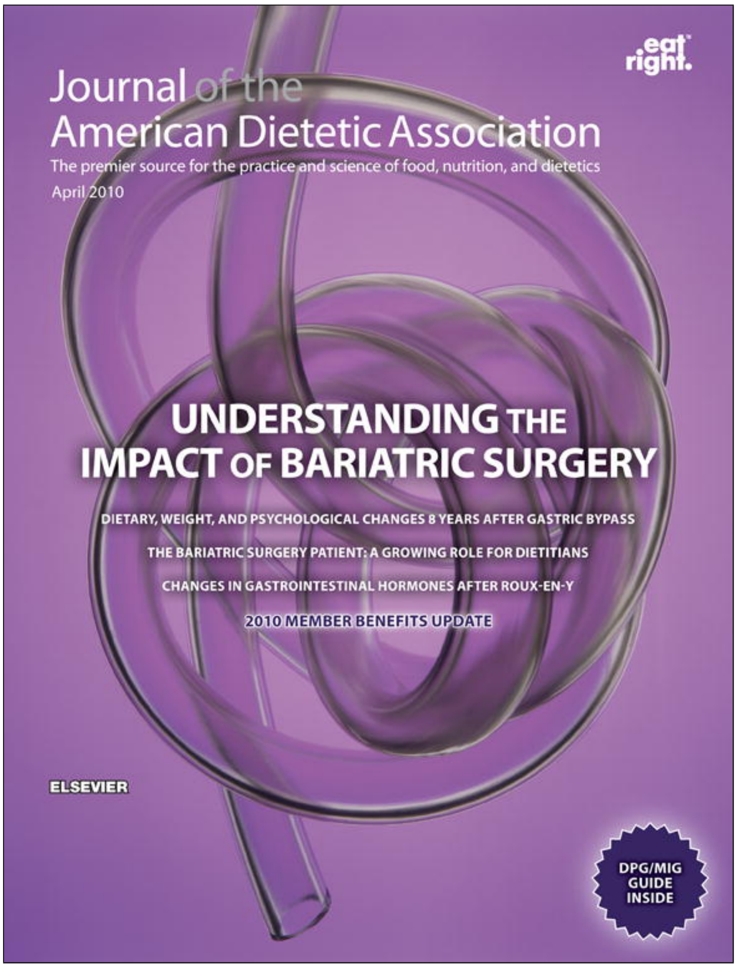
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RESEARCH

Original Research

Alcoholic Beverage Consumption, Nutrient Intakes, and Diet Quality in the US Adult Population, 1999-2006

ROSALIND A. BRESLOW, PhD, MPH, RD; PATRICIA M. GUENTHER, PhD, RD; WENYEN JUAN, PhD; BARRY I. GRAUBARD, PhD

ABSTRACT

Background Little is known about associations between alcoholic beverage consumption, nutrient intakes, and diet quality, although each has been independently associated with chronic disease outcomes.

Objective This study examines cross-sectional relationships between alcoholic beverage consumption, nutrient intakes, and diet quality (Healthy Eating Index-2005 [HEI-2005] scores) in the US adult population.

Methods Data were from four cycles of the National Health and Nutrition Examination Survey (1999-2006). Weighted multiple regression analyses, adjusted for age, race/ethnicity, education, smoking status, and body mass index included 8,155 men and 7,715 women aged ≥20 years who reported their past-year alcoholic beverage consumption and 24-hour dietary intake. Alcoholic beverage consumption was defined by drinking status (never, former, current drinker) and, among current drinkers, by drinking level (number of drinks per day, on average: men <1 to ≥5; women <1 to ≥3).

Results Among men, there was no association between drinking status and intakes of energy, most nutrients, or total HEI-2005 score. Among women, former and current (compared to never) drinkers had significantly higher intakes of energy and several nutrients, and current drinkers had significantly lower total HEI-2005 scores (current drinkers 58.9; never drinkers 63.2). Among current drinkers of both sexes, as drinking level increased, intakes of energy and several nutrients significantly increased, whereas total HEI-2005 scores significantly decreased (from 55.9 to 41.5 in men, and from 59.5 to 51.8 in women).

Conclusions Among men and women, increasing alcoholic beverage consumption was associated with a decline in total diet quality as measured by the HEI-2005, apparently due to higher energy intake from alcohol as well as other differences in food choices. Educational messages should focus on nutrition and chronic disease risk associated with high consumption of alcoholic beverages and poor food choices, including excessive energy intake.

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Heavier alcoholic beverage consumption and less healthful dietary intake have been associated with chronic diseases, including cardiovascular disease (1,2), cancers of the colorectum and upper aero-digestive tract (3), and alcohol-related liver disease (4). Both of these modifiable lifestyle behaviors are preventable causes of chronic disease morbidity and mortality (5,6). An understanding of their association in the US population could inform clinical practice, epidemiologic research, and public health education.

Observed associations between alcoholic beverage consumption and dietary intake may vary depending on the way each is assessed. Alcoholic beverage consumption may be measured by drinking status (never, former, current drinker) and drinking level (number of drinks per day, on average). Dietary intake may be assessed by examining intake of various nutrients and/or a more global measure of diet quality such as the Healthy Eating Index (HEI) (7). The HEI, which measures diet quality in terms of compliance with Federal dietary recommendations, was developed by the US Department of Agriculture to assess and monitor the dietary status of Americans (8). The original HEI was released in 1995, and it was recently revised to reflect the 2005 Dietary Guidelines for Americans (DGA) (HEI-2005) (9-11).

Several epidemiologic studies (12-22) have examined associations between drinking status and nutrient intakes; however, nondrinkers typically were not separated into former and never drinkers. Former drinkers who quit drinking due to illness (23) could have different dietary intakes than lifetime abstainers.

Several epidemiologic studies (12-22,24,25) have examined associations between drinking levels and nutrient intakes. However, of the four studies conducted in the United States (12-14,24), only two used samples nationally representative of the US adult population, and both were performed more than 20 years ago (13,14). The other two studies were performed in a specialized cohort (12) and among elderly individuals (24).

The *Report of the 2005 Dietary Guidelines Advisory Committee* provided unadjusted estimates of nutrient intakes and original HEI total scores by current drinking level using data from the 1999-2000 National Health and Nutrition Examination Survey (NHANES) (2); nondrinkers were not considered. Breslow and colleagues (26), using the same data source, estimated associations between drinking levels and the original HEI, adjusted for demographic and lifestyle factors; however, nondrinkers were not considered in adjusted analyses, and nutrient intakes were not examined. Both studies (2,26) had a relatively small sample size, and neither evaluated associations with the HEI-2005. Therefore, the purpose of our study is to examine associations between alcoholic beverage consumption (drinking status and drinking level), nutrient intakes, and diet quality as evaluated by the HEI-2005, among US adults using data from NHANES 1999-2006.

METHODS

Data Source

Data for this study were provided by participants in four cycles of NHANES: 1999-2000, 2001-2002, 2003-2004, and 2005-2006 (NHANES 1999-2006). NHANES is a continuing, cross-sectional, nationally representative survey of the US noninstitutionalized civilian population, conducted by the National Center for Health Statistics. It employs a complex, stratified, multistage probability sample design. In NHANES 1999-2006, a total of 41,474 individuals completed an in-person home interview, and 39,352 subsequently completed an interview and examination conducted in a mobile examination center. Response rates for the unweighted examined sample in NHANES 1999-2000, 2001-2002, 2003-2004, and 2005-2006 were 76%, 80%, 76%, and 77%, respectively (27).

Measurements of Alcohol Consumption, Nutrient Intakes, and Diet Quality

The independent variables of interest were drinking status (never, former, current drinker) and drinking levels (number of drinks per day, on average) among current drinkers. An alcohol use questionnaire was administered in the mobile examination center interview. Participants who were aged 20 years and older were asked: "In any 1 year, have you had at least 12 drinks of any type of alcoholic beverage?" (yes/no); "In your entire life, have you had at least 12 drinks of any type of alcoholic beverage?" (yes/no); "In the past 12 months, how often did you drink any type of alcoholic beverage?" (frequency); and, "In the past 12 months, on those days that you drank alcoholic beverages, on the average how many drinks did you have?" (quantity).

Participants who, in their entire life, never had at least 12 drinks were defined as never drinkers. Participants who had at least 12 drinks in their entire life, but had not consumed alcohol in the past 12 months, were defined as former drinkers. Participants who consumed at least 12 drinks in their entire life and drank on at least 1 day in the past year were considered current drinkers. For current drinkers, number of drinks per day, on average, was calculated as ([quantity×frequency]/365.25); categorization of drinking level was sex-specific because men and women differ in amounts of alcoholic beverages consumed. For men, number of drinks per day, on average, was categorized as <1 (operationally, >0 to 0.49), 1 (0.5 to 1.49), 2 (1.5 to 2.49), 3 (2.5 to 3.49), 4 (3.5 to 4.49), and ≥5 (≥4.5) drinks/day. For women, categories were <1, 1, 2, and ≥3 drinks/day because of the small number who consumed ≥4 drinks per day.

The dependent variables of interest were energy and nutrient intakes and HEI-2005 total and component scores. Participants' dietary intakes were collected in the mobile examination center via an interviewer-administered recall of foods and beverages consumed during the previous day (midnight to midnight). Nutrient intakes used in this study include those obtained from all foods and beverages consumed, including alcoholic beverages, but not dietary supplements. They were calculated by the US Department of Agriculture's (USDA) Agricultural Research Service using the Food and Nutrient Database for Dietary Studies (28). This study did not estimate intakes of linoleic acid or linolenic acid; however, such estimates have been published elsewhere (29).

The HEI-2005 scores were calculated using the MyPyramid Equivalents Database according to the methodology established by the USDA Center for Nutrition Policy and Promotion (30). Individuals' dietary intakes vary from day to day, so a 24-hour dietary recall does not provide a reliable estimate of an individual's long-term average or usual daily intake. However, the mean of a group's usual intake can yield a reasonable estimate of the group's mean usual nutrient or food group intake if the recalls are collected on all days of the week and seasons of the year, as is the case with NHANES 1999-2006. Thus, the mean nutrient intakes reported here for groups approximate their mean usual nutrient intakes, and the HEI-2005 scores are based on mean usual intakes of the relevant food groups, nutrients, and energy. At the time of this study the MyPyramid Equivalents for food groups needed to calculate the HEI-2005 were not available from the USDA Agricultural Research Service for 2005-2006. For those years we used the 2003-2004 values for 4,368 of the food codes (28). For the 210 codes that were new in 2005-2006, values were imputed by a registered dietitian by matching to the most similar food code used in 2003-2004.

Like the DGA, the HEI-2005 is primarily food-based. The total score is the sum of 12 component scores. Nine components measure intake of food groups: total fruit; whole fruit (ie, forms other than juice); total vegetables; dark-green and orange vegetables and legumes; total grains; whole grains; milk, which includes soy beverages; meat and beans, which includes meat, poultry, fish, eggs, soybean products other than beverages, nuts, seeds, and legumes; and oils (nonhydrogenated vegetable oils, and oils in fish, nuts, and seeds). For these components, higher scores reflect higher intakes. The remaining three components assess aspects of the diet that should be limited: saturated fat; sodium; and energy from solid fats, alcoholic beverages, and added sugars (SoFAAS), which is a proxy measure of discretionary energy. For these components, higher scores reflect lower intakes because lower intakes are better. HEI-2005 scores are determined on a density basis; that is, the amount of a dietary component of interest consumed (ie, a food group or nutrient) is divided by total energy and multiplied by 1,000 or expressed as a percentage of energy. The total maximum score is 100. The density approach provides a means to measure diet quality; that is, the mix of foods in the diet, rather than diet quantity. Further information about the HEI-2005 and its scoring system has been published elsewhere (9,10).

Covariates

Factors used as covariates in the analysis included age (continuous), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), educational level (less than high school graduate, high school graduate, more than high school graduate), cigarette smoking status (current, former, never), and mean body mass index (weight in kilograms divided by height in meters squared). The results presented control for differences attributable to these factors.

Sample

Of the 39,352 participants in NHANES 1999-2006 who completed the mobile examination center interview/examination, 18,986 (9,019 men, 9,967 women) were aged 20 years or older. The analytic sample for this study included the 15,870 participants (8,155 men, 7,715 women) who answered questions on alcoholic beverage consumption in the past year and provided a reliable 24-hour dietary recall. Women who were pregnant or breastfeeding were not included in the analytic cohort because these individuals often abstain from alcoholic beverage consumption and otherwise modify their diet. The sample size in adjusted analyses is 15,513 participants (7,973 men, 7,540 women) due to missing data on covariates.

Data Analysis

Statistical analyses were performed using SAS (version 9.13, 2005, SAS Institute, Inc, Cary, NC) and SUDAAN (version 9.03, 2004, Research Triangle Institute, Research Triangle Park, NC), a statistical software package that takes into account survey sample weighting, stratification, and clustering in the computation of standard errors. Analyses were weighted to produce estimates for the US population. The weighted sample reflects the demographics of the US population. Unadjusted percentage distributions of demographic and lifestyle characteristics were calculated by drinking status (never, former, current drinker). Global differences for categorical variables were tested using χ^2 tests, and Wald F tests were used to test differences among means of continuous variables.

Individual mean energy and nutrient intakes and their respective standard errors, adjusted for covariates (age, race/ethnicity, education, smoking status, and body mass index), were calculated by drinking status (never, former, current drinker) and within current drinkers by drinking level using multiple linear regression. These adjusted means are predicted marginals (31), which were directly standardized to the joint distribution of the covariates in the model, using Proc Regress in SUDAAN. The predicted marginals for population groups (eg, alcoholic beverage consumption groups) are effectively estimated means of the predicted energy and nutrient intakes if everyone in the sample belonged to the same population group. Since sample weights were used in these calculations, the standardization is with respect to the joint distribution in the US population.

Significant differences between energy and nutrient intakes between pairs of drinking status categories were tested using t tests of the β coefficients for each category from the corresponding regression model. The significance of trends by drinking levels was determined by assigning ordinal values to drinking levels and using a t test of the corresponding β coefficient for energy intake and each nutrient intake.

The total HEI-2005 score is the sum of its 12 component scores. Freedman and colleagues recommend the population ratio method for calculating HEI-2005 component scores (32). However, our study required the computation of adjusted HEI-2005 component scores. Because there was not a straightforward way to perform these computations, the method developed for this study is herewith presented.

Predicted marginals were estimated for each of the 12 HEI-2005 component scores by either drinking status or drinking level using multiple linear regression with the same covariates used above. The adjusted population ratios were then computed by taking the predicted marginal for each component and dividing it by the predicted marginal for energy. This was done for each category of drinking status and each drinking level. The adjusted HEI-2005 component scores were then truncated in accordance with the HEI-2005 scoring system (9). To test the significance of trends across the six levels of alcoholic beverage consumption in men and the four levels in women, a simple linear regression of the population ratios across these levels was fit using an ordinal score for each level. A t test was used to determine the statistical significance of the slope, and a jackknife estimate was used to obtain the standard error of the slope. A stratified jackknife variance estimator was used to obtain the standard errors of the population ratios for the adjusted total and component HEI-2005 scores (33).

The jackknife variance is computed by removing the data from one sampled primary sampling unit in NHANES at a time, then readjusting the sample weights for the remaining data from the sample stratum of the removed primary sampling unit to reflect the appropriate population size of the stratum, and then recomputing the population ratios for the adjusted HEI-2005 scores using the remaining data with the revised sample weights. Because there are 117 primary sample units in the NHANES, 117 recomputed ratios were obtained. For each set of the recomputed ratios, the differences between

Table 1. Weighted distributions of drinking status by sex and selected characteristics, adults aged 20 years and older, United States, 1999-2006[a]

	Men[b]						Women[bc]					
	Never drinker		Former drinker		Current drinker		Never drinker		Former drinker		Current drinker	
	← mean± standard deviation →											
Age (y)	44.5±19.0		54.6±15.8		43.7±15.6		52.7±19.6		55.1±16.4		45.3±15.7	
	n^d	%	n^d	%	n^d	%	n^d	%	n^d	%	n^d	%
Sample	579	6.7	1,751	17	5,825	76.3	1,671	17.4	1,583	17.7	4,461	64.9
Race/ethnicity												
Non-Hispanic white	282	6.0	909	17.3	3,043	76.7	651	14.5	757	17.1	2,529	68.4
Non-Hispanic black	170	11.7	377	19.7	1,045	68.6	413	25.3	388	22.6	776	52.1
Hispanic	90	5.1	424	14.1	1,555	80.8	520	22.3	390	17.0	1,016	60.8
Other	37	11.6	41	15.0	182	73.4	87	31.1	48	17.7	140	51.3
Education												
Less than high school	170	6.6	752	24.7	1,664	68.7	741	28.9	618	25.3	944	45.8
High school	138	5.8	421	19.5	1,379	74.7	385	18.0	411	20.3	1,076	61.7
More than high school	270	7.1	573	13.1	2,776	79.8	540	13.1	551	13.8	2,439	73.1
Smoking status												
Current smoker	43	1.5	319	12.5	1,765	86.0	108	5.6	283	18.0	1,054	76.3
Former smoker	78	2.5	854	25.6	1,757	71.9	138	5.4	475	25.1	1,023	69.5
Never smoker	457	12.9	575	13.9	2,297	73.1	1,419	26.4	824	14.8	2,381	58.9
Body mass index												
≤24.99	210	7.8	443	13.0	1,722	79.2	473	15.2	380	12.4	1,654	72.4
25.0-29.99	195	5.5	667	15.9	2,443	78.6	530	18.8	469	19.0	1,241	62.2
≥30	157	7.1	580	21.8	1,570	71.1	616	18.1	686	22.2	1,507	59.8
Mean±standard deviation	28.4±6.9		29.3±6.0		27.9±5.5		28.8±7.0		30.1±7.8		27.8±6.9	

[a]Data source: National Health and Nutrition Examination Survey, 1999-2000, 2001-2002, 2003-2004, 2005-2006.
[b]All $P<0.001$ for χ^2 tests of drinking status by categorical race/ethnicity, education, smoking status, and body mass index; all $P<0.001$ for Wald F tests of drinking status with respect to continuous mean age and mean body mass index.
[c]Pregnant and breastfeeding women are excluded.
[d]Numbers may not add to full sample due to missing data.

pairs of drinking status categories were computed, and the variance across these differences was calculated as

$$\widehat{var}_{JK}(\hat{\theta}) = \sum_{h=1}^{58} \frac{k_h - 1}{k_h} \sum_{i=1}^{k_h} (\hat{\theta}_{(hi)} - \hat{\theta})^2$$

where $\hat{\theta}_{(hi)}$ are the differences for the ratios between a pair of drinking status categories after leaving out the primary sampling unit i from the stratum h, $\hat{\theta}$ is the difference of the ratios for the total sample; 58 is the number of sample strata in the analytic sample, and k_h is the number of sample primary sampling units in stratum h, $\sum_{h=1}^{58} k_h = 117$ (33) (see reference 33 page 30, formula 2.5-2 for the stratified jackknife variance estimator). In this variance estimation, the untruncated scores are used where the truncation of the scores is described in Freedman and colleagues (32). t Tests for pairwise differences were computed by dividing each difference for the population ratios for the adjusted HEI-2005 scores, based on the entire sample, by the square root of the jackknife variance for the pairwise group difference and then comparing this to a normal referent distribution to determine P for the test. Similarly, jackknife variance estimation was used to obtain standard errors for the slope used for testing the significance of the trend of the population ratios for the adjusted HEI-2005 scores across drinking levels. In analyses of energy and individual nutrients, standards were computed in a different manner using the Taylor linearization method for stratified multistage complex samples using SUDAAN.

For significance testing, α was <.05, two-tailed. Pairwise comparisons by drinking status, and tests of trends across drinking levels of the energy and nutrient intakes, and population ratios for the adjusted HEI-2005 scores were based on stricter thresholds by applying the Bonferroni correction. Because the energy and nutrient intakes and the HEI-2005 scores were analyzed separately, the Bonferroni corrections were applied separately for each.

RESULTS

Characteristics

Because the NHANES is designed to provide estimates for the US population, the majority of the inferred population was non-Hispanic white (Table 1), had at least a high school education, did not currently smoke, and had a mean body mass index ≥25. In 1999-2006, 76% of men and 65% of women were current drinkers. Based on χ^2 tests, unadjusted percentage distributions of all demographic and lifestyle characteristics differed significantly by drinking status (never, former, and current drinker)

($P<0.001$). Based on global Wald F tests, mean age and body mass index differed significantly by drinking status; both were highest among former drinkers and lowest among current drinkers.

Results discussed in the remainder of this section are adjusted for age, race/ethnicity, educational level, smoking status, and body mass index. Results of unadjusted analyses are available from the authors on request.

Drinking Status

Energy and Nutrient Intakes. Among men, there were no significant differences in energy or macronutrient intakes between never, former, and current drinkers (Table 2). Among women, energy intakes were significantly higher among former and current (compared to never) drinkers. Regarding macronutrients, women who were former and current (compared to never) drinkers had significantly higher intakes of total fat, saturated fat, monounsaturated fat, and polyunsaturated fat; the current drinkers also had significantly higher intakes of protein and cholesterol.

Among men, there were no significant differences in micronutrient intakes except for vitamin C intake, which was highest in never drinkers and lowest in former drinkers (Table 2). Among women, former (compared to never) drinkers had significantly higher intakes of calcium, magnesium, and potassium. Compared to women who never drank, current drinkers had significantly higher intakes of eight micronutrients.

Diet Quality. Regardless of drinking status, the diet quality of Americans was relatively poor on average when compared to the recommendations of the 2005 DGA. Among men, total diet quality scores (ie, total HEI-2005 scores) did not differ significantly by drinking status (scores ranged from 53.6 to 57.8 out of a maximum score of 100) (Table 3); however, former and current (compared to never) drinkers consumed significantly less total fruit per 1,000 kcal (resulting in lower fruit scores), and current drinkers also consumed a greater percentage of energy from solid fats, alcoholic beverages, and added sugars (resulting in a lower SoFAAS score). In addition, men who were former (compared to current) drinkers consumed a higher percent of energy from saturated fat (resulting in a lower saturated fat score). Among women, total diet quality scores were significantly lower among current drinkers (score 58.9) than never drinkers (score 63.2); they consumed less whole grains and milk per 1,000 kcal (resulting in lower scores for whole grains and milk). Women who were current drinkers also consumed less milk per 1,000 kcal than former drinkers.

Drinking Level

Energy and Nutrient Intakes. Among men and women who currently consumed alcoholic beverages, energy and protein intakes increased significantly with increasing alcoholic beverage consumption (Table 4). As alcohol consumption increased, intakes of niacin, vitamin B-6, phosphorus, magnesium, and potassium also increased.

Diet Quality. Among men who currently consumed alcoholic beverages, total diet quality scores declined significantly from 55.9 to 41.5 with increasing consumption of alcoholic beverages (Table 5). Their intakes of total fruit, whole fruit, total grains, whole grains, and milk per 1,000 kcal significantly declined with increasing consumption of alcoholic beverages (resulting in lower scores for each of these components), while the percentage of energy from solid fats, alcoholic beverages, and added sugars increased (resulting in lower SoFAAS scores); however, sodium intake per 1,000 kcal decreased (resulting in a higher sodium score). Among women who currently consumed alcoholic beverages, total diet quality scores also significantly declined from 59.5 to 51.8, with increasing consumption of alcoholic beverages. In particular, their intakes of total fruit and whole fruit per 1,000 kcal decreased, and the percentage of energy from solid fats, alcoholic beverages, and added sugars increased (resulting in lower SoFAAS scores).

DISCUSSION

In this nationally representative study, diet quality was poorer among women who were current drinkers than among women who had never consumed alcoholic beverages. Among both men and women who were current drinkers, diet quality declined with increasing consumption of alcoholic beverages.

Although higher levels of alcoholic beverage consumption were associated with higher intakes of energy, protein, and some vitamins and minerals among current drinkers, they were also associated with lower diet quality scores, due in part to the higher energy intakes attributable to alcoholic beverages. The higher intakes of alcoholic beverages contributed to both higher energy intakes and higher percentages of energy from alcoholic beverages, which in turn resulted in lower scores for energy from SoFAAS, the discretionary energy component of the HEI-2005. It appears that solid fats did not contribute much to the decreasing scores for energy from SoFAAS because intakes of saturated fats (in grams), which are highly correlated with solid fats, did not increase as alcoholic beverage consumption increased. The extent to which added sugars contributed is unknown.

Alcoholic beverages are a significant source of energy. The ethanol in alcoholic beverages provides about 7 kcal/g (34). A 5-oz glass of red wine provides 125 kcal; a jigger (1.5 oz) of 80-proof gin or vodka, 97 kcal; and a 12-oz can of beer, 153 kcal (28). Energy in mixed drinks can be considerably higher. For example, a 4.5-oz Piña Colada cocktail contains 245 kcal. In 1994-1996, alcoholic beverages provided 3.3% of the US adult population's energy intake (35).

Alcoholic beverages do contain certain nutrients. In 1994-1996, alcoholic beverages provided 2% to 3% of adult intakes of folate, niacin, and vitamin B-6, and at least 1% of riboflavin, phosphorus, potassium, and copper (35). (Note that this was before grain products were fortified with folate.) However, alcoholic beverages have been shown to interfere with absorption and metabolism of some nutrients in studies of alcoholics (4). The higher protein intakes at higher alcohol consumption levels are surprising and cannot be accounted for by the alcoholic beverages, suggesting other dietary differences. All of the HEI-2005 food-group component scores decreased or remained unchanged with increasing alcohol consumption.

Table 2. Weighted mean daily energy and nutrient intakes[a] among men and women aged 20 years and older, by drinking status, United States, 1999-2006[b]

	Men						Women[c]					
	Drinking Status			*P* Value			Drinking Status			*P* Value		
Energy/nutrient	Never drinker (n=561)	Former drinker (n=1,688)	Current drinker (n=5,724)	Former vs never drinker	Current vs former drinker	Current vs never drinker	Never drinker (n=1,611)	Former drinker (n=1,532)	Current drinker (n=4,397)	Former vs never drinker	Current vs former drinker	Current vs never drinker
	←— *mean±standard error* —→						←— *mean±standard error* —→					
Energy (kcal)	2,602±50	2,540±37	2,667±19	NS[d]	NS	NS	1,683±22	1,804±22	1,850±15	*	NS	****
Protein (g)	96.1±1.9	96.2±1.7	100±1	NS	NS	NS	62.9±1.0	67.8±1.0	69.1±0.7	NS	NS	****
Fat (g)	97.7±2.5	99.6±1.8	98.8±0.9	NS	NS	NS	62.1±0.9	69.2±1.1	70.8±0.7	****	NS	****
Carbohydrate (g)	336±8	321±5	313±3	NS	NS	NS	222±3	234±4	225±2	NS	NS	NS
Cholesterol (mg)	324±11	344±9	355±4	NS	NS	NS	213±5	225±6	243±3	NS	NS	**
Saturated fat (g)	32.1±0.9	33.3±0.7	32.6±0.3	NS	NS	NS	20.3±0.4	22.7±0.4	23.2±0.3	***	NS	****
Monounsaturated fat (g)	36.9±1.0	37.5±0.7	37.2±0.4	NS	NS	NS	23.0±0.4	25.4±0.4	26.1±0.3	***	NS	****
Polyunsaturated fat (g)	20.3±0.6	20.1±0.4	20.1±0.2	NS	NS	NS	13.5±0.3	15.0±0.3	15.2±0.2	*	NS	***
Dietary fiber (g)	18.9±0.6	17.4±0.5	17.6±0.2	NS	NS	NS	13.9±0.4	14.1±0.3	13.8±0.2	NS	NS	NS
Vitamin A (μg)	721±53	638±35	670±15	NS	NS	NS	550±20	583±20	558±10	NS	NS	NS
Thiamin (mg)	1.99±0.07	1.87±0.04	1.95±0.02	NS	NS	NS	1.34±0.03	1.39±0.03	1.40±0.02	NS	NS	NS
Riboflavin (mg)	2.53±0.09	2.50±0.05	2.56±0.03	NS	NS	NS	1.72±0.03	1.89±0.04	1.86±0.02	NS	NS	*
Niacin (mg)	28.0±1.2	27.2±0.6	29.6±0.3	NS	NS	NS	18.0±0.3	19.6±0.4	20.1±0.2	NS	NS	****
Vitamin B-6 (mg)	2.23±0.10	2.11±0.06	2.32±0.02	NS	NS	NS	1.46±0.03	1.58±0.03	1.60±0.02	NS	NS	*
Folate (DFE[e])	645±19	578±14	634±9	NS	NS	NS	458±12	477±10	471±8	NS	NS	NS
Vitamin B-12 (μg)	6.02±0.59	6.02±0.31	6.65±0.14	NS	NS	NS	3.80±0.16	4.12±0.15	4.33±0.09	NS	NS	NS
Vitamin C (mg)	111±6	85.5±3.4	101±2	**	**	NS	76.9±3.2	81.7±2.7	83.1±2.1	NS	NS	NS
Vitamin E (mg)	8.18±0.28	8.14±0.38	8.15±0.10	NS	NS	NS	5.70±0.13	6.24±0.15	6.47±0.09	NS	NS	***
Calcium (mg)	1,050±32	1,013±33	999±12	NS	NS	NS	725±16	803±16	760±10	*	NS	NS
Phosphorus (mg)	1,569±30	1,537±28	1,580±12	NS	NS	NS	1,051±16	1,132±16	1,126±12	NS	NS	*
Magnesium (mg)	326±7	319±8	339±3	NS	NS	NS	229±4	249±4	250±3	*	NS	**
Iron (mg)	19.1±0.5	17.9±0.4	18.4±0.2	NS	NS	NS	13.0±0.3	13.5±0.2	13.4±0.2	NS	NS	NS
Zinc (mg)	13.8±0.3	14.3±0.4	14.8±0.2	NS	NS	NS	9.21±0.24	10.2±0.2	10.1±0.1	NS	NS	NS
Copper (mg)	1.56±0.09	1.51±0.05	1.57±0.02	NS	NS	NS	1.06±0.03	1.14±0.02	1.14±.01	NS	NS	NS
Potassium (mg)	3,197±61	3,036±52	3,195±25	NS	NS	NS	2,195±31	2,361±29	2,393±25	*	NS	****
Sodium (mg)[f]	4,085±86	4,050±77	4,131±37	NS	NS	NS	2,701±44	2,858±43	2,969±28	NS	NS	***

[a]Adjusted for age, race/ethnicity, education, smoking status, and body mass index.
[b]Data source: National Health and Nutrition Examination Survey, 1999-2000, 2001-2002, 2003-2004, 2005-2006.
[c]Excludes pregnant and breastfeeding women.
[d]NS=not significant.
[e]DFE=dietary folate equivalents.
[f]Sodium excludes salt added at the table.
*$P<0.05/78$ based on Bonferroni correction.
**$P<0.01/78$ based on Bonferroni correction.
***$P<0.001/78$ based on Bonferroni correction.
****$P<0.0001/78$ based on Bonferroni correction.

Table 3. Weighted mean Healthy Eating Index-2005 (HEI-2005) scores[a] among men and women aged 20 years and older, by drinking status, United States, 1999-2006[b]

		Men						Women[c]					
		Drinking Status			*P* Value			Drinking Status			*P* Value		
HEI-2005 component[d]	Maximum HEI-2005 score	Never drinker (n=561)	Former drinker (n=1,688)	Current drinker (n=5,724)	Former vs never drinker	Current vs former drinker	Current vs never drinker	Never drinker (n=1,611)	Former drinker (n=1,532)	Current drinker (n=4,397)	Former vs never drinker	Current vs former dinker	Current vs never drinker
		←— *mean± standard error* —→						←— *mean± standard error* —→					
Total HEI-2005	100	57.8±0.91	54.1±0.97	53.6±0.51	NS[e]	NS	NS	63.2±1.08	61.3±0.96	58.9±0.72	NS	NS	****
Total fruit	5	3.2±0.22	2.2±0.14	2.5±0.07	**	NS	*	3.5±0.19	3.0±0.15	3.2±0.10	NS	NS	NS
Whole fruit	5	3.4±0.37	2.8±0.21	2.8±0.10	NS	NS	NS	4.8±0.28	3.9±0.25	3.9±0.13	NS	NS	NS
Total vegetables	5	3.4±0.13	3.0±0.12	3.1±0.05	NS	NS	NS	3.9±0.11	3.8±0.11	3.7±0.06	NS	NS	NS
Dark-green and orange vegetables and legumes	5	1.1±0.09	1.2±0.10	1.2±0.05	NS	NS	NS	1.8±0.13	1.7±0.14	1.6±0.07	NS	NS	NS
Total grains	5	5.0±0.17	5.0±0.07	4.8±0.05	NS	NS	NS	5.0±0.12	5.0±0.10	5.0±0.06	NS	NS	NS
Whole grains	5	1.0±0.11	0.9±0.05	0.9±0.03	NS	NS	NS	1.3±0.06	1.3±0.08	1.1±0.03	NS	NS	*
Milk	10	5.6±0.29	5.7±0.27	5.1±0.09	NS	NS	NS	6.3±0.23	6.3±0.19	5.6±0.13	NS	*	*
Meat and beans	10	10.0±0.43	10.0±0.28	10.0±0.13	NS	NS	NS	10.0±0.24	10.0±0.22	10.0±0.13	NS	NS	NS
Oils	10	6.2±0.39	6.5±0.20	6.2±0.11	NS	NS	NS	7.0±0.20	7.6±0.21	7.2±0.14	NS	NS	NS
Saturated fat	10	6.4±0.43	5.4±0.23	6.5±0.12	NS	****	NS	6.5±0.20	5.8±0.29	5.9±0.15	NS	NS	NS
Sodium	10	3.9±0.33	3.9±0.16	4.0±0.10	NS	NS	NS	3.4±0.20	3.7±0.17	3.6±0.10	NS	NS	NS
Energy from SoFAAS[f]	20	8.6±0.47	7.6±0.46	6.3±0.24	NS	NS	****	9.6±0.39	9.2±0.38	8.±0.29	NS	NS	NS

[a]Adjusted for age, race/ethnicity, education, smoking status, and body mass index.
[b]Data source: National Health and Nutrition Examination Survey, 1999-2000, 2001-2002, 2003-2004, 2005-2006.
[c]Excludes pregnant and breastfeeding women.
[d]For food group components (Total fruit, whole fruit, total vegetables, dark-green and orange vegetables and legumes, total grains, whole grains, milk, meat and beans, oils), higher (better) scores reflect higher intakes; however, for moderation components where intakes should be limited (saturated fat, sodium, and energy from SoFAAS), higher (better) scores reflect lower intakes.
[e]NS=not significant.
[f]Energy from SoFAAS includes energy from solid fats, alcoholic beverages, and added sugars.
*$P<0.05/39$ based on Bonferroni correction.
**$P<0.01/39$ based on Bonferroni correction.
****$P<0.0001/39$ based on Bonferroni correction.

Table 4. Weighted mean daily energy and nutrient intakes[a] among men and women aged 20 years and older who currently drink alcoholic beverages, United States, 1999-2006[b]

Energy/nutrient	Men: No. of Drinks Per Day, on Average <1 (n=3,123)	1 (n=1,441)	2 (n=556)	3 (n=311)	4 (n=96)	≥5 (n=189)	*P* trend	Women[c]: No. of Drinks Per Day, on Average <1 (n=3,515)	1 (n=629)	2 (n=172)	≥3 (n=80)	*P* trend
	← mean±standard error →							← mean±standard error →				
Energy (kcal)	2,581±23	2,621±33	2,862±61	2,911±81	3,115±141	3,139±136	****	1,808±15	1,951±33	2,103±86	2,248±143	****
Protein (g)	98.2±1.0	99.5±1.3	108±3	105±3	114±6	99.3±3.8	*	67.6±0.7	73.6±1.4	78.2±3.5	76.1±5.9	**
Fat (g)	99.0±1.2	96.6±1.3	103±3	102±4	105±6	90.3±4.4	NS[d]	69.9±0.8	73.0±1.6	77.4±3.7	72.7±6.4	NS
Carbohydrate (g)	321±3	300±5	308±7	299±9	320±15	306±12	NS	226±2	220±5	209±8	239±18	NS
Cholesterol (mg)	350±6	350±9	380±14	374±19	394±26	351±21	NS	238±3	255±9	288±19	239±28	NS
Saturated fat (g)	32.5±0.4	32.0±0.5	34.7±1.1	33.8±1.4	33.9±2.2	29.6±1.5	NS	22.9±0.3	24.0±0.7	24.6±1.2	23.4±1.9	NS
Monounsaturated fat (g)	37.2±0.5	36.5±0.5	39.1±1.0	38.9±1.7	38.7±2.2	34.3±1.7	NS	25.7±0.3	27.0±0.6	29.0±1.6	26.4±2.5	NS
Polyunsaturated fat (g)	20.4±0.3	19.3±0.4	20.5±0.6	20.4±0.9	22.8±1.7	18.4±1.1	NS	15.0±0.2	15.6±0.4	17.1±1.0	16.7±1.9	NS
Dietary fiber (g)	17.7±0.3	17.3±0.3	17.9±0.6	18.2±0.7	17.8±1.0	17.5±1.1	NS	13.7±0.2	14.1±0.4	14.5±0.6	14.3±1.6	NS
Vitamin A (μg)	693±22	646±24	675±35	611±40	720±91	542±61	NS	563±12	538±20	538±40	549±77	NS
Thiamin (mg)	1.96±0.03	1.91±0.03	1.97±0.05	1.95±0.07	2.00±0.14	1.86±0.10	NS	1.39±0.02	1.40±0.04	1.41±0.06	1.55±0.20	NS
Riboflavin (mg)	2.57±0.04	2.48±0.04	2.62±0.06	2.64±0.09	2.81±0.17	2.50±0.11	NS	1.86±0.03	1.87±0.04	1.86±0.08	2.12±0.20	NS
Niacin (mg)	28.4±0.4	29.4±0.4	31.9±0.8	32.4±0.9	34.6±1.7	35.5±1.7	****	19.7±0.3	20.8±0.5	23.2±1.2	25.2±2.0	*
Vitamin B-6 (mg)	2.22±0.03	2.29±0.04	2.48±0.06	2.60±0.08	2.77±0.18	2.92±0.20	****	1.57±0.03	1.67±0.04	1.89±0.10	2.06±0.18	**
Folate (DFE[e])	638±10	624±16	628±18	637±27	706±61	631±42	NS	473±9	454±13	459±23	583±106	NS
Vitamin B-12 (μg)	6.53±0.18	6.87±0.36	6.76±0.30	6.66±0.53	6.93±0.78	6.35±0.61	NS	4.35±0.11	4.12±0.13	4.69±0.27	4.60±0.55	NS
Vitamin C (mg)	104±3	97.0±3.1	100±5	104±7	106±12	83.4±6.8	NS	81.5±2.3	91.7±4.0	82.2±5.4	82.0±9.9	NS
Vitamin E (mg)	8.14±0.13	8.05±0.17	8.28±0.22	8.00±0.36	9.13±0.67	8.35±0.71	NS	6.34±0.11	6.98±0.24	6.97±0.41	6.75±0.71	NS
Calcium (mg)	1,010±16	961±19	1,043±32	1,019±48	1,055±92	896±50	NS	753±12	791±20	754±33	849±76	NS
Phosphorus (mg)	1,559±17	1,544±20	1,672±37	1,684±55	1,779±103	1,623±58	*	1,104±13	1,195±20	1,220±48	1,296±93	*
Magnesium (mg)	327±4	335±5	361±8	380±11	408±23	396±16	****	243±3	271±6	282±13	307±19	***
Iron (mg)	18.8±0.3	17.9±0.3	18.6±0.6	18.2±0.7	18.3±1.2	16.4±0.9	NS	13.5±0.2	12.9±0.3	13.1±0.5	14.1±1.5	NS
Zinc (mg)	14.9±0.3	14.3±0.2	15.1±0.5	15.0±0.6	17.0±1.8	15.2±1.3	NS	9.99±0.16	10.3±0.3	11.1±0.6	11.1±1.2	NS
Copper (mg)	1.57±0.03	1.52±0.03	1.57±0.05	1.61±0.06	1.78±0.13	1.60±0.09	NS	1.12±0.01	1.22±0.03	1.24±0.05	1.21±0.09	NS
Potassium (mg)	3,149±35	3,138±35	3,350±69	3,440±105	3,550±166	3,281±113	**	2,339±28	2,573±47	2,626±88	2,664±199	**
Sodium (mg)[f]	4,122±40	4,065±66	4,292±104	4,220±154	4,324±241	4,027±187	NS	2,925±31	3,096±64	3,292±165	3,051±269	NS

[a]Adjusted for age, race/ethnicity, education, smoking status, and body mass index.
[b]Data source: National Health and Nutrition Examination Survey, 1999-2000, 2001-2002, 2003-2004, 2005-2006.
[c]Excludes pregnant and breastfeeding women.
[d]NS=not significant.
[e]DFE=dietary folate equivalents.
[f]Sodium excludes salt added at the table.
*$P<0.05/26$ based on Bonferroni correction.
**$P<0.01/26$ based on Bonferroni correction.
***$P<0.001/26$ based on Bonferroni correction.
****$P<0.0001/26$ based on Bonferroni correction.

Table 5. Weighted mean Healthy Eating Index-2005 (HEI-2005) scores[a] among men and women aged 20 years and older who currently drink alcoholic beverages, United States, 1999-2006[b]

		Men							Women[c]				
		No. of Drinks Per Day, on Average							No. of Drinks Per Day, on Average				
HEI-2005 component[d]	Maximum HEI-2005 score	<1 (n=3,123)	1 (n=1,441)	2 (n=556)	3 (n=311)	4 (n=96)	≥5 (n=189)	*P* trend	<1 (n=3,515)	1 (n=629)	2 (n=172)	≥3 (n=80)	*P* trend
		← mean±standard error →							← mean±standard error →				
Total HEI-2005	100	55.9±0.61	52.8±0.74	50.4±1.20	48.6±1.52	48.5±2.56	41.5±1.83	****	59.5±0.74	57.7±1.21	53.5±2.50	51.8±2.70	*
Total fruit	5	2.7±0.10	2.5±0.12	2.1±0.16	2.4±0.22	2.2±0.37	1.2±0.17	****	3.3±0.11	2.8±0.15	2.5±0.27	2.1±0.32	**
Whole fruit	5	3.0±0.12	2.8±0.19	2.2±0.20	2.4±0.26	2.5±0.48	1.5±0.20	****	4.1±0.15	3.3±0.21	3.4±0.51	2.3±0.35	**
Total vegetables	5	3.2±0.06	3.1±0.07	3.1±0.13	3.0±0.19	3.1±0.26	3.0±0.19	NS[e]	3.6±0.07	4.0±0.17	3.6±0.23	3.6±0.36	NS
Dark-green and orange vegetables and legumes	5	1.2±0.07	1.2±0.07	1.4±0.16	1.0±0.15	1.4±0.35	1.2±0.19	NS	1.6±0.08	2.0±0.18	1.3±0.22	1.7±0.43	NS
Total grains	5	5.0±0.07	4.7±0.09	4.4±0.13	4.1±0.17	3.8±0.32	3.5±0.20	****	5.0±0.06	4.5±0.14	4.2±0.18	4.2±0.41	NS
Whole grains	5	1.0±0.05	0.8±0.05	0.8±0.08	0.8±0.11	0.5±0.11	0.5±0.07	****	1.1±0.04	1.0±0.09	0.9±0.17	0.8±0.17	NS
Milk	10	5.4±0.13	4.8±0.16	5.0±0.27	4.7±0.36	4.2±0.64	3.2±0.31	****	5.7±0.15	5.4±0.28	4.8±0.32	4.8±0.69	NS
Meat and beans	10	10.0±0.17	10.0±0.26	10.0±0.26	10.0±0.53	10.0±0.85	9.9±0.57	NS	10.0±0.16	10.0±0.38	10.0±0.77	9.0±0.76	NS
Oils	10	6.5±0.15	6.1±0.21	5.9±0.26	5.8±0.53	6.6±0.63	4.8±0.51	NS	7.2±0.15	7.2±0.29	6.9±0.71	7.6±1.28	NS
Saturated fat	10	6.1±0.15	6.4±0.25	6.8±0.52	7.2±0.54	6.1±0.33	6.4±0.26	NS	5.6±0.17	6.6±0.36	7.2±0.59	6.3±0.35	NS
Sodium	10	3.6±0.12	4.0±0.19	4.5±0.30	4.7±0.37	5.6±0.50	6.3±0.49	****	3.4±0.11	3.8±0.26	4.0±0.47	5.7±0.76	NS
Energy from SoFAAS[f]	20	8.2±0.28	6.3±0.31	4.0±0.58	2.4±0.75	2.5±1.53	0.0±1.52	****	8.8±0.28	7.0±0.59	4.6±1.16	3.9±1.61	**

[a]Adjusted for age, race/ethnicity, education, smoking status, and body mass index.
[b]Data source: National Health and Nutrition Examination Survey, 1999-2000, 2001-2002, 2003-2004, 2005-2006.
[c]Excludes pregnant and breastfeeding women.
[d]For food group components (total fruit, whole fruit, total vegetables, dark-green and orange vegetables and legumes, total grains, whole grains, milk, meat and beans, oils), higher (better) scores reflect higher intakes; however, for moderation components where intakes should be limited (saturated fat, sodium, and energy from SoFAAS), higher (better) scores reflect lower intakes.
[e]NS=not significant.
[f]Energy from SoFAAS includes energy from solid fats, alcoholic beverages, and added sugars.
*$P<0.05/13$ based on Bonferroni correction.
**$P<0.01/13$ based on Bonferroni correction.
****$P<0.0001/13$ based on Bonferroni correction.

Optimal classification of nondrinkers in epidemiologic studies of alcoholic beverage consumption and chronic disease outcomes could be facilitated by information about the dietary intakes of never and former drinkers. Previous studies of alcoholic beverage consumption and dietary intakes (12-22,26) generally combined never and former drinkers into a single nondrinker group; however, these groups could have different dietary intakes. The sick quitter hypothesis (23) posits that some former drinkers may have quit consuming alcoholic beverages because they were ill (for reasons including alcohol consumption). Illness could also alter their diets. This study found more differences in nutrient intakes between former and never drinkers among women than men. However, the lower vitamin C intakes found in men who were former drinkers could be important in some studies. Furthermore, associations between drinking status and dietary intakes may vary between studies. In terms of clinical practice and nutrition education, the results suggest that former drinkers may be an overlooked, important target group.

The results of this study suggest that the HEI-2005 is a useful indicator of diet quality according to drinking status and drinking levels. It reveals information about dietary patterns that is not readily apparent from nutrient intake data. For example, in men and women, fruit intake declined with increasing consumption of alcoholic beverages. This specific dietary difference would not be easily determined from the nutrient data as all foods, including fruit, are comprised of a mixture of macro- and micronutrients and other important constituents not necessarily captured in a food composition database. In addition, the HEI-2005 adjusts for energy intake and, by doing so, controls for variation in energy intake across levels of alcoholic beverage consumption. Therefore, the HEI-2005 enables identification of key aspects of dietary behavior that differ among alcohol-use subgroups and may be useful in formulating educational messages understandable by consumers in terms of the foods they consume.

The diet quality of Americans is poor in general. A recent report from the US Department of Agriculture found that the mean total HEI-2005 score of the US population in 2003-2004 was 57.5 out of 100, indicating that diets are far from the recommendations of the 2005 DGA and need improvement (36). In our study, mean total HEI-2005 scores (adjusted for age, race/ethnicity, education, smoking status, and body mass index) ranged from 41.5 for men who drank the most to 63.2 for women who had never consumed alcoholic beverages. Among men who were current drinkers, as alcoholic beverage consumption increased from <1 to ≥ 5 drinks per day, on average, total HEI-2005 scores significantly declined from 55.9 to 41.5; and among women who were current drinkers, as alcoholic beverage consumption increased from <1 to ≥ 3 drinks per day, on average, total HEI-2005 scores significantly declined from 59.5 to 51.8. This suggests that increasing levels of alcoholic beverage consumption may lead to increased nutrition risk (although causality cannot be inferred from these cross-sectional results).

This study had numerous strengths. The dataset used, NHANES 1999-2006, had relatively high response rates and provided a population-based sample much larger than used in earlier research. The study used the current US Department of Agriculture method of diet quality assessment, the HEI-2005. Appropriate analytic methods were used, including the Bonferroni technique to test statistical significance in the presence of multiple comparisons. Had this technique not been used, numerous additional associations would have been significant. The study estimated a population ratio for the HEI-2005 component scores adjusted for covariates that might differ according to drinking status (never, former, current drinker) and drinking level. This is an extension of the unadjusted population ratio for HEI-2005 proposed by Freedman and colleagues (32). A jackknife method is provided for estimating standard errors for the HEI-2005 component scores from complex survey data, such as the NHANES. The method can be used to construct 95% confidence intervals and to conduct statistical testing. The methods used in this study are general and can be applied to analyses examining relationships between HEI-2005 total and component scores and exposures other than alcoholic beverage consumption.

The study updates and expands upon tabulations found in the 2005 Dietary Guidelines Advisory Committee's report by using a larger sample size, including results by drinking status, adjusting for covariates, and performing statistical testing. By controlling various characteristics of the groups studied, the differences in intakes related to alcoholic beverage consumption per se were evident. Earlier NHANES data are linkable to mortality data to create cohort studies (37). The differences in nutrient intakes and diet quality found here may inform such studies.

This study also had limitations. Results were based on a 1-day recall of dietary intake; however, the mean nutrient intakes of a group are estimates of the mean long-term, or usual, intakes of each subpopulation studied if one assumes that the sampling of recalled days was balanced over the days of the week and seasons of the year. Although dietary data were collected on all days of the week and in all seasons, the distribution by day of week was uneven. The extent to which this affects the estimates of group usual nutrient intakes is unknown. Dietary supplements and physical activity were not accounted for. It would have been possible to remove energy from alcohol in the calculation of total energy intake, but we chose not to do so because our interest was in total nutrients consumed, including from alcoholic beverages; and, with regard to diet quality, it was important to capture all the major sources of discretionary calories, including those from alcoholic beverages as well as solid fats and added sugars. Finally, cause and effect cannot be inferred from cross-sectional results.

CONCLUSIONS

Regardless of drinking status, American adults' diet quality is relatively poor on average when compared to the recommendations of the 2005 DGA. During 1999-2006, the majority of Americans (76% of men and 65% of women) were current drinkers. This study found numerous associations between alcoholic beverage consumption and dietary intake. Increasing levels of alcoholic beverage consumption were associated with increasing intakes of some nutrients, but poorer diet quality, as indicated by decreasing HEI-2005 scores, apparently due to both higher energy intakes attributable at least in part to alcoholic beverage consumption as well as other differences in food choices. Although women who were current drinkers had significantly higher intakes of energy and some nutrients than women who had never consumed alcoholic beverages, the current drinkers had poorer diet quality; women who were former drinkers (compared to never drinkers) had higher intakes of certain nutrients but also had higher energy intakes.

Further research is needed to elucidate food choice differences by level of drinking. Describing intakes of finer food groupings than those used in the HEI-2005 may be informative. The energy contributions of solid fats, alcoholic beverages, and added sugars could be separated to clarify the relative importance of each.

These findings have implications for research studies, public health, and clinical practice. The design and interpretation of epidemiologic studies should consider differences in dietary intake among never, former, and current drinkers, and differences in dietary intake among lighter and heavier drinkers. Such studies should also investigate differences in overall dietary patterns rather than focusing on specific nutrients or types of foods. Both nutrient intakes and diet quality are useful measures of dietary intake in the US population; however, in terms of public health recommendations to prevent chronic disease, a focus on diet quality in terms of foods rather than nutrients has more utility (2).

Persons who choose to drink and those who have quit should be assisted in achieving a healthful diet. In particular, educational messages should focus on reducing nutrition and chronic disease risk associated with high consumption of alcoholic beverages and poor food choices. The National Institute on Alcohol Abuse and Alcoholism publication *Rethinking Drinking: Alcohol and Your Health* (38) may be useful to dietetics practitioners and their clients.

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