ± 0.2	13.2 ± 0.4	0.03	14.4 ± 0.2	12.6 ± 0.4	<0.01
PUFA (% kcal)	5.9 ± 0.2	7.6 ± 0.3	<0.01	6.4 ± 0.1[4]	7.7 ± 0.3	<0.01
TFA (% kcal)	2.6 ± 0.1	N/A		2.8 ± 0.1	N/A	
Carbohydrates (% kcal)	48.7 ± 0.6	48.4 ± 0.8	0.78	48.7 ± 0.4	49.8 ± 1.0	0.31
Protein (% kcal)	16.7 ± 0.3	17.9 ± 0.5	0.04	16.3 ± 0.1	17.2 ± 0.4	0.04
Fiber (g)	15.1 (9.2–23.3)	16.9 (11.3–25.4)	0.10	13.4 (8.8–19.6)	11.6 (7.9–16.6)	0.12
Cholesterol (mg)	272 (128–531)	252 (150–417)	0.81	218 (104–446)	200 (106–402)	0.68
Sodium (mg)	2914 (2093–4077)	3351 (2449–4823)	0.16	2577 (1798–3496)	2476 (1771–3550)	0.72

Abbreviations: SFA: saturated fatty acids; MUFA: monounsaturated fatty acids; PUFA: polyunsaturated fatty acids; TFA: trans fatty acids. To convert Kcal to kJ, multiply by 4.187.

[1] Data were presented as mean or percent ± SEM, and median (interquartiles) if continuous variables were not normally distributed.

[2] P value was based on Chi-square test for categorical variables and t-test for continuous variables (reported energy, fiber, cholesterol, and sodium were normalized prior to the test) for comparing differences between SHS and NHANES.

[3] Duration of diabetes in the NHANES 1999–2000 were not available because the answers for the question “Age when first told you had diabetes” were 1 (coded as 1=Enter number, but no one entered the real number). The questions for physical activity in the SHS and NHANES 1999–2000 were different, so physical activity was not presented in NHANES 1999–2000.

Table 3

Number (percentage) of participants with diabetes in Strong Heart Study and NHANES 1999–2000 meeting 1997 American Diabetes Association nutritional recommendations for people with diabetes[1]

Nutrient	SHS			NHANES 1999–2000		
	N	Mean ± SEM or median (interquartiles)	n (%) =participant who met the recommendation	N	Mean ± SEM or median (interquartiles)	n (%) =participant who met the recommendation
Protein (% of kcal)	443	16.4 ± 0.2	343 (77.4)2	345	17.5 ± 0.3	228 (69.7)
Total fat (% of kcal)						
SFA (if elevated TG)[15] (% of kcal)	251	12.0 ± 0.2	66 (26.3)[3]	74	11.3 ± 0.4	36 (40.2)
PUFA (% of kcal)	739	6.4 ± 0.1	673 (91.1)[4]	111	7.7 ± 0.5	89 (72.6)
PUFA (if elevated TG)[15] (% of kcal)	251	5.9 ± 0.2	236 (94.0)[2]	74	7.3 ± 0.5	60 (79.3)
MUFA and PUFA (% of kcal)						
MUFA (if elevated TG and non-obese) (% of kcal)[15]	112	14.2 ± 0.3	104 (92.9)	43	12.8 ± 0.7	40 (93.7)
Carbohydrates and MUFA (% of kcal)	1008	63.0 ± 0.2	475 (47.1)[2]	373	62.0 ± 0.5	151 (39.4)
Carbohydrates (mg/d)						
Cholesterol (mg/d)	696	228 (111–464)	409 (58.8)	74	311 (143–521)	44 (48.8)
Trans fatty acids (g/d)						
Dietary fibers (g/d)	1008	13.7 (8.9–21.0)	214 (21.2)[3]	373	13.6 (9.8–20.1)	73 (16.6)
Plant stanols/sterols		No data	No data		No data	No data
Sodium (mg/d)	329	2744 (1917–3784)	132 (40.1) or 189 (57.4)	193	2872 (1900–3992)	83 (38.5) or 113 (51.7)
Sodium in people with mild to moderate hypertension[17] (mg/d)	235	2692 (1933–3797)	95 (40.4)	86	2634 (1761–3700)	45 (44.4)
Sodium in hypertensive individuals[17] (mg/d)	675	2632 (1884–3575)	199 (29.5)[2]	172	2753 (2146–4145)	48 (19.5)
Patients with symptomatic heart failure (mg/d)						
Alcohol (drinks)	1003	0 (0–0)	975 (97.2)[4]	373	0 (0–1)	326 (89.2)

[1] SHS data were performed with SAS version 9.0 and NHANES 1999–2000 data were analyzed with SAS-Callable SUDAAN version 9.0. To convert Kcal to kJ, multiply by 4.187.