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Income and race/ethnicity are associated with adherence to food-based dietary guidance among U.S. adults and children

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Abstract

Background—Income and race/ethnicity are associated with differences in dietary intakes that may contribute to health disparities among the United States population.

Objective—To examine alignment of intakes of food groups and energy from solid fats, added sugars, and alcohol with the 2005 Dietary Guidelines and MyPyramid, by family income and race/ethnicity.

Design—Data from the National Health and Nutrition Examination Survey (NHANES), a cross-sectional nationally-representative survey, for 2001-2004.

Participants/setting—Persons aged 2 years and older for whom reliable dietary intake data were available (n=16,338) were categorized by income (lowest, middle, and highest) and race/ethnicity (non-Hispanic White (NHW), non-Hispanic Black (NHB), and Mexican-American (MA)).

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Statistical analyses performed—The National Cancer Institute (NCI) method was used to estimate the proportions of adults and children in each income and race/ethnic group whose usual intakes met the recommendations.

Results—Higher income was associated with greater adherence to recommendations for most food groups; the proportions meeting minimum recommendations among adults in the highest income group were double that observed for the lowest income group for total vegetables, milk, and oils. Fewer differences by income were apparent among children. Among the race/ethnic groups, the proportions meeting recommendations were generally lowest among NHB. Marked differences were observed for milk—15% of NHB children met the minimum recommendations compared to 42% of NHW children and 35% of MA children; a similar pattern was evident for adults. One in five Mexican American adults met the dry beans and peas recommendations compared to approximately 2% of NHW and NHB. Most adults and children consumed excess energy from solid fats and added sugars irrespective of income and race/ethnicity.

Conclusions—The diets of some subpopulations, particularly individuals in lower-income households and NHB, are especially poor in relation to dietary recommendations, supporting the need for comprehensive strategies to enable healthier dietary intake patterns.

Keywords

dietary guidance; income; race/ethnicity; disparities; usual dietary intakes; 24-hour recall; NHANES

INTRODUCTION

Health disparities are pervasive among the United States (U.S.) population, with individuals of lower socioeconomic status and members of minority subgroups being more prone to a host of chronic diseases, including obesity (1-4). Dietary intakes are an important contributor to such disparities (5). Previous research provides evidence of relatively low mean intakes of nutrients and food groups among individuals from low-income households as well as particular racial/ethnic groups (6-10). An examination of trends among racial and socioeconomic groups in the U.S. using data from the Nationwide Food Consumption Surveys and Continuing Survey of Food Intake by Individuals indicated large differences in dietary quality in 1965 but relatively similar diet quality by 1989-1991 (11). However, analyses of NHANES data covering the period from 1971 to 2002 suggest disparities in dietary intakes in relation to income and race that have not improved over time (12,13).

Understanding the extent to which differences in dietary intakes are of public health concern can be fostered by examining how the intakes of various groups compare to dietary guidance. At the time that this study was conducted, U.S. food-based dietary guidance was comprised of MyPyramid and the 2005 Dietary Guidelines for Americans (14,15). MyPyramid translates the 2005 Dietary Guidelines into patterns of eating and includes recommendations for five major food groups—fruits, vegetables, grains, meat and beans, milk—plus oils (14). More specific recommendations reflect the nutrient composition of different contributors to the main food groups. For example, the guidance indicates that the majority of fruit should be consumed as whole fruit and half of all grains should be consumed as whole grains to ensure adequate fiber intake. In addition to providing recommendations for total vegetable intakes, recommendations are also provided for subgroups based on nutrient content to communicate the optimal distribution of vegetable intakes (15). In addition, the guidance emphasizes meeting essential nutrient needs while not exceeding total energy needs, which requires selecting mostly nutrient-dense foods and limiting extras, which include solid fats (discretionary fat derived from hydrogenated

vegetable oils or animal sources other than fish) and added sugars (all sugars used as ingredients in processed and prepared foods), as well as alcohol for adults (14,15).

One means of examining compliance with dietary guidelines is by assigning Healthy Eating Index-2005 scores (16-18). For example, analyses of NHANES data for adults 60 years of age and older from 1999 to 2002 show lower mean scores (indicative of lower adherence to guidelines) for various components of the HEI-2005 among non-Hispanic Blacks and Mexican-Americans as compared to non-Hispanic whites (HEI-2005) (16). An examination of HEI-2005 scores by income using NHANES data from 2003-2004 found lower mean scores for vegetables and whole grains and higher mean scores for sodium among individuals in lower-income compared to higher-income families (17). However, these analyses do not provide an indication of the proportions of various population subgroups whose intakes are outside of recommendations.

In this paper, further light is shed on differences in adherence to dietary guidance among the population through estimating the proportions of adults and children of varying income levels and race/ethnicity whose usual dietary intakes meet dietary guidance as communicated by MyPyramid and the 2005 Dietary Guidelines for Americans (the version in effect at the time that this study was conducted and which is more contemporaneous with the data analyzed in this study compared to the 2010 version). In particular, prevalences of food group intakes that meet the minimum recommendations were estimated. Because some food groups may be overconsumed, prevalences of exceeding maximum recommendations were also examined. Finally, the prevalences of intakes of discretionary calories (which include solid fats, added sugars, and for adults, alcoholic beverages) that are within standards were estimated.

METHODS

Data and variables

The NHANES is a cross-sectional nationally-representative health and nutrition survey of the civilian, noninstitutionalized U.S. population conducted by the National Center for Health Statistics. The survey includes demographic, socioeconomic, and health-related questions, including the What We Eat in America (WWEIA) dietary interview, and is carried out through complex, stratified, multistage probability sampling. The NHANES protocol was approved by the National Center for Health Statistics Research Ethics Review Board and all participants provided informed consent. Additional details about NHANES are available elsewhere (19).

NHANES data for 2001 through 2004 were used for this analysis. These data are the most recent for which USDA's MyPyramid Equivalents Database (MPED) (20,21) is available, which made it possible to estimate intakes of food groups used in dietary guidance. Dietary guidelines are intended for individuals aged 2 years and older, thus, data for children younger than 2 years of age were excluded. Reliable dietary intake information was available for 17,311 persons aged 2 years and older. Individuals with missing data for family income were excluded (n=973), resulting in an analytic sample of 16,338. There were no significant differences in age, sex, or race/ethnicity between those included in the analytic sample and those excluded due to missing family income data.

Dietary intakes—Dietary intake data were collected by interviewer-administered 24-hour recalls (24HR) conducted using the Automated Multiple Pass Method (19). One 24HR was available for 9,043 individuals and two 24HR were available for the remaining 7,295 individuals, totaling 23,633 recalls. The MPED (version 1.0 for 2001-2002 NHANES data and 2.0 for 2003-2004 data) (20,21) was used to convert amounts of foods reported on the

24HRs into amounts of food groups (total fruits, whole fruits, total vegetables, dark green vegetables, orange vegetables, dry beans and peas, starchy vegetables, other vegetables, total grains, whole grains, meat and beans, milk, and oils) as well as solid fats, added sugars, and alcohol. To achieve this, the MPED disaggregates all foods reported into their component ingredients, groups similar ingredients together, and provides estimates for each group or constituent in units of measure consistent with MyPyramid.

Recommendations for each food group and for discretionary calories vary depending on estimated energy needs, which relate to sex, age, and activity level. In all cases, a conservative approach that favored meeting the recommendation for the food component of interest was applied. To examine the proportion of individuals whose intakes met food group recommendations, the lowest recommended level (which assumes a sedentary lifestyle) was used for each sex/age subgroup. To examine the proportions of individuals whose intakes exceeded recommendations for each food group and the proportions whose energy from discretionary calories were within recommendations, the highest recommended levels (which assume an active level) were used. In addition to examining calories from discretionary sources collectively, solid fats and added sugars were each examined separately using the example recommended amounts from the 2005 Dietary Guidelines for Americans (15). For adults only, alcoholic beverage consumption was compared to the guideline for moderate consumption (up to 1 drink per day for women and up to 2 drinks per day for men) (15).

Income groups—Income groups were created using the Poverty Income Ratio (PIR), which is the ratio of income to the federal poverty threshold based on family size and composition (19). PIR cut points consistent with those used to determine eligibility for food assistance programs (22-24) and other analyses of national data, including annual reporting of food insecurity in the U.S. (25), were applied to create three groups: lowest (less than or equal to 130 percent of the poverty threshold), middle (131 to 185 percent), and highest (greater than 185 percent).

Race/ethnic groups—Race/ethnic groups were defined by NHANES using responses to questions on race and Hispanic origin (19). The groups with adequate sample to support separate estimates include non-Hispanic White (NHW), non-Hispanic Black (NHB), and Mexican American (MA). Individuals of a different racial/ethnic identity, those who reported more than one racial identity, and those with missing values on race/ethnicity were coded into an “other” category (19). Data for these individuals (n=1,278) were used in the analysis of differences by income group but excluded from the subset of analyses that examined differences among race/ethnic groups.

Statistical Analysis

Analyses were conducted using SAS (version 9.2, 2008, SAS Institute, Cary, NC). To generate estimates of the proportions of individuals in each sex/age subgroup whose usual intakes met or exceeded the food group recommendations and were within the recommendations for discretionary calories, the NCI method was used to estimate usual intake distributions (26). This involved estimating the mean and the within- and between-person variance components for the amount of each food component consumed. Not all individuals report consuming foods from a given food group on a given day. To address this, the NCI method uses a nonlinear mixed model comprised of one or two parts depending on the food component in question. The one-part model is an “amount only” model for food components that are consumed most days by almost everyone, such as total grains. The two-part model is used for episodically consumed foods (i.e., food components that are not consumed every day by all individuals, such as dark green vegetables), and models both the

probability of consumption and the amount of the food component consumed on the recall day. The determination of which model to use (one- or two-part) was based on the proportion of 24HR with zero intakes for the food component in question. The one-part model was used for food components for which fewer than 5% of 24HRs have zero intakes and the two-part model was used for those with more than 10%. For food components that had zero intakes reported on between 5% and 10% of 24HR, both models were fit and the best-fitting was selected. Details on the model selection for the food components examined in this paper are available elsewhere (27).

No matter whether the one-part or two-part model is employed, stable estimation of the within- and between-person variance components requires that a substantial number of individuals have consumed the food component on multiple days. Meeting this requirement necessitates running the models on large groups. Because the variance components may vary by age and sex, models were run for three large strata (children aged 2 to 8 years, males 9 years and older, and females 9 years and older), including categorical variables for sex (necessary for the models for 2 to 8 year old children only) and age to allow estimates to be generated for the sex/age groups used in dietary guidance (14,15) as well as for all children (2 to 18 years) and all adults (19 years and older). In addition to the income and race/ethnicity variables, covariates to account for whether the 24HR data were from the first or second recall and weekend/weekday effects were included.

Once the usual intake distributions were estimated for each dietary component, the proportions of individuals in each sex/age group by income and race/ethnic group meeting or exceeding recommendations were estimated. For ease of interpretation given the focus of this analysis on income and race/ethnic groups rather than sex and age differences, we present estimates for all adults and for all children grouped together. Estimates of the proportions of individuals in each sex/age subgroup whose intakes are consistent with dietary guidance have been published elsewhere (27).

T-tests were used to test differences in the proportions of adults and children in each income group and race/ethnic group meeting recommendations for each food component (28). A comparison-wise significance level of 0.05 was applied to draw out differences by income and race/ethnic group in Tables 1 through 6 and the description of results. Pair-wise differences and p-values are presented in Supplemental Tables 1 through 6. Variance estimation was carried out with the Balanced Repeated Replication (BRR) technique, using replicate weight sets developed by USDA's Agricultural Research Service for use with NHANES WWEIA 2001-2004 dietary intake data. The BRR technique is a replication-based variance estimation procedure that accounts for the stratification, clustering, and weighting of complex samples such as NHANES (28). The nationally representative sample and weighting procedures result in estimates that are applicable to the population.

RESULTS

Because NHANES is designed to provide nationally-representative estimates, the sample characteristics reflect those of the U.S. population. The number of adults and children within each of the income and race/ethnic groups of interest in this analysis are noted in Tables 1-6.

Adults

Patterns among income groups—Greater proportions of adults in the highest income group compared to each of the other two income groups met the minimum recommendations for total fruits, whole fruits, total vegetables, dark green vegetables, other vegetables, whole grains, meat and beans, milk, and oils (Table 1). Differences among income groups in the proportions exceeding the maximum recommendations were observed for most food groups;

generally, the proportions exceeding recommendations increased with increasing income with the exception of the dry beans and peas group (Table 2). Only 5% of all adults had intakes of energy from solid fats, added sugars, and alcohol collectively that were within the discretionary calorie allowance and there were no significant differences by income group (Table 3). When solid fats and added sugars were considered separately, a smaller proportion of adults in the highest income group had solid fat intakes within the standards compared to the lowest income group and the reverse was true for added sugars. A gradient effect was observed for alcoholic beverages such that the proportion of adults within the recommendation increased with decreasing income (Table 3).

Patterns among race/ethnic groups—Compared to both NHW and MA adults, smaller proportions of NHB adults met the minimum recommendations for whole fruits, total vegetables, other vegetables, total grains, and milk (Table 1). Greater proportions of MA adults met the minimum recommendations for dry beans and peas and total grains, and smaller proportions met the minimum recommendations for dark green vegetables, starchy vegetables, and oils compared to both NHW and NHB adults. Despite the fact that less than 1% and 10% of any group met the minimum recommendations for whole grains and milk, respectively, greater proportions of NHW adults met these recommendations compared to NHB and MA. A smaller proportion of NHW adults met the minimum recommendations for meat and beans compared to the other two groups. Similar patterns were observed when the proportions exceeding maximum recommendations by race/ethnic group were considered (Table 2). A smaller proportion of NHB adults had added sugar intakes within the standard compared to NHW and MA adults, whereas a higher percentage of NHB and MA adults had alcohol intakes that did not exceed the guidelines for moderate drinking compared to NHW adults (Table 3).

Children

Patterns among income groups—A smaller proportion of children in the highest income group met the minimum recommendations for starchy vegetables compared to the other income groups, whereas a greater percentage of them met the other vegetables recommendation (Table 4). Compared to the highest income group, smaller proportions of children in the middle income group met the minimum recommendations for whole fruits and whole grains and smaller proportions of children in the lowest income group met the minimum recommendations for milk and for oils. However, greater proportions of those in the lowest income group compared to the highest income group met the minimum recommendations for total vegetables and meat and beans (Table 4). Children in the lowest income group were more likely to meet the minimum and to exceed the maximum recommendation for the dry beans and peas group compared to children in the other income groups (Tables 4-5). A very small proportion of children had intakes of energy from solid fats and added sugars that were within the discretionary calorie allowance and there were no differences by income (Table 6).

Patterns among race/ethnic groups—Smaller proportions of NHB children met the minimum recommendations for whole fruit, orange and other vegetables, total grains, and milk compared to NHW children (Table 4). A greater proportion of NHB children met the minimum starchy vegetable recommendations compared to MA children. Greater proportions of MA children met the minimum recommendations for total fruit, whole fruit, dry beans and peas, other vegetables, and total grains compared to NHW and NHB children. Greater proportions of NHW children met the minimum recommendations for whole grains, milk, and oils compared to NHB and MA children, whereas a smaller proportion of NHW children met the meat and beans recommendations compared to the other two race/ethnic groups. As with adults, similar patterns were observed when proportions exceeding

maximum recommendations were examined (Table 5). A smaller proportion of NHW children had intakes of discretionary calories that did not exceed the allowances compared to MA children (Table 6). Compared to NHB children, a smaller proportion of NHW children had intakes of solid fats within the standards and a greater proportion of MA children had added sugar intakes that were within the standards.

DISCUSSION

Though the diets of the vast majority of Americans fare poorly when compared to recommendations (27), some subgroups are doing worse than others. The predominant pattern among adults was higher rates of adherence to food group recommendations among those in the highest compared to the lowest and middle income groups. Among children, the findings were more mixed, with smaller proportions of children in the highest-income group compared to the other income groups meeting recommendations for some food groups.

The food groups that are most problematic among vulnerable subgroups (in particular, individuals in households in the lowest and middle income groups and NHB) include whole fruits, total vegetables and some vegetable subgroups, whole grains, and milk; findings that are largely consistent with those of earlier studies (6,12,13). For example, an analysis of data from the 1994-1996 Continuing Surveys of Food Intakes by Individuals (CSFII) found that NHB consumed the fewest servings on average of grains and milk products but had higher intakes of meat and slightly higher intakes of green and yellow vegetables, while MA had higher mean intakes of tomatoes and markedly higher intakes of dry beans and peas (6). In that study, mean intakes of grains, fruits, vegetables and milk were highest among the highest income group (6).

In the context of the obesity epidemic (3,4) and from the perspective of meeting nutrient needs and maintaining energy balance, the available evidence suggests that the entire population but in particular, lower-income individuals and NHB and MA adults and children, could benefit from shifting intakes from food groups that are most likely to be over-consumed (e.g., total grains and other vegetables) toward under-consumed groups (e.g., whole grains and dark green and orange vegetables) and reducing energy from extras. These findings have implications beyond individual dietary choices to the U.S. food supply overall (29,30) and the foods available in retail outlets, restaurants, schools, worksites, and health care facilities, which tend to offer a plethora of energy-dense packaged and processed foods. At a neighborhood level, the greater availability of less healthy choices and restricted availability of nutrient-dense foods, such as fruits and vegetables, appears to be a particular problem in minority and lower-income areas (2,31-34). The relatively low cost of processed and packaged foods high in empty calories compared to fruits, vegetables, whole grains, low-fat milk products, and lean meats also requires attention (29). Research has shown differential sensitivity to prices of fruits and vegetables and fast food across income groups, suggesting that changing prices may be a viable strategy for influencing dietary quality (35,36). Aside from socioeconomic factors, differences among race/ethnic groups also may reflect cultural practices and biological differences (2,5,6,29). A notable example is the small proportion of NHB with sufficient milk intakes, a finding which is not surprising given the genetic predisposition of African-Americans toward lactose intolerance, as well as cultural beliefs and perceptions about consumption of dairy products (37).

Socioeconomic status is a complex construct, and income and race/ethnicity are only two possible indicators. However, understanding adherence to recommendations in relation to these characteristics sheds light on population subgroups that warrant particular attention. The models used to generate usual intake distributions for race/ethnic groups included the income group covariates (and vice versa) to better characterize the subpopulations and

improve the efficiency of estimation, as is appropriate for descriptive surveillance (26). This approach does not produce estimates by race/ethnic group that are adjusted for income or the reverse. Though income may not explain race/ethnic differentials entirely, the tight link between race/ethnicity and income in the U.S. (2) suggests that income likely plays a substantial role in the differences observed among race/ethnic groups and vice versa. A previous study using NHANES data showed that although both higher income and higher education predicted higher intakes of most dietary constituents studied among both Whites and Blacks, differentials by race were apparent across all income and education categories (13). It is likely that the income and race/ethnicity differentials observed in this analysis also reflect markedly higher rates of food insecurity among lower income and minority households (25). Interestingly, somewhat fewer income effects were apparent among children as compared to adults. This is consistent with the food security literature, which suggests that adults in households experiencing financially-constrained food access make efforts to buffer children from severe dietary compromise (38); more recent research suggests the need to interrogate the effects of low socioeconomic status and food insecurity on children more closely (39).

These analyses are not without limitations. NHANES 2001-2004 represents the most recent data for which the MPED was available, allowing examination of food groups and dietary components as expressed in dietary guidance. Further, while other databases may enable investigation of a wider spectrum of race/ethnic groups, NHANES is the only national survey that includes detailed dietary intake data enabling the type of analyses reported here. However, this study sheds no light on disparities in diet affecting race/ethnic groups that represent smaller proportions of the population, and overlooks diversity within the three groups that were examined. The analyses also did not account for acculturation of individuals not born in the U.S., which could play a role in the differences observed. The income thresholds may have masked gradient effects in the population given that the bottom two groups could both be considered relatively low income. Further, participation in programs intended to offset low income, such as food assistance and housing subsidies, was not considered but could influence financial resources and thus food purchasing.

Underreporting is a ubiquitous problem in dietary intake data and, to the extent that it is associated with socioeconomic status and race/ethnicity (40), is a potential source of bias in the comparison among groups. In the absence of data to reliably estimate energy expenditures, the lowest recommendations were used for a given sex/age group when the proportions meeting food group recommendations were estimated and the highest recommendations were used when estimating the proportions exceeding food group recommendations and proportions within the standards for discretionary calories. Insofar as usual activity levels differ according to income and race/ethnicity, the assumptions applied may have introduced error into the between-group comparisons. Analyses considering occupation- and transportation-related activity in addition to leisure-time activity suggest that lower income and minority race/ethnic status may be positively associated with activity level, in which case our results are likely to underestimate differences across groups (41).

The 2005 Dietary Guidelines for Americans and MyPyramid define discretionary calories as including amounts of food groups consumed after meeting the recommendations as well as solid fats, added sugars, and alcohol (14,15). This study did not account for this complexity. Prevalences of excess food group intakes were examined and though this was not a major issue for most food groups, rates of overconsumption of meat and beans and total grains may mean that the proportions within the discretionary calorie allowances are even smaller than estimated. Finally, we examined adherence to the 2005 Dietary Guidelines, which is one possible dietary pattern thought to be consistent with health. The similarity between this guidance and other dietary guidelines (42) suggests that the results would not be

substantially different had a different set of recommendations been applied. Notably, the 2010 Dietary Guidelines for Americans and MyPlate (which has replaced MyPyramid) (43,44) have now been released, but their consistency with the 2005 guidance suggests that repeating our analyses using the updated recommendations would have little effect on our findings.

CONCLUSIONS

Overall, most Americans do not meet food-based dietary recommendations, regardless of their household income and race/ethnicity, speaking to the need for continued efforts to shift the dietary patterns of the population as a whole. However, the diets of some subpopulations, particularly individuals in lower-income households and NHB, are especially poor in relation to dietary recommendations, supporting targeted strategies to address the factors that contribute to their dietary intake patterns (1,5,12,13). Without a comprehensive approach, individual- and environmental-level initiatives aimed at improving dietary patterns and reducing risk of obesity and other diet-related chronic diseases may not be as effective as possible and could potentially exacerbate disparities.

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Table 1

Percentages of adults aged 19+ years whose usual intakes of each food group are equal to or above the minimum recommended amounts¹ among income groups and race/ethnic groups, NHANES 2001–2004.

	Total fruits	Whole fruits	Total vegetables ²	Dark green vegetables	Orange vegetables	Dry beans and peas ²				Total grains	Whole grains	Meat and beans ²	Milk	Oils
						Starchy vegetables	Other vegetables	% ± SE						
All Adults (9126)	17.5 ± 1.08	25.1 ± 1.25	12.9 ± 1.22	5.9 ± 0.82	1.9 ± 0.90	38.3 ± 2.28	48.9 ± 1.83	3.5 ± 0.60		58.9 ± 1.39	0.8 ± 0.15	54.1 ± 1.29	7.7 ± 0.83	20.0 ± 1.52
Income group (n)														
Lowest, PIR <=1.30 (2682)	13.8 ± 1.21 ^a	19.1 ± 1.29 ^a	7.7 ± 0.91 ^a	2.1 ± 0.67 ^a	1.4 ± 0.83 ^a	41.1 ± 3.55 ^a	34.7 ± 2.77 ^a	4.8 ± 1.00 ^{ab}		53.9 ± 2.37 ^a	0.3 ± 0.11 ^a	45.9 ± 1.80 ^a	4.8 ± 0.72 ^a	12.1 ± 1.52 ^a
Middle, PIR 1.31-1.85 (1194)	16.2 ± 1.62 ^a	22.1 ± 2.25 ^a	7.0 ± 1.15 ^a	3.8 ± 0.80 ^b	1.4 ± 0.81 ^a	37.2 ± 3.71 ^a	33.1 ± 3.32 ^a	6.1 ± 1.28 ^a		55.4 ± 3.18 ^{ab}	0.3 ± 0.12 ^a	47.8 ± 2.65 ^a	6.1 ± 1.16 ^a	10.3 ± 1.77 ^a
Highest, PIR >=1.86 (5250)	18.9 ± 1.14 ^b	27.4 ± 1.37 ^b	15.5 ± 1.46 ^b	7.4 ± 1.01 ^c	2.1 ± 1.04 ^a	37.6 ± 2.29 ^a	56.0 ± 1.80 ^b	2.7 ± 0.70 ^b		61.0 ± 1.46 ^b	1.0 ± 0.19 ^b	57.7 ± 1.72 ^b	9.0 ± 0.91 ^b	24.0 ± 1.86 ^b
Race/ethnic group (n) ³														
NHW (4763)	17.4 ± 1.21 ^{ab}	26.6 ± 1.49 ^a	14.1 ± 1.33 ^a	6.4 ± 0.89 ^a	2.1 ± 0.99 ^a	39.7 ± 2.62 ^a	52.3 ± 2.20 ^a	2.2 ± 0.68 ^a		59.9 ± 1.63 ^a	0.9 ± 0.18 ^a	52.6 ± 1.42 ^a	8.8 ± 0.95 ^a	21.9 ± 1.61 ^a
NHB (1804)	16.9 ± 1.31 ^a	15.3 ± 0.93 ^b	5.7 ± 0.90 ^b	6.8 ± 1.37 ^a	1.0 ± 0.58 ^a	39.4 ± 2.97 ^a	22.7 ± 2.50 ^b	1.7 ± 0.87 ^a		45.0 ± 1.92 ^b	0.4 ± 0.11 ^b	63.3 ± 2.06 ^b	1.2 ± 0.28 ^b	14.5 ± 2.29 ^b
MA (1910)	22.8 ± 2.66 ^b	27.1 ± 2.65 ^a	13.7 ± 1.75 ^a	1.1 ± 0.41 ^b	1.6 ± 0.81 ^a	25.3 ± 3.98 ^b	57.1 ± 3.44 ^a	20.0 ± 2.55 ^b		70.5 ± 2.47 ^c	0.2 ± 0.11 ^b	59.7 ± 2.88 ^b	6.2 ± 1.09 ^c	9.6 ± 1.33 ^c

Abbreviations: NHANES, National Health and Nutrition Examination Survey; PIR, Poverty Income Ratio; SE, standard error; NHW, non-Hispanic White; NHBB, non-Hispanic Black; MA, Mexican American.

^{abc} Different letters indicate significant differences at p<0.05.

¹ MyPyramid food group recommendations depend on appropriate level of energy, and energy needs vary by activity level, sex and age. For this analysis, the minimum recommendations, which correspond to a sedentary level of activity level, were used and sex-age-specific recommendations were applied prior to generating percentages for each income and race/ethnic group.

² Consistent with MyPyramid, dry peas and beans were first allocated to the meat and beans group, with any amount remaining after the meat and beans group recommendation was met counting toward the total vegetables and legumes groups.

³ Adults of other race/ethnicity (n=649) are excluded from the analysis by race/ethnicity.

Table 2

Percentages of adults aged 19+ years whose usual intakes of each food group are above the maximum recommended amounts¹ among income groups and race/ethnic groups, NHANES 2001-2004.

	Total fruits	Whole fruits	Total vegetables ²	Dark green vegetables	Orange vegetables	Other vegetables	Starchy vegetables	Total grains	Whole grains	Meat and beans ²	Milk	Oils
All Adults (9126)	10.0% ± 0.79	17.5% ± 0.95	2.2% ± 0.52	4.5% ± 0.74	0.7% ± 0.50	29.4% ± 1.58	1.4% ± 0.50	21.4% ± 1.13	0.1% ± 0.04	36.4% ± 1.32	7.7% ± 0.83	6.3% ± 1.06
Income group (n)												
Lowest, PIR ≤1.30 (2682)	8.0% ± 0.90 ^a	13.5% ± 1.04 ^a	1.1% ± 0.27 ^a	1.4% ± 0.51 ^a	0.6% ± 0.43 ^a	19.1% ± 2.11 ^a	2.0% ± 0.83 ^a	19.3% ± 1.72 ^a	0.04% ± 0.03 ^a	29.7% ± 1.57 ^a	4.8% ± 0.72 ^a	3.4% ± 0.75 ^a
Middle, PIR 1.31-1.85 (1194)	9.5% ± 1.18 ^{ab}	15.8% ± 1.81 ^{ab}	0.9% ± 0.29 ^a	2.6% ± 0.67 ^a	0.5% ± 0.42 ^a	17.2% ± 2.28 ^a	1.3% ± 0.46 ^a	19.4% ± 2.59 ^a	0.04% ± 0.02 ^{ab}	31.1% ± 2.26 ^a	6.1% ± 1.16 ^a	2.9% ± 0.82 ^a
Highest, PIR >=1.86 (5250)	10.7% ± 0.83 ^b	19.1% ± 1.05 ^b	2.8% ± 0.66 ^b	5.8% ± 0.94 ^b	0.9% ± 0.58 ^a	34.6% ± 1.71 ^b	1.3% ± 0.45 ^a	22.4% ± 1.15 ^a	0.1% ± 0.05 ^b	39.4% ± 1.69 ^b	9.0% ± 0.91 ^b	7.7% ± 1.31 ^b
Race/ethnic group (n) ³												
NHW (4763)	9.8% ± 0.87 ^a	18.6% ± 1.16 ^a	2.4% ± 0.56 ^a	4.8% ± 0.80 ^a	0.8% ± 0.54 ^a	31.8% ± 1.84 ^a	1.4% ± 0.49 ^a	21.3% ± 1.24 ^a	0.1% ± 0.05 ^a	34.8% ± 1.44 ^a	8.8% ± 0.95 ^a	6.9% ± 1.13 ^a
NHB (1804)	9.7% ± 0.91 ^a	10.3% ± 0.67 ^b	0.8% ± 0.24 ^b	5.7% ± 1.24 ^a	0.4% ± 0.32 ^a	10.8% ± 2.04 ^b	1.8% ± 0.83 ^a	13.5% ± 1.32 ^b	0.04% ± 0.02 ^b	44.7% ± 1.86 ^b	1.2% ± 0.28 ^b	4.7% ± 1.21 ^b
MA (1910)	14.6% ± 2.12 ^b	20.1% ± 2.30 ^a	2.9% ± 0.77 ^a	0.9% ± 0.35 ^b	0.8% ± 0.54 ^a	36.1% ± 3.20 ^a	0.8% ± 0.45 ^a	33.8% ± 2.97 ^c	0.03% ± 0.03 ^b	42.8% ± 2.77 ^b	6.2% ± 1.09 ^c	2.9% ± 0.70 ^b

Abbreviations: NHANES, National Health and Nutrition Examination Survey; PIR, Poverty Income Ratio; SE, standard error; NHW, non-Hispanic White; NHB, non-Hispanic Black; MA, Mexican American.

^{abc}Different letters indicate significant differences at p<0.05.

¹MyPyramid food group recommendations depend on appropriate level of energy, and energy needs vary by activity level, sex and age. For this analysis, the maximum recommendations, which correspond to an active level, were used and sex-age-specific recommendations were applied prior to generating percentages for each income and race/ethnic group.

²Consistent with MyPyramid, dry peas and beans were first allocated to the meat and beans group, with any amount remaining after the meat and beans group recommendation was met counting toward the total vegetables and legumes groups.

³Adults of other race/ethnicity (n=649) are excluded from the analysis by race/ethnicity.

Table 3

Percentages of adults aged 19+ years whose usual intakes of solid fats, added sugars, and alcoholic beverages are within (equal to or lower than) guidelines among income groups and race/ethnic groups, NHANES 2001-2004.

	Energy from Solid Fats and Added Sugars ¹	Energy from Solid Fats, Added Sugars, and Alcoholic Beverages ²	Solid Fats ³	Added Sugars ³	Alcoholic Beverages ⁴
	% ± SE				
All Adults (9126)	7.9 ± 0.51	5.0 ± 0.36	6.0 ± 0.71	27.6 ± 0.91	84.2 ± 1.00
Income group (n)					
Lowest, PIR <=1.30 (2682)	7.6 ± 0.78 ^a	5.4 ± 0.50 ^a	7.1 ± 0.82 ^a	24.3 ± 1.49 ^a	90.2 ± 0.92 ^a
Middle, PIR 1.31-1.85 (1194)	8.6 ± 1.05 ^a	5.9 ± 0.75 ^a	7.2 ± 1.03 ^{ab}	27.2 ± 2.12 ^{ab}	86.2 ± 1.67 ^b
Highest, PIR >=1.86 (5250)	7.9 ± 0.58 ^a	4.8 ± 0.44 ^a	5.4 ± 0.80 ^b	28.7 ± 0.91 ^b	82.0 ± 1.14 ^c
Race/ethnic group (n)⁵					
NHW (4763)	8.1 ± 0.53 ^a	5.1 ± 0.37 ^a	5.9 ± 0.71 ^a	28.4 ± 0.96 ^a	83.5 ± 1.12 ^a
NHB (1804)	7.2 ± 0.72 ^a	4.4 ± 0.56 ^a	6.6 ± 0.91 ^a	22.9 ± 1.51 ^b	86.5 ± 1.30 ^b
MA (1910)	8.3 ± 0.94 ^a	5.6 ± 0.70 ^a	6.0 ± 1.11 ^a	28.9 ± 1.82 ^a	87.5 ± 1.41 ^b

Abbreviations: NHANES, National Health and Nutrition Examination Survey; PIR, Poverty Income Ratio; SE, standard error; NHW, non-Hispanic White; NHB, non-Hispanic Black; MA, Mexican American.

^{abc} Different letters indicate significant differences at p<0.05.

¹ Percentages of adults whose usual intake of energy from solid fats and added sugars combined was within the maximum discretionary calorie allowances.

² Percentages of adults whose usual intake of energy from solid fats, added sugars and alcoholic beverages combined was within the maximum discretionary calorie allowances.

³ Percentages of adults whose usual intakes of solids fats and added sugars respectively were within the example amounts found in the 2005 Dietary Guidelines for Americans, which show how the discretionary calorie allowance could be divided.

⁴ Percentages of adults whose usual intake of alcohol was within the guidelines for moderate consumption (1 drink per day for women and 2 drinks per day for men).

⁵ Adults of other race/ethnicity (n=649) are excluded from the analysis by race/ethnicity.

Table 4

Percentages of children aged 2-18 years whose usual intakes of each food group are equal to or above the minimum recommended amounts¹ among income groups and race/ethnic groups, NHANES 2001-2004.

	Total fruits	Whole fruits	Total vegetables ²	Dark green vegetables	Orange vegetables	Dry beans and peas ²	Starchy vegetables					Total grains	Whole grains	Meat and beans ²	Milk	Oils
							% ± SE									
All children (7212)	28.7 ± 1.52	24.9 ± 1.61	6.6 ± 0.95	1.0 ± 0.47	4.2 ± 0.86	5.1 ± 0.85	42.0 ± 3.03	21.3 ± 1.42	80.7 ± 1.57	0.5 ± 0.14	43.8 ± 1.38	37.1 ± 1.36	21.0 ± 3.03			
Income group (n)																
Lowest, PIR≤1.30 (3130)	29.5 ± 1.95 _a	24.4 ± 1.39 _{ab}	8.8 ± 1.31 _a	1.2 ± 0.65 _a	5.0 ± 1.25 _a	11.3 ± 1.56 _a	51.2 ± 3.56 _a	17.1 ± 2.29 _a	79.6 ± 1.77 _a	0.3 ± 0.12 _{ab}	47.8 ± 2.38 _a	33.4 ± 1.77 _a	15.4 ± 3.36 _a			
Middle, PIR 1.31-1.85 (975)	24.8 ± 2.38 _a	19.0 ± 2.44 _a	8.4 ± 2.73 _{ab}	0.7 ± 0.87 _a	5.9 ± 3.65 _a	4.8 ± 2.37 _b	51.0 ± 6.08 _a	16.2 ± 2.13 _a	80.4 ± 1.87 _a	0.3 ± 0.11 _a	48.7 ± 4.24 _{ab}	39.8 ± 4.04 _{ab}	22.1 ± 7.41 _{ab}			
Highest, PIR >=1.86 (3107)	29.1 ± 1.63 _a	26.3 ± 2.12 _b	5.0 ± 0.79 _b	1.0 ± 0.46 _a	3.3 ± 0.95 _a	1.4 ± 0.70 _b	34.7 ± 3.30 _b	25.0 ± 1.61 _b	81.5 ± 1.92 _a	0.6 ± 0.18 _b	40.3 ± 1.51 _b	38.8 ± 1.48 _b	24.0 ± 2.67 _b			
Race/ethnic group (n) ³																
NHW (2147)	26.8 ± 1.74 _a	24.6 ± 1.97 _a	6.0 ± 0.91 _a	1.0 ± 0.46 _a	4.4 ± 0.88 _a	2.0 ± 0.77 _a	41.0 ± 3.71 _{ab}	22.2 ± 1.48 _a	81.2 ± 1.88 _a	0.5 ± 0.16 _a	40.6 ± 1.59 _a	41.7 ± 1.72 _a	23.6 ± 3.08 _a			
NHB (2294)	28.5 ± 2.05 _a	16.4 ± 1.70 _b	7.1 ± 1.49 _{ab}	1.4 ± 0.92 _{ab}	2.3 ± 0.93 _b	3.2 ± 1.76 _a	48.3 ± 3.17 _a	11.8 ± 1.54 _b	73.8 ± 1.73 _b	0.3 ± 0.11 _b	54.3 ± 2.29 _b	15.3 ± 1.79 _b	16.8 ± 3.17 _b			
MA (2142)	39.9 ± 2.89 _b	35.4 ± 3.17 _c	9.3 ± 1.63 _b	0.3 ± 0.33 _b	4.1 ± 1.62 _{ab}	24.4 ± 2.31 _b	37.9 ± 2.66 _b	29.4 ± 2.75 _c	86.0 ± 1.47 _c	0.2 ± 0.13 _b	49.2 ± 2.87 _b	35.2 ± 2.58 _c	12.8 ± 3.12 _b			

Abbreviations: NHANES, National Health and Nutrition Examination Survey; PIR, Poverty Income Ratio; SE, standard error; NHW, non-Hispanic White; NHB, non-Hispanic Black; MA, Mexican American.

^{abc}Different letters indicate significant differences at p<0.05.

¹MyPyramid food group recommendations depend on appropriate level of energy, and energy needs vary by activity level, sex and age. For this analysis, the minimum recommendations, which correspond to a sedentary level of activity level, were used and sex-age-specific recommendations were applied prior to generating percentages for each income and race/ethnic group

²Consistent with MyPyramid, dry peas and beans were first allocated to the meat and beans group, with any amount remaining after the meat and beans group recommendation was met counting toward the total vegetables and legumes groups.

³Children of other race/ethnicity (n=629) are excluded from the analysis by race/ethnicity.

Table 5

Percentages of children aged 2-18 years whose usual intakes of each food group are above the maximum recommended amounts¹ among income groups and race/ethnic groups, NHANES 2001-2004.

	Total fruits	Whole fruits	Total vegetables ²	Dark green vegetables	Orange vegetables	Dry beans and peas ²	Starchy vegetables	Other vegetables	Total grains	Whole grains	Meat and beans ²	Milk	Oils
	% ± SE												
All children (7212)	15.5% ± 1.21	15.0% ± 1.35	0.5% ± 0.18	0.4% ± 0.21	0.9% ± 0.36	1.4% ± 0.46	13.2% ± 1.43	8.6% ± 0.90	40.1% ± 1.46	0.04% ± 0.02	15.8% ± 1.20	26.6% ± 1.51	4.0% ± 1.10
Income group (n)													
Lowest, PIR<=1.30 (3130)	16.3% ± 1.58 _{ab}	15.1% ± 1.09 _a	0.8% ± 0.29 ^a	0.4% ± 0.27 ^a	1.1% ± 0.43 ^a	3.1% ± 0.93 _a	20.4% ± 2.43 ^a	6.2% ± 1.08 ^a	38.4% ± 2.26 _a	0.02% ± 0.01 ^a	17.0% ± 1.54 ^a	22.9% ± 1.67 _a	2.3% ± 0.95 _a
Middle, PIR 1.31-1.85 (975)	12.2% ± 1.70 _a	10.8% ± 1.80 _b	0.7% ± 0.46 ^a	0.2% ± 0.34 ^a	1.6% ± 1.71 ^a	1.4% ± 0.93 _b	22.2% ± 5.17 ^a	5.7% ± 1.13 ^a	39.1% ± 2.96 _a	0.02% ± 0.01 ^a	16.8% ± 2.97 ^a	27.9% ± 3.84 _{ab}	3.8% ± 2.57 _{ab}
Highest, PIR >=1.86 (3107)	15.7% ± 1.30 _b	15.9% ± 1.74 _a	0.4% ± 0.12 ^a	0.4% ± 0.21 ^a	0.7% ± 0.31 ^a	0.4% ± 0.25 _b	7.0% ± 1.65 _b	10.6% ± 1.14 _b	41.4% ± 2.02 _a	0.1% ± 0.04 ^a	14.9% ± 1.18 ^a	28.6% ± 1.62 _b	5.1% ± 1.07 _b
Race/ethnic group (n) ³													
NHW (2147)	14.1% ± 1.32 _a	14.7% ± 1.63 _a	0.5% ± 0.15 ^a	0.4% ± 0.20 ^a	1.0% ± 0.38 ^a	0.4% ± 0.25 _a	12.0% ± 1.83 ^a	9.0% ± 0.97 ^a	40.4% ± 1.95 _a	0.05% ± 0.03 ^a	14.2% ± 1.34 ^a	30.7% ± 1.71 _a	4.8% ± 1.16 _a
NHB (2294)	15.1% ± 1.53 _a	9.2% ± 1.22 _b	0.6% ± 0.30 ^a	0.6% ± 0.40 ^{ab}	0.5% ± 0.28 _b	0.5% ± 0.56 _a	17.5% ± 2.07 ^a	3.9% ± 0.77 _b	34.1% ± 2.12 _b	0.02% ± 0.02 ^{ab}	22.7% ± 1.77 _b	8.9% ± 1.32 _b	2.9% ± 1.09 _b
MA (2142)	23.9% ± 2.58 _b	23.1% ± 2.75 _c	0.9% ± 0.35 ^a	0.1% ± 0.11 _b	0.8% ± 0.54 ^{ab}	8.3% ± 1.88 _b	12.3% ± 2.03 ^a	12.6% ± 1.69 _c	46.5% ± 2.39 _c	0.01% ± 0.02 _b	17.8% ± 1.73 _c	23.8% ± 2.36 _c	2.0% ± 0.85 _b

Abbreviations: NHANES, National Health and Nutrition Examination Survey; PIR, Poverty Income Ratio; SE, standard error; NHW, non-Hispanic White; NHB, non-Hispanic Black; MA, Mexican American.

^{abc}Different letters indicate significant differences at p<0.05.

¹MyPyramid food group recommendations depend on appropriate level of energy, and energy needs vary by activity level, sex and age. For this analysis, the maximum recommendations, which correspond to an active level, were used and sex-age-specific recommendations were applied prior to generating percentages for each income and race/ethnic group

²Consistent with MyPyramid, dry peas and beans were first allocated to the meat and beans group, with any amount remaining after the meat and beans group recommendation was met counting toward the total vegetables and legumes groups.

³Children of other race/ethnicity (n=629) are excluded from the analysis by race/ethnicity.

Percentages of children aged 2-18 years whose usual intakes of solid fats and added sugars are within (equal to or lower than) guidelines among income groups and race/ethnic groups, NHANES 2001-2004.

Table 6

	Energy from Solid Fats and Added Sugars ¹		Solid Fats ²	Added Sugars ²
	% ± SE			
All children (7212)	2.9 ± 0.34		3.1 ± 0.50	10.4 ± 0.61
Income group (n)	± SE			
Lowest, PIR≤1.30 (3130)	3.0 ± 0.41 ^a		3.4 ± 0.46 ^a	9.7 ± 0.94 ^a
Middle, PIR 1.31-1.85 (975)	2.7 ± 0.41 ^a		3.1 ± 0.55 ^a	9.4 ± 1.00 ^a
Highest, PIR ≥1.86 (3107)	2.9 ± 0.41 ^a		2.9 ± 0.61 ^a	11.1 ± 0.71 ^a
Race/ethnic group (n) ³				
NHW (2147)	2.7 ± 0.32 ^a		2.9 ± 0.49 ^a	10.3 ± 0.58 ^{ab}
NHB (2294)	3.3 ± 0.48 ^{ab}		4.0 ± 0.65 ^b	9.6 ± 1.05 ^a
MA (2142)	3.7 ± 0.57 ^b		3.4 ± 0.74 ^{ab}	12.2 ± 1.19 ^b

Abbreviations: NHANES, National Health and Nutrition Examination Survey; PIR, Poverty Income Ratio; SE, standard error; NHW, non-Hispanic White; NHB, non-Hispanic Black; MA, Mexican American.

^{abc}Different letters indicate significant differences at p<0.05.

¹Percentages of children whose usual intake of energy from solid fats and added sugars combined was within the maximum discretionary calorie allowances.

²Percentages of children whose usual intakes of solids fats and added sugars respectively were within the example amounts found in the 2005 Dietary Guidelines for Americans, which show how the discretionary calorie allowance could be divided.

³Children of other race/ethnicity (n=629) are excluded from the analysis by race/ethnicity.