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Rice Consumption in the United States: New Evidence from Food Consumption Surveys

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Abstract

Evidence from recent U.S. food consumption surveys provides new information on the distribution of rice consumption, the characteristics of rice consumers, and the diets of people who consume rice. Recently available data from nationally representative surveys of food consumed by individuals in the United States allowed comparison of consumption today (2001-02) with consumption in the mid-1990s. Data come from the Continuing Survey of Food Intakes by Individuals (1994-96) and the National Health and Nutrition Examination Survey (2001-02). Rice is consumed by a significant portion of the U.S. adult population. In 2001-02, over 18 percent (18.2 percent) of adults reported eating at least half a serving of white or brown rice in one day of observed intake. This share was slightly higher than that of 1994-96 (17.4 percent). Compared with others, individuals who consumed at least half a serving of white or brown rice in the observed day of intake consumed a smaller share of calories per day from fat and saturated fat; less discretionary fat or added sugar; and more fiber, dietary folate, fruit, vegetables, and enriched grains. Consumers eating rice were more likely to eat a diet that included choices of foods consistent with the 2005 U.S. Dietary Guidelines.

Keywords: dietary guidelines, rice consumption.

RICE CONSUMPTION IN THE UNITED STATES: NEW EVIDENCE FROM FOOD CONSUMPTION SURVEYS

Introduction

Rice is a major staple among two-thirds of the world's population. In the United States, rice consumption has increased over the last several decades, reaching a level of 20.1 pounds per capita today (Figure 1). Although per capita rice consumption in 2003 was nearly three times that of 1970, little is known about rice consumption patterns and the nutritional contribution that rice provides in the diet of Americans. Some contributing factors include the growing Asian-American and Hispanic-American populations, new rice-based food products, and marketing efforts by the rice industry (USDA-ERS 2004). Recent national food consumption surveys provide evidence on the distribution of consumption, the characteristics of rice consumers, and the diets of people who consume rice.

This report provides information on current rice consumption patterns in the United States and the dietary intake of rice consumers compared with others. The analysis is based on data from the United States: the Continuing Survey of Food Intakes by Individuals (CSFII) (1994-96) and the National Health and Nutrition Examination Survey (NHANES) (2001-02), both large, nationally representative surveys of individuals in the United States and the foods they consume.

The primary objective of the research was to gain a better understanding of the distribution of rice consumption and the contribution of rice in the diets of individuals in the United States. The availability of data from surveys in 1994-96 and 2001-02 allowed comparison between the two periods.

Data and Methods

The data are from two nationwide dietary intake surveys: the 1994-96 CSFII, conducted by the U.S. Department of Agriculture (USDA), and the 2001-02 NHANES,

conducted by the USDA and the U.S. Department of Health and Human Services (HHS), and its supporting technical files. Both surveys are nationally representative and asked respondents about food intake in the last 24 hours. The CSFII survey includes reported food intakes on two nonconsecutive days. The NHANES has food intake data from only one interview day. We report data both from the two survey days and for one day only (day one) from the CSFII (1994-96), as well as the one day of intake from the NHANES (2001-02).

The analysis uses information from 9,318 adults in the CSFII and 4,744 adults in the NHANES. The food intake data were matched to the Food Commodity Intake Database (FCID) through the common set of food codes in order to identify consumption of foods containing the commodity “rice.” The FCID converts food intakes (reported as eaten) into “food commodities” (for example, as white rice, tomatoes, and beans rather than “chili with rice and beans”) by linking foods identified by food codes and the amount eaten with commodity codes and the amount of commodity per 100 grams of food.¹ The FCID was used primarily to identify whether a food item contained the commodity rice and, if so, the corresponding amount of rice (measured as a dry weight). One hundred grams of regular white rice, cooked, has 35.709 grams of rice dry weight. One serving of regular rice, according to the 1992 Food Guide Pyramid, is equal to one-half cup of rice or 79 grams (food as eaten) (Smiciklas-Wright et al. 2002).² Therefore, one serving of regular rice is equivalent to 28.21 grams of rice dry weight.

Both data sets were weighted to be nationally representative. The CSFII data were analyzed using Linux SAS version 9.1, and the NHANES data were analyzed using SAS version 9.00. All statistical tests were done using WESVAR 4.2.

Identification and Classification of Rice Consumers

“Rice consumers” were identified and classified based on the amount of consumption (intake) of rice consumed in foods, that is, foods identified as containing the “commodity” (a commodity-based ingredient) rice as identified by the FCID. Although foods containing rice included the commodities white rice, brown rice, rice flour, rice bran, and rice in baby foods, we included in our analysis and definition of “rice consumption” only foods that had white rice, brown rice, and rice flour. We excluded foods with rice bran and baby foods.

The actual amount of rice consumed by reporting individuals was based on the individual's reported food intake (amount) matched to the commodity amounts in the foods (see the appendix for a detailed description of the data and procedures).

The classification of "rice consumer" was assigned to individuals who reported eating half of a serving or more of rice in one day (i.e., 14.1 grams of rice dry weight). It is important to note that others (non-consumers of rice) may have consumed rice on days other than the day of the survey. The data provide an estimate of the average proportion of individuals who consumed rice (greater than 14.1 grams dry weight) on a given day.

Results

Tables 1 through 15 present the results based on the CSFII 1994-96 data and the NHANES 2001-02 data. The presentation covers basic information on consumption of rice, comparison of consumption by socio-economic and demographic groups, selected nutrient intake and Pyramid food servings of rice consumers and others, and information on foods containing rice. Similar information from both surveys is ordered together to facilitate comparison across the two surveys.

Consumption of Rice

Based on the CSFII 1994-96 data, 28.3 percent of adults 20 years of age and older reported eating at least half a serving of white or brown rice on at least one of two survey days (Table 1A), and over 17 percent (17.4 percent) consumed that amount on one day of observed data (Table 1B and Figure 2). The more recent NHANES 2001-02 data show over 18 percent (18.2 percent) of adults consumed at least half a serving of white or brown rice in the one day of observed intake (Table 2 and Figure 2). In a comparison of the one day reported intakes, the two surveys show similar results, with a slightly larger share of adults consuming rice in the more recent 2001-02 period. Brown rice is consumed by a relatively small share of adults (1.3 percent in each survey consume at least half a serving of brown rice on one day). There was little difference between men and women in the likelihood of consuming rice in general, though women were more likely to consume brown rice than were men in both periods (Tables 1B and 2).

Adults (20 years of age and older) were more likely to consume rice than those 2 to 19 years old in both survey periods (Tables 1A, 1B, and 2). Among adults, those 60 years

old and older were least likely to consume rice, and those 25 to 39 years old were most likely to consume rice (Tables 3A, 3B, and 4).

In 1994-96, the average amount of rice (white or brown) consumed by all adults was 11.8 grams of rice (dry weight) (Table 5). For those consuming half a serving or more of rice, the average rice amount consumed was 66.5 grams of rice (dry weight). In contrast, the average amount of rice (white or brown) consumed by all adults in 2001-02 was 11.4 grams of rice (dry weight) (Table 6). For those consuming half a serving or more rice, the average amount of rice consumed was 61.2 grams (dry weight), an amount that would be approximately equal to 1.1 cups of cooked white rice. Comparison between the two surveys shows that although there has been a small increase in the percentage of adults consuming rice, the average amount of rice consumed by these individuals has declined (66.5 grams in 1994-96 compared to 61.2 grams in 2001-02).

Comparison across Consumer Groups

Table 5 (CSFII 1994-96) and Tables 6 and 7 (NHANES 2001-02) provide information on the distribution of the population by socioeconomic characteristics and their relative consumption patterns. Consumption was compared across the total population and across rice consumers by using a “consumption index” to indicate the relative levels of intake compared with the average consumption level for adults. The index equals 100.0 at the average consumption level for all adults and at the average consumption level for adult consumers of half a serving or more. Based on this index, we found the following results.

Region and Location. In the 1994-96 period, adults in the western United States consumed 47 percent more rice on average and, among those consuming rice, 23 percent more rice compared to the average amount consumed (66.5 grams, dry weight) (Table 5); those in the Midwest consumed 40 percent less than the average amount of rice, and 16 percent less than the average amount consumed by rice consumers. Those living in more urban areas (central cities in Metropolitan Statistical Areas) also consumed relatively more rice than average (Table 5).

Ethnicity and Race. White, non-Hispanic adults consumed the least amount of rice on average and, of consumers, consumed amounts of rice that were less than all other ethnic groups examined except for Mexican-Americans (Tables 5 and 6), who consumed

similar amounts. Among different ethnic and racial groups, other Hispanic (not Mexican-American) and other races (including multi-racial groups) were more likely to consume rice than were white non-Hispanics and had higher intakes of rice. Adult rice consumers who were Hispanic (but not Mexican-American) had 34 percent higher intake of rice than average in 1994-96. Consumers of rice classified in the “other” ethnic group (Asian, Pacific; Native American, and “others”) ate more than 115 grams per day on average, over 70 percent higher than average. Although black, non-Hispanic consumers were more likely to eat rice, the amounts they ate were near the average amount (Table 5). The results from the 2001-02 data were similar. Although Mexican-Americans were more likely to be consumers of rice, they consumed amounts below the average and similar to amounts consumed by white, non-Hispanic consumers (Table 6).

Income, Education, and Ethnicity. Low-income adults were more likely to consume rice, and consumers ate larger amounts of rice than did others. In 2001-02, those in households with income equal or less than 185 percent of the poverty threshold consumed 10 percent more rice than the average. Those with less education (less than high school) also consumed relatively more rice than average (Table 6).

Using the NHANES 2001-02 data, we analyzed separately the demographic characteristics and consumption of low-income consumers (income less than 185 percent poverty threshold) (Table 7). Over 19 percent of low-income consumers ate rice (more than a half serving) (percentage not shown in Table 7). Among the low-income adults consuming rice, the average rice amount eaten in a day was 67.3 grams of rice (dry weight).

White, non-Hispanic low-income consumers were less likely to consume rice and consumed nearly 30 percent less than did average low-income consumers. Those most likely to consume rice and those who consumed the most rice were individuals in the “other” ethnic group, a group that includes Asian Americans. They consumed 147 percent above the low-income average for consumers of rice. Black (non-Hispanic) consumers of rice consumed amounts near the average level. Individuals born outside the United States (but not in Mexico) consumed over 40 percent more rice than the average for all low-income consumers (Table 7).

Health Characteristics. In 1994-96, about 42 percent of rice consumers had diets with less than 30 percent of calories from fat, in contrast with about 30 percent of non-

rice consumers (Table 8). The majority of adults (rice consumers and non-consumers) were not on any kind of special diet. Rice consumers were more likely to have a body mass index (BMI) of less than 25 compared with others. However, the average BMI score did not differ between rice consumers and others (Table 8).

In contrast, nearly 50 percent of rice consumers had diets with less than 30 percent of calories from fat in 2001-02 (Table 9). Some differences were noted between rice consumers and others with respect to BMI, although not all of the differences were statistically significant. Based on the NHANES 2001-02 data, rice consumers were more likely to have a BMI less than 25; those with a BMI greater than 30 (considered “obese”) were less likely to consume rice, and they consumed relatively less rice than did others (Table 6). However, in a comparison of all adults, the average BMI did not differ between rice consumers and others (Table 9).

Although low-income rice consumers had consumption levels and percentages consuming rice that were similar to those observed for all adults (Table 7), their health related measures were different. We found statistically significant different average BMI levels between rice consumers and others for the lower-income individuals. Low-income consumers had lower BMI scores than did other low-income individuals (27.3 versus 28.9) (Table 9).

Nutrient Intakes

The CSFII 1994-96 data, based on two-day average amounts, show that individuals who eat rice had a lower percentage of calories from fat in their diets, a smaller share of calories from saturated fat, and more dietary fiber (Table 10). The results are similar for men and women when analyzed separately. Rice consumers also had greater intakes of folate (measured as mcg dietary folate equivalents [DFE]), iron, and potassium in their diets, all nutrients of concern for inadequate intakes (Table 10). The differences were statistically significant.

The more recent NHANES 2001-02 data show similar results (Table 11). Rice consumers had a lower share of calories from fat and saturated fat; more fiber; and higher intake of folate, iron, and potassium. The results for women and men are again consistent with the findings in general (Table 11).

Pyramid Food Servings

The Food Pyramid has been a means for providing guidance on dietary choices, based on the *Dietary Guidelines for Americans 2000*. Consistent with this guidance, USDA classified foods based on their contribution to Food Pyramid categories, and this classification of foods is useful for describing diets relative to dietary guidance recommendations, including the newly released *Dietary Guidelines for Americans 2005* (<http://www.healthierus.gov/dietaryguidelines/>) (HHS/USDA 2005).

We compared non-rice and rice consumers' dietary intakes in terms of amounts of Pyramid food group servings consumed. This allows comparison of consumption of a range of foods by the rice consumers and others relative to recommended servings and amounts (based on the 2000 Dietary Guidelines). Differences were evaluated for statistical significance.

As shown in Table 12, when compared with diets consumed by those not consuming at least a half serving of rice per day, in 1994-96, rice consumers consumed

- More grains and whole grains.
- More vegetables measured with and without legumes; with and without potatoes; as dark-green vegetables; and as deep-yellow vegetables. The amount of vegetables less potatoes was about a half serving more for rice consumers.
- More fruit. The amount of fruit was 0.3 serving more.
- More meat, poultry, and fish.
- Less discretionary fat (fat in foods representing choices that are not "low fat" choices, such as choosing whole or reduced fat milk instead of skim milk).
- Less added sugar.

When the consumers are separated by gender, the differences are similar to those observed in the combined groups with the exception of the consumption of meat by men. For men, there are no statistically significant differences in the amount of meat consumed by rice consumers compared with others (Table 12).

Results from the more recent NHANES 2001-02 data (Table 13) show that when compared with those not consuming at least a half serving of rice per day, rice consumers reported dietary intakes that included

- More grains, including rice (but diets are not different from others for whole grains consumption).
- More vegetables measured with and without legumes, and with and without potatoes; and measured as deep-yellow vegetables. The amount of vegetables less potatoes was over a half serving more for rice consumers.
- More fruit.
- More meat, poultry, and fish.
- Less discretionary fat ($p \leq 0.1$).
- Less added sugar.

When consumers are separated by gender, the results are similar for women except that women who are rice consumers do not consume more fruit than do other women. For men, although the consumption of discretionary fat and added sugar by rice consumers is lower than for others, the results are not statistically significant (Table 13). Figure 3 shows a comparison of rice consumers versus others in terms of vegetables (less legumes) and fruits.

Data from the two surveys (NHANES 2001-02 and CSFII 1994-96) show some decrease in the quality of adults' diets over the period. The consumption of whole grains and dark-green vegetables is not statistically different for rice consumers compared with others; although rice consumers consumed less discretionary fat and added sugar than did others, their average daily intakes of these food components have increased over time (between 1994-96 and 2001-02). Differences in intake of discretionary fat and added sugar for men are no longer statistically significant.

The consumption patterns of low-income rice consumers are more similar to those of other consumers than is the case for all individuals, based on analysis of the NHANES 2001-02 data (Table 14). Low-income rice consumers consume more grain (but not whole grains), more vegetables (a measure not including potatoes, and excluding legumes and potatoes), and more meat, poultry, and fish than other low-income consumers, but intakes of other Pyramid food groups are not statistically different.

Rice Food Frequency

Finally, reported food intakes were evaluated to determine the most popular (frequently reported) forms of rice consumed. Based on the list of food codes selected from

NHANES 2001-02 that have white or brown rice, we determined that the five rice foods and forms of rice most frequently consumed were white rice, rice in cereals, rice pilaf and casseroles, fried rice, and Spanish rice (Table 15).

Summary

New nationally representative dietary intake data show the contribution of rice in the U.S. diet and the unique dietary patterns and diet quality among rice consumers. Rice consumers differ from other consumers in their nutrient intake and in the food choices they make. Rice consumers are more likely to choose a diet that is lower in fat and higher in dietary fiber, folate, iron, and potassium. Average intakes of vegetables and fruits are higher among rice consumers; added discretionary fat and added sugar are lower among rice consumers than for others. Despite the smaller amount of rice consumed in the 2001-02 period by adults who consumed rice (66.5 grams compared with 61.3 grams per day), a larger proportion of adults consumed rice (17.4 percent in 1994-96 compared with 18.2 percent in 2001-02). Low-income rice consumers have diets more similar to those of others with low income.

Compared with others, adults who eat a half serving (or more) of rice in a day consume

- Less discretionary fat and less added sugar.
- A smaller share of calories per day from fat and saturated fat.
- More fiber, dietary folate, iron, and potassium.
- More fruit, vegetables, and enriched grains.

The differences between rice consumers and others have remained relatively stable between the 1994-96 and the 2001-02 periods. It is important to note, however, that the tabular comparisons between rice consumers and others do not account for multivariate and complex relationships among economic, social, and demographic factors that affect consumption. Although the differences persist over time, the multivariate contribution of income, household composition, and ethnicity as well as other factors that may influence differences in dietary choices may affect the contribution of any one of these determinants to dietary intake.

Tables

TABLE 1A. Individuals consuming selected types of rice at least once in two days of consumption (CSFII)

	All Population (Individuals Age 2 and Older)	Age (Years)		Adults (20 and Older)	
		2-19	20 and Older	Women	Men
Number of Individuals	14,257	4,939	9,318	4,568	4,750
Percentage of Individuals Consuming					
White or brown rice					
No rice	66.6	68.2	66.1	65.0	67.2
Less than ½ serving	5.8	6.0	5.7	6.6	4.6
½ serving or more	27.6	25.8	28.3	28.4	28.2
White rice					
No rice	69.1	70.0	68.8	68.4	69.2
Less than ½ serving	4.9	5.4	4.8	5.3	4.2
½ serving or more	26.0	24.7	26.5	26.3	26.7
Brown rice					
No rice	96.4	97.3	96.0	95.1	97.0
Less than ½ serving	1.5	1.1	1.7	2.2	1.1
½ serving or more	2.1	1.5	2.3	2.7	1.8
Rice including flour ^a					
No rice	14.6	12.9	15.2	16.3	13.9
Less than ½ serving	54.3	55.4	54.0	52.6	55.5
½ serving or more	31.1	31.7	30.9	31.1	30.6

Source: CSFII 1994-96 (two days of data). Percentages are based on weighted data.

Notes: A ½ serving is equivalent to 14.1 grams of white rice (dry weight). Some of those reporting consumption of ½ serving or more on one day may have consumed a lesser amount of rice on the other day.

^a Includes white rice, brown rice, or rice flour.

TABLE 1B. Individuals consuming rice on one day (CSFII)

	All Population (Individuals Age 2 and Older)	Age (Years)		Adults (20 and Older)	
		2-19	20 and Older	Women	Men
Number of Individuals	14,257	4,939	9,318	4,568	4,750
Percentage of Individuals Consuming					
White or brown rice					
No rice	79.4	80.8	78.8	78.0	79.7
Less than ½ serving	3.8	3.8	3.8	4.5	3.1
½ serving or more	16.8	15.3	17.4	17.6	17.2
White rice					
No rice	81.0	82.1	80.6	80.3	80.9
Less than ½ serving	3.1	3.2	3.1	3.5	2.7
½ serving or more	15.8	14.7	16.3	16.2	16.4
Brown rice					
No rice	97.9	98.5	97.7	97.1	98.4
Less than ½ serving	0.9	0.8	1.0	1.3	0.6
½ serving or more	1.1	0.7	1.3	1.6	1.0
Rice including flour ^a					
No rice	33.6	31.8	34.1	35.2	32.8
Less than ½ serving	47.4	49.4	46.7	45.4	48.1
½ serving or more	19.1	18.8	19.2	19.4	19.0

Source: CSFII 1994-96 (day one data). Percentages are based on weighted data.

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight).

^a Includes white rice, brown rice, or rice flour.

TABLE 2. Individuals consuming rice (NHANES)

	All Population (Individuals Age 2 and Older)	Age (Years)		Adults (20 and Older)	
		2-19	20 and Older	Women	Men
Number of individuals	9,032	4,288	4,744	2,494	2,250
Percentage of Individuals Consuming					
White or brown rice					
No rice	77.9	79.5	77.3	76.2	78.4
Less than ½ serving	4.4	4.1	4.5	5.4	3.6
½ serving or more	17.7	16.4	18.2	18.3	18.0
White rice					
No rice	79.7	80.3	79.5	79.1	80.0
Less than ½ serving	3.6	4.0	3.5	4.0	2.9
½ serving or more	16.7	15.7	17.0	16.9	17.1
Brown rice					
No rice	97.8	98.9	97.4	96.7	98.1
Less than ½ serving	1.1	0.6	1.3	1.7	0.9
½ serving or more	1.1	0.5	1.3	1.5	1.0
Rice including flour ^a					
No rice	32.5	31.8	32.8	32.7	32.9
Less than ½ serving	48.1	49.2	47.7	47.6	47.8
½ serving or more	19.4	19.0	19.5	19.7	19.3

Source: NHANES 2001-02 (one day of data). Percentages are based on weighted data.

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight).

^a Includes white rice, brown rice, or rice flour.

TABLE 3A. Adults classified by age consuming selected types of rice at least one in two days of consumption (CSFII)

	All Adults Age 20 and Older	Age (20 and Older)			
		20-24	25-39	40-59	60 and Older
Number of Individuals	9,318	686	2,304	3,355	2,973
		Percentage of Individuals Consuming			
White or brown rice					
No rice	66.1	66.3	63.2	66.1	70.3
Less than ½ serving	5.7	3.0	5.5	5.1	8.0
½ serving or more	28.3	30.7	31.3	28.8	21.8
White rice					
No rice	68.8	68.7	65.8	69.2	72.7
Less than ½ serving	4.8	2.6	4.5	4.2	7.0
½ serving or more	26.5	28.6	29.8	26.6	20.3
Brown rice					
No rice	96.0	96.4	96.1	95.5	96.6
Less than ½ serving	1.7	1.3	1.7	1.8	1.6
½ serving or more	2.3	2.4	2.2	2.7	1.7
Rice including flour ^a					
No rice	15.2	16.3	12.8	15.7	17.5
Less than ½ serving	54.0	50.7	53.4	53.4	57.2
½ serving or more	30.9	33.0	33.8	30.9	25.3

Source: CSFII 1994-96 (two days of data). Percentages are based on weighted data.

Notes: A ½ serving is equivalent to 14.1 grams of white rice (dry weight). Some of those reporting consumption of ½ serving or more on one day may have consumed a lesser amount of rice on the other day.

^a Includes white rice, brown rice, or rice flour.

TABLE 3B. Adults classified by age consuming selected types of rice on one day (CSFII)

	Age (20 and Older)				
	All Adults 20 and Older	20-24	25-39	40-59	60 and Older
Number of Individuals	9,318	686	2,304	3,355	2,973
	Percentage of Individuals Consuming				
White or brown rice					
No rice	78.8	78.7	77.2	78.2	82.1
Less than ½ serving	3.8	2.9	2.9	4.3	5.0
½ serving or more	17.4	18.5	19.9	17.6	12.9
White rice					
No rice	80.6	79.9	78.8	80.3	84.0
Less than ½ serving	3.1	2.5	2.4	3.3	4.3
½ serving or more	16.3	17.6	18.8	16.4	11.7
Brown rice					
No rice	97.7	98.5	97.9	97.3	97.7
Less than ½ serving	1.0	0.5	0.7	1.4	1.0
½ serving or more	1.3	1.0	1.4	1.3	1.3
Rice including flour ^a					
No rice	34.1	36.1	32.9	33.4	36.0
Less than ½ serving	46.7	43.7	45.1	47.6	49.2
½ serving or more	19.2	20.3	21.9	19.1	14.8

Source: CSFII 1994-96 (day one data). Percentages are based on weighted data.

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight).

^a Includes white rice, brown rice, or rice flour.

TABLE 4. Adults classified by age consuming selected types of rice (NHANES)

	All Adults 20 and Older	Age (20 and older)			60 and Older
		20-24	25-39	40-59	
Number of individuals	4,744	487	1,245	1,488	1,524
		Percentage of Individuals Consuming			
White or brown rice					
No rice	77.3	80.4	72.6	78.7	79.8
Less than ½ serving	4.5	1.8	5.4	4.5	4.9
½ serving or more	18.2	17.8	22.1	16.8	15.3
White rice					
No rice	79.5	81.8	74.7	81.2	82.2
Less than ½ serving	3.5	1.7	3.8	3.6	3.6
½ serving or more	17.0	16.5	21.5	15.2	14.2
Brown rice					
No rice	97.4	98.7	97.3	97.0	97.5
Less than ½ serving	1.3	0.0	2.0	1.2	1.3
½ serving or more	1.3	1.3	0.7	1.8	1.2
Rice including flour ^a					
No rice	32.8	40.5	30.2	32.8	32.7
Less than ½ serving	47.7	39.5	46.7	49.0	50.9
½ serving or more	19.5	20.1	23.1	18.3	16.4

Source: NHANES 2001-02 (one day of data). Percentages are based on weighted data.

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight).

^a Includes white rice, brown rice, or rice flour.

TABLE 5. Average rice intake by region and demographic characteristics (CSFII)

	Total Adults	Consumers of Rice (White or Brown) (≥½ Serving)		
All individuals	9,318			1,524
Amount per day (grams, dry weight)		11.8 ^a		66.5 ^b
	Distribution of Population (%)	Consumption Index (% of Average)	Consumers (%)	Consumption Index (% of Average)
Region				
Northeast	20.1	131.4	22.2	103.5
Midwest	23.4	60.2	12.3	84.1
South	35.1	79.7	16.0	87.2
West	21.4	146.6	20.8	123.0
Household Size				
1 member	13.2	70.3	14.6	83.0
2-3 members	54.3	91.5	16.1	97.9
4 or more members	32.5	126.3	20.6	107.5
Racial/Ethnic Group				
White, non-Hispanic	76.3	55.9	12.4	76.5
Black, non-Hispanic	11.0	118.6	21.3	97.7
Mexican-American	4.0	124.6	28.1	76.8
Other Hispanic	4.8	303.4	39.9	134.3
Other ^c	3.9	633.9	64.8	173.4
Annual Household Income				
0-130% of poverty threshold	15.6	125.4	19.6	112.3
131-350% of poverty threshold	41.3	90.7	15.5	101.5
Over 350% of poverty threshold	43.1	100.0	18.4	94.0
Urbanization				
MSA, central city	31.6	145.8	23.2	110.4
MSA, not central city	46.5	97.5	17.1	98.9
Non-MSA	21.9	39.0	9.7	68.4
Education				
Less than high school	15.2	100.0	16.3	107.1
High school or GED	34.4	78.0	13.8	98.3
Some college	35.7	107.6	19.0	98.6
5+ years of college	13.1	126.3	23.0	95.5
Never attended/ other/refused/don't know/not ascertained	1.6	183.1	23.9	135.9

TABLE 5. Continued

	Distribution of Population (%)	Consumption Index (% of Average)	Consumers (%)	Consumption Index (% of Average)
Employment				
Employed, full time	47.3	100.8	17.6	100.5
Employed, part time	12.3	102.5	18.5	96.2
Employed, not at work	3.2	132.2	16.8	138.0
Not employed	35.8	92.4	16.6	96.5
Undetermined	1.3	161.0	24.8	114.7

Source: CSFII 1994-96 (day one data). Index and percentages are based on weighted data.

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight).

^a Day one average for total adult population (including those who do not consume).

^b Day one average for adults consuming white or brown rice.

^c Asian, Pacific Islander; American Indian, Alaska Native; other.

TABLE 6. Average rice intake by demographic and health characteristics (NHANES)

	Total Adults		Consumers of Rice (White or Brown) ($\geq 1/2$ Serving)	
All individuals	4,744		921	
Amount per day (grams, dry weight)		11.4 ^a		61.2 ^b
	Distribution of Population (%)	Consumption Index (% of average)	Consumers (%)	Consumption Index (% of average)
Racial/ethnic group				
White, non-Hispanic	72.0	64.0	14.2	80.2
Black, non-Hispanic	10.6	132.5	23.6	102.9
Mexican-American	7.1	110.5	23.4	84.8
Other Hispanic	5.9	170.2	30.2	104.4
Other ^c	4.0	502.6	45.0	206.7
Annual household income				
0-185% of poverty threshold	30.0	116.7	19.5	110.0
Over 185% of poverty threshold	70.0	93.0	17.6	95.1
Education				
Less than high school	19.2	127.2	21.0	110.5
High school diploma (including GED)	25.3	70.2	13.5	92.3
More than high school	55.4	104.4	19.3	98.5
Refused/don't know/not ascertained	0.1	150.0	37.7	74.0
Country of birth				
Born in 50 U.S. states or Washington, DC	86.2	73.7	15.2	86.8
Born in Mexico	4.5	125.4	25.4	88.6
Born elsewhere	9.2	337.7	42.2	147.5
Refused	0.1	170.2	20.2	157.0
BMI				
BMI < 20	9.2	108.8	21.9	90.8
20 ≤ BMI < 25	27.7	114.0	20.0	103.3
25 ≤ BMI < 30	34.0	96.5	16.6	105.2
≥ 30	29.1	88.6	17.1	94.0
Opinion about own health				
Excellent	14.1	102.6	20.7	91.7
Very good	34.6	80.7	15.2	94.8
Good	31.9	114.9	20.5	102.6
Fair	12.3	115.8	18.7	112.9
Poor	3.0	80.7	16.4	88.1
Don't know	4.1	107.9	17.4	113.4

Source: NHANES 2001-02 (one day of data). Index based on weighted data.

Note: A 1/2 serving is equivalent to 14.1 grams of white rice (dry weight).

^a Average for total adult population (including those who do not consume).

^b Average for adults consuming white or brown rice.

^c Other race, including multi-racial.

TABLE 7. Average rice intake by demographic and health characteristics for low-income adults (NHANES)

	Total Adults		Consumers of Rice (White or Brown) ($\geq 1/2$ serving)	
All individuals, low income	1,767		359	
Amount per day (grams, dry weight)		13.3 ^a		67.3 ^b
	Distribution of Popula- tion (%)	Consumption Index (% of average)	Consumers (%)	Consumption Index (% of average)
Racial/ethnic group				
White, non-Hispanic	56.1	49.6	13.4	70.6
Black, non-Hispanic	16.5	123.3	24.0	100.1
Mexican-American	12.6	95.5	21.8	83.7
Other Hispanic	10.4	133.8	30.5	86.3
Other ^c	4.4	604.5	48.3	247.4
Education				
Less than high school	38.1	116.5	21.7	104.3
High school diploma (including GED)	29.0	67.7	12.9	100.1
More than high school	32.6	109.8	22.4	96.0
Refused/don't know/not ascertained	0.3	195.5	57.6	67.3
Country of birth				
Born in 50 U.S. states or Washington, DC	79.8	65.4	15.0	84.4
Born in Mexico	9.5	98.5	22.7	82.5
Born elsewhere	10.5	361.7	50.1	141.9
Refused	0.2	278.9	38.6	142.8
BMI				
BMI < 20	13.2	91.0	22.0	81.4
20 \leq BMI < 25	26.2	138.3	24.6	109.4
25 \leq BMI < 30	29.4	94.0	17.9	101.5
≥ 30	31.2	78.2	15.5	97.2
Opinion about own health				
Excellent	8.8	124.1	25.8	93.8
Very good	20.6	88.0	17.1	99.9
Good	35.6	102.3	19.1	104.5
Fair	22.2	89.5	17.8	97.0
Poor	6.7	83.5	20.8	76.5
Don't know	6.2	150.4	24.7	118.9

Source: NHANES 2001-02 (one day of data). Index based on weighted data.

Note: A $1/2$ serving is equivalent to 14.1 grams of white rice (dry weight).

^a Average for total adult low-income population (including those who do not consume).

^b Average for low-income adults consuming white or brown rice.

^c Other race, including multi-racial.

TABLE 8. Distribution of adults consuming rice at least once in two days of consumption by selected health characteristics (CSFII)

	Total Adults	Consumers of Rice (White or Brown)	
		(0 - < 1/2 serving) ^a	(serving ≥ 1/2) ^a
All individuals	9,318	6,867	2,451
Percentage of individuals	100	Percentage of Individuals	
		100	100
Diet with percent calories from fat			
< 30%	33.30	29.60	42.50
≥ 30%	66.70	70.40	57.50
Any kind of diet			
Yes	17.0	16.5	18.2
No	82.9	83.4	81.7
Not ascertained	0.1	0.1	0.1
Weight loss diet (low calorie), for those reporting yes to any kind of diet			
Yes	37.9	37.1	39.9
No	62.0	62.9	60.1
Not ascertained	0.0	0.0	---
Low-fat diet, for those reporting yes to any kind of diet			
Yes	49.4	48.4	51.9
No	50.0	51.6	48.1
Not ascertained	0.0	0.0	---
Body Mass Index (BMI)			
BMI<20	8.1	7.7	9.3
20≤BMI<25	37.3	36.1	40.5
25≤BMI<30	34.7	36.1	31.3
≥ 30	19.8	20.2	18.9
Average BMI	27.8	27.8	27.6
Opinion about own health in general			
Excellent	23.2	22.3	25.6
Very good	33.1	32.3	35.3
Good	29.0	29.9	26.7
Fair	11.2	11.8	9.7
Poor	3.2	3.4	2.5
Don't know/not ascertained	0.3	0.4	0.2
How often do you exercise vigorously enough to work up a sweat?			
Daily to once a week	56.9	56.4	58.2
1-3 times per month	6.0	6.0	6.0
Rarely or never	36.8	37.3	35.4
Don't know/Not ascertained	0.3	0.3	0.4

Source: CSFII 1994-96 (2 days of data). Percentages are based on weighted data.

^a A 1/2 serving is equivalent to 14.1 grams of white rice (dry weight). Some of those reporting consumption of a 1/2 serving or more on one day may have consumed a smaller amount of rice on the other day.

TABLE 9. Distribution of adults consuming rice in one day of consumption by BMI characteristics and percentage of calories from fat in diet (NHANES)

	Total Adults	Consumers of Rice (White or Brown)	
		(0 - < ½ serving)	(serving ≥ ½)
All adults	4,744	3,823	921
Body Mass Index (BMI) (%)			
BMI<20	9.2	8.8	11.1
20≤BMI<25	27.7	27.1	30.5
25≤BMI<30	34.0	34.6	30.9
≥ 30	29.1	29.5	27.5
Average BMI (kg/m**2)	28.1	28.1	27.7
Diet with percentage of calories from fat (%)			
<30%	34.8	31.5	49.7
≥ 30%	65.2	68.5	50.3
Low-income consumers	1,767	1,408	359
Body Mass Index (BMI) (%) ^a			
BMI<20	13.2	12.8	15.0
20≤BMI<25	26.2	24.5	33.1
25≤BMI<30	29.4	30.0	27.0
≥ 30	31.2	32.7	24.9
Average BMI (kg/m**2)	28.6	28.9*	27.3

Source: NHANES 2001-02 (one day of data).

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight).

^a Chi-square test statistically significant at p≤0.05.

* p≤0.05. Statistical t tests comparing rice consumers versus non-consumers were estimated using WesVar version 4

TABLE 10. Average daily nutrient intake by categories of rice consumers (at least once in two days of consumption) (CSFII)

	Number of Individuals	% Calories from Fat	% Calories from Saturated Fat	% Calories from Carbohydrates	Dietary Fiber (grams)	Folate (μg DFE)	Iron (mg)	Potas- sium (g)
Recommended amount		20%-35% ^a	<10% ^a	45-65% ^a	21-38 ^b	320 ^c	5-8.1 ^d	4.7 ^e
Adults								
≥ 20	9,318	33.1	11.0	50.5	15.7	524.7	15.3	2.7
White or brown rice								
0 - < 1/2 serving	6,867	33.8***	11.4***	49.9***	15.1***	488.8***	14.7***	2.7*
$\geq 1/2$ serving	2,451	31.1	10.1	51.9	17.2	615.6	16.7	2.8
Women	4,568	32.5	10.8	51.9	13.6	447.1	12.6	2.3
White or brown rice								
0 - < 1/2 serving	3,353	33.3***	11.1***	51.3***	13.0***	411.7***	12.0***	2.2***
$\geq 1/2$ serving	1,215	30.6	9.8	53.4	15.0	536.4	14.1	2.4
Men	4,750	33.7	11.3	48.9	18.1	608.8	18.1	3.1
White or brown rice								
0 - < 1/2 serving	3,514	34.4***	11.7***	48.4***	17.5***	572.2***	17.6**	3.1
$\geq 1/2$ serving	1,236	31.8	10.3	50.2	19.7	702.3	19.4	3.2

Source: CSFII 1994-96. Food and Nutrient Database for Dietary Studies, 1.0; FNDDS, 2004 used for folate estimates.

Note: A 1/2 serving is equivalent to 14.1 grams of white rice (dry weight). Some of those reporting consumption of 1/2 serving or more on one day may have consumed a lesser amount of rice on the other day.

^a Recommended amounts of % calories from fat, % calories from saturated fat, and % calories from carbohydrates based on the Dietary Guidelines for Americans 2005 (HHS/USDA 2005).

^b Dietary fiber: Adequate Intake (AI) is 25 g/day for women age 19-50 years and 21 g/day for women age 51 years and older; 38 g/day for men age 19-50 years and 30 g/day for men age 51 years and older (Institute of Medicine 2002).

^c Folate: Estimated Average Requirement (EAR) for women and men age 19 and older is 320 μg /day DFE (Institute of Medicine 1998).

^d Iron: EAR is 8.1 mg/day for women age 19-50 years of age and 5 mg/day for age 51 and older; EAR is 6 mg/day for men age 19 and older (Institute of Medicine 2001).

^e Potassium: AI is 4.7 g/day for women and men age 19 and older (Institute of Medicine 2005).

*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$. Statistical t tests comparing rice consumers versus non-consumers were estimated using WesVar version 4.2.

TABLE 11. Average daily nutrient intake by categories of rice consumers (NHANES)

	Number of Individuals	% Calories from Fat	% Calories from Saturated fat	% Calories from Carbohydrates	Dietary Fiber (grams)	Folate ($\mu\text{g DFE}$)	Iron (mg)	Potassium (g)
Recommended amount		20% - 35% ^a	<10% ^a	45-65% ^a	21-38 ^b	320 ^c	5-8.1 ^d	4.7 ^c
Adults								
≥ 20	4,744	33.4	10.6	50.3	16.0	555.0	15.6	2.7
White or brown rice								
0 - < 1/2 serving	3,823	34.1***	10.9***	49.8***	15.5***	521.2***	15***	2.7***
$\geq 1/2$ serving)	921	30.2	9.3	52.9	17.9	707.2	17.9	3.0
Women	2,494	33.5	10.6	51.7	14.3	487.4	13.3	2.4
White or brown rice								
0 - < 1/2 serving	2,010	34.3***	10.9***	51.1***	14.0***	460.5***	12.9***	2.3**
$\geq 1/2$ serving	484	30.3	9.4	54.1	15.7	607.3	15.0	2.6
Men	2,250	33.3	10.6	48.9	17.8	628.7	18.0	3.2
White or brown rice								
0 - < 1/2 serving	1,813	34.0***	10.9***	48.3**	17.2***	587.1***	17.3***	3.1***
$\geq 1/2$ serving	437	30.0	9.3	51.6	20.4	818.0	21.1	3.4

Source: NHANES 2001-02 (one day of data). Weighted data.

Note: A 1/2 serving is equivalent to 14.1 grams of white rice (dry weight).

^a Recommended amounts of % calories from fat, % calories from saturated fat, and % calories from carbohydrates based on the Dietary Guidelines for Americans 2005 (HHS/USDA 2005).

^b Dietary fiber: Adequate Intake (AI) is 25 g/day for women age 19-50 years and 21 g/day for women age 51 years and older; 38 g/day for men age 19-50 years and 30 g/day for men age 51 years and older (Institute of Medicine 2002).

^c Folate: Estimated Average Requirement (EAR) for women and men age 19 and older is 320 $\mu\text{g/day DFE}$ (Institute of Medicine 1998).

^d Iron: EAR is 8.1 mg/day for women age 19-50 years of age and 5 mg/day for age 51 and older; EAR is 6 mg/day for men age 19 and older (Institute of Medicine 2001).

^e Potassium: AI is 4.7 g/day for women and men age 19 and older (Institute of Medicine 2005).

*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$. Statistical t tests comparing rice consumers versus non-consumers were estimated using WesVar version 4.2.

TABLE 12. Average daily servings of Food Guide Pyramid food groups consumed by categories of rice consumers (at least once in two days of consumption) (CSFII)

	Number of Individuals	Grains (serv.)	Whole Grains (serv.)	Vegetables (Including Legumes) (serv.)	Vegetables (Less Potatoes) ^a (serv.)	Vegetables (Less Potatoes Less Legumes) (serv.)	Dark-Green Vegetables (serv.)	Deep- Yellow Vegetables (serv.)	Fruit (serv.)	Dairy (serv.)	Meat, Poultry, and Fish (ounces)	Discret. Fat (grams)	Added Sugar (tsps.)
Adults													
≥20	9,318	6.7	1.0	3.6	2.5	2.3	0.2	0.2	1.5	1.3	4.9	56.8	17.8
White or brown rice													
0 - < ½ serving	6,867	6.4***	0.9**	3.5**	2.3***	2.1***	0.2***	0.2***	1.4***	1.4**	4.8*	58.0***	18.6***
≥ ½ serving	2,451	7.3	1.1	3.7	2.9	2.6	0.2	0.2	1.7	1.2	5.2	53.5	15.8
Women	4,568	5.5	0.9	3.1	2.2	2.1	0.2	0.2	1.5	1.1	3.7	45.2	14.7
White or brown rice													
0 - < ½ serving	3,353	5.3***	0.8**	3.0**	2.1***	1.9***	0.2***	0.2***	1.4***	1.1	3.6***	45.9*	15.2**
≥ ½ serving	1,215	6.1	1.0	3.2	2.6	2.4	0.3	0.2	1.7	1.1	4.1	43.6	13.2
Men	4,750	7.9	1.1	4.1	2.8	2.5	0.2	0.2	1.5	1.5	6.1	69.3	21.2
White or brown rice													
0 - < ½ serving	3,514	7.7***	1.1*	4.1*	2.6***	2.4***	0.2*	0.2***	1.4***	1.6*	6.0	71.2**	22.4***
≥ ½ serving	1,236	8.5	1.2	4.3	3.3	2.9	0.2	0.2	1.8	1.4	6.4	64.4	18.3

Source: CSFII 1994-96 (2 days of data) (Pyramid Servings Database, version 2, Dec. 2004). Averages are based on weighted data

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight). Some of those reporting consumption of ½ serving or more on one day.

*** p≤0.001, ** p≤0.01, * p≤0.05. Statistical t tests comparing rice consumers versus non-consumers were estimated using WesVar version 4.2

^a Includes legumes but not potatoes.

TABLE 13. Average daily servings of Food Guide Pyramid food groups consumed by categories of rice consumers (NHANES)

	Number of Indi- viduals	Grains (serv.)	Whole Grains (serv.)	Vegetables (Including Legumes) (serv.)	Vegetables (Less Potatoes) ^a (serv.)	Vegetables (Less Potatoes Less Legumes) (serv.)	Dark- Green Vegeta- bles (serv.)	Deep- Yellow Vegetables (serv.)	Fruit (serv.)	Dairy (serv.)	Meat, Poultry, and Fish (ounces)	Discret. Fat (grams)	Added Sugar (tsps.)
Adults													
≥20	4,744	6.8	0.8	3.5	2.5	2.3	0.2	0.2	1.6	1.6	4.9	63.3	21.5
White or brown rice													
0 - < ½ serving	3,823	6.5***	0.8	3.5*	2.4***	2.2***	0.2	0.1**	1.6*	1.6	4.7***	64+	21.8*
≥ ½ serving	921	8	0.9	3.8	3.2	2.8	0.3	0.2	1.8	1.5	5.7	59.9	20.4
Women	2,494	6.0	0.8	3.2	2.4	2.2	0.3	0.2	1.5	1.4	3.8	53.4	18.1
White or brown rice													
0 - < ½ serving	2,010	5.8***	0.8	3.1*	2.2***	2.1**	0.2	0.1*	1.5	1.4	3.6**	54.2*	18.3+
≥ ½ serving	484	6.8	0.8	3.5	3.0	2.6	0.3	0.2	1.7	1.3	4.4	49.9	16.9
Men	2,250	7.7	0.9	3.9	2.7	2.4	0.2	0.1	1.7	1.8	6.1	74.0	25.4
White or brown rice													
0 - < ½ serving	1,813	7.3***	0.8	3.8	2.5***	2.3**	0.2	0.1**	1.6+	1.8	5.9***	74.6	25.6
≥ ½ serving	437	9.2	1.0	4.2	3.5	3.0	0.2	0.2	2.0	1.7	7.1	71.1	24.2

Source: NHANES 2001-02 (one day of data) (Pyramid Servings Database, Version 2, December 2004). Averages are based on weighted data.

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight). Some of those reporting consumption of a ½ serving or more on one day may have consumed a smaller amount of rice on the other day.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1. Statistical t tests comparing rice consumers and non-consumers were estimated using WesVar version 4.2.

^a Includes legumes but not potatoes.

TABLE 14. Average daily servings of Food Guide Pyramid food groups consumed by categories of low-income rice consumers (NHANES)

	Number of Indi- viduals	Grains (serv.)	Whole Grains (serv.)	Vegetables (Including Legumes) (serv.)	Vegetables (Less Potatoes) ^a (serv.)	Vegetables (Less Potatoes Less Legumes) (serv.)	Dark- Green Vegeta- bles (serv.)	Deep- Yellow Vegetables (serv.)	Fruit (serv.)	Dairy (serv.)	Meat, Poultry, and Fish (ounces)	Discret. Fat (grams)	Added Sugar (tsp.)
Adults													
≥20	1,767	6.7	0.6	3.2	2.2	1.9	0.1	0.1	1.3	1.4	4.6	58.9	23.1
White or brown rice													
0 - < ½ serving	1,408	6.4***	0.6	3.1	2.1***	1.8***	0.1	0.1	1.3	1.3+	4.4**	59.6	23.1
≥ ½ serving	359	8.0	0.6	3.5	2.9	2.4	0.2	0.2	1.6	1.4	5.6	55.6	23.1
Women	967	5.9	0.6	2.9	2.0	1.8	0.2	0.1	1.3	1.2	3.8	51.8	20.2
White or brown rice													
0 - < ½ serving	772	5.6***	0.6	2.8	1.8**	1.6**	0.2	0.1	1.3	1.2	3.6*	52.8	20.3
≥ ½ serving	195	7.2	0.6	3.1	2.7	2.3	0.2	0.2	1.3	1.2	4.7	48.0	19.9
Men	800	7.8	0.6	3.7	2.6	2.2	0.1	0.1	1.4	1.5	5.8	68.5	27.1
White or brown rice													
0 - < ½ serving	636	7.5**	0.6	3.6	2.5**	2.1	0.1*	0.1	1.3+	1.5	5.5*	69.1	26.9
≥ ½ serving	164	9.2	0.5	4.1	3.2	2.5	0.2	0.1	2.0	1.8	6.8	66.2	27.6

Source: NHANES 2001-02 (one day of data) (Pyramid Servings Database, Version 2, December 2004). Averages are based on weighted data.

Note: A ½ serving is equivalent to 14.1 grams of white rice (dry weight). Some of those reporting consumption of a ½ serving or more on one day may have consumed a smaller amount of rice on the other day.

*** p≤0.001, ** p≤0.01, * p≤0.05, + p≤0.1. Statistical t tests comparing rice consumers versus non-consumers were estimated using WesVar version 4.2

^a Includes legumes but not potatoes.

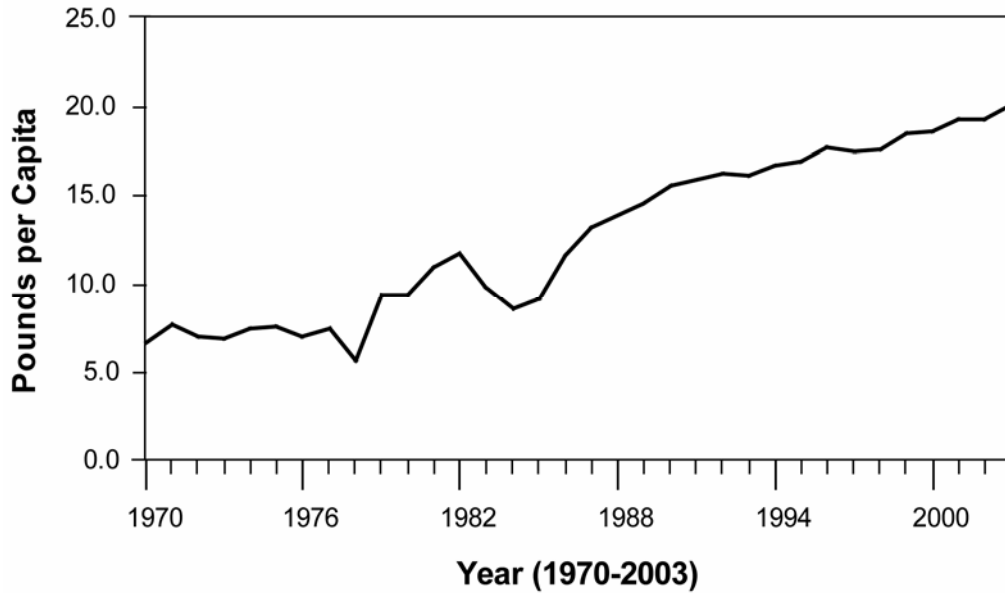
TABLE 15. Rice foods, frequency of consumption (all consumers age two and older) (NHANES)

Position	Food Category	Frequency
1	White rice	817
2	Cereals	261
3	Rice pilaf and casseroles	224
4	Fried rice	190
5	Spanish rice	152
6	Beef, chicken, pork, rice-vegetable dishes	138
7	Meat, rice, soups	110
8	Rice and beans	80
9	Brown rice	65
10	Yellow rice	50
11	Rice beverages (including tea and Mexican atoles)	42
12	Rice cake	30
13	Seafood gumbo	26
14	White and wild rice	25
15	Sushi	21
16	Bean and rice soup	17
17	Burrito enchilada	11
18	Rice with milk	8
19	Candy	7
19	Veggie burger—meatless	7
21	Granola bar	3

Source: NHANES 2001-02 (one day of data), FCID.

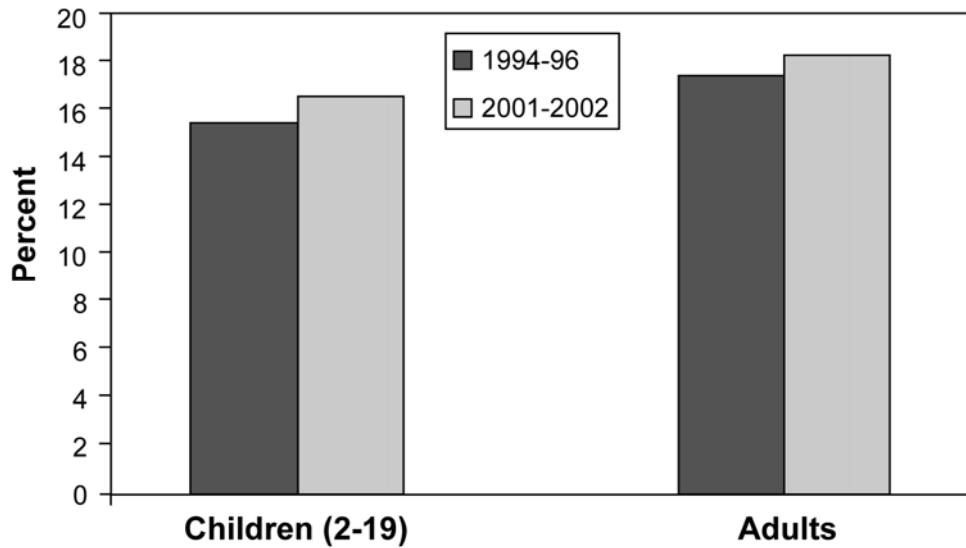
Note: Includes white and brown rice.

Figures



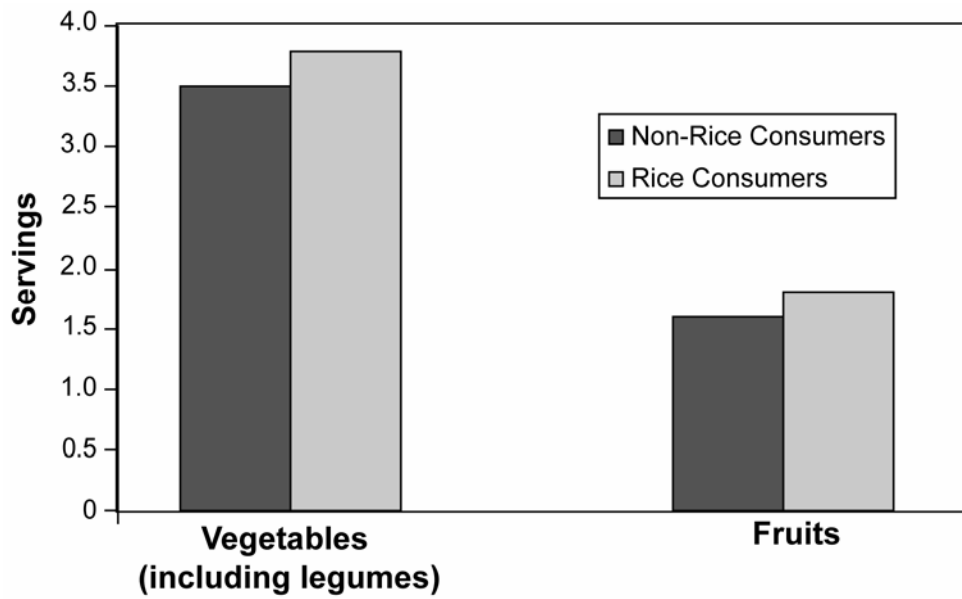
Source: USDA/ERS, U.S. Food Supply Data, 2004

FIGURE 1. Per capita rice consumption, 1970-2003



Source: CSFII 1994-96 and NHANES 2001-02

FIGURE 2. Percentage of individuals consuming rice (a 1/2 serving or more)



Source: NHANES 2001-02

FIGURE 3. Vegetables and fruits consumption by adults (2001-02)

Endnotes

1. The commodities (over 500) are those listed by the U.S. Environmental Protection Agency (EPA) in their Food Commodity Master List of June 15, 2000. The FCID was developed jointly by the Environmental Protection Agency and the Agricultural Research Service, U.S. Department of Agriculture.
2. See Smiciklas-Wright et al. 2002, Table 2.016, p. 135.

Appendix

Data and Procedures

The primary sources of data were two nationwide dietary intake surveys: the 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII), conducted by the U.S. Department of Agriculture (USDA), and the 2001-02 National Health and Nutrition Examination Survey (NHANES), conducted by the USDA and the U.S. Department of Health and Human Services.

CSFII 1994-96

In each of the three survey years of the CSFII, a nationally representative sample of individuals was asked to provide food intakes on two nonconsecutive days (as 24-hour recalls) and socioeconomic and health-related information through in-person interviews. Over the three years, the total number of individuals in the survey was over 15,000. The data are weighted to produce results that are nationally representative of the U.S. population two years of age and older for all the tabular analysis presented in this report.

A total of 14,257 individuals who reported dietary intakes on both of the surveyed days were used. The sample included 4,939 children (2-19 years old), 4,568 women, and 4,750 men. In total there were 9,318 adults in the sample. Most of the analysis was conducted with data pooled over three years to allow detailed analysis of some population groups that may be relatively small. Our analysis is based on reports from individuals with two complete days of intake data reported as well as for individuals reporting intake data for one day only (day-one data). The availability of two days of intake data allows evaluation of differences in consumption across days. Data were weighted using the final three-year two-day weight (WT3_2DAY) when analyzing two days of data and the final three-year day-one weight (WT3_DAY1) when analyzing day-one data.

NHANES 2001-02

The 2001-02 National Health and Nutrition Examination Survey (NHANES) is a multistage, stratified area sample that is representative of the U.S. civilian, non-institutionalized population. Certain groups were oversampled to allow for more precise estimates. Oversampled groups include adolescents 12-19 years old, persons 60+ years old, African Americans, Mexican Americans, low-income persons, and pregnant women. Each annual sample is nationally representative, but the two-year sample is used to provide adequate sample sizes for subgroup analyses. The year 2002 was the first year of full integration of the two nationwide dietary intake surveys—CSFII and NHANES. The new integrated survey is called What We Eat in America and is collected as part of NHANES. What We Eat in America food intake data can be linked to health status data from other NHANES components. To protect the confidentiality of survey participants, single-year data from NHANES are not released for public use. For that reason, only day-one interview data are included in the 2001-02 release, and there is one day of reported 24-hour dietary recall available. Data sets were weighted to be nationally representative using the full-sample two-year Mobile Examination Center (MEC) examination weight (WTMEC2YR).

A total of 9,032 individuals who reported dietary intakes on day one were used. The sample included 4,288 children (2-19 years), 2,494 women, and 2,250 men. In total there were 4,744 adults in the sample. The analysis was conducted with data pooled over the two years.

The CSFII 1994-96 data were analyzed using Linux SAS version 9.1, and the NHANES 2001-02 data were analyzed using SAS version 9.00. All statistical tests were done using WesVar 4.2.

Food Commodity Intake Database (FCID)

In addition, we used the Food Commodity Intake Database (FCID). The FCID is a CSFII 1994-96 companion data set in which intakes are presented in terms of food commodities rather than foods as consumed (for example, as wheat flour and whole egg rather than as noodles). The FCID was developed jointly by the Environmental Protection Agency and the Agricultural Research Service. The commodities (over 500) are those

listed by the U.S. Environmental Protection Agency in their Food Commodity Master List as of June 15, 2000.

The commodity database links food codes (used in the CSFII and NHANES) with commodity codes and amounts (in the FCID). The FCID was used primarily to identify the commodity rice content in the different food codes and its corresponding amount (measured in dry weight). One hundred grams of regular white rice, cooked (food code = 56205000) has 35.709 grams of rice dry weight. One serving of regular rice is equal to one-half cup of rice or 79 grams (food as eaten) (Smiciklas-Wright et al. 2002, Table 2.016, p. 135). Therefore, one serving of regular rice is equivalent to 28.21 grams of rice dry weight.

Using data from the CSFII 1994-96, NHANES 2001-02, and FCID, we identified and classified rice consumers. The classification of rice consumers was based on reported intake of foods that contained rice. Foods containing rice were identified as foods (in the USDA database) that included the “commodity” (a commodity-based ingredient) of rice as identified by the Food Commodity Database (Smiciklas-Wright 2002).

Foods containing rice included the following commodities (identified by the last two digits of the commodity code): white rice; brown rice; rice flour; rice bran; and rice in baby foods (white and brown rice, rice flour, and rice bran in baby food).

We included in our analysis foods that had white rice (commodity 15003230), brown rice (commodity 15003240), and rice flour (commodity 15003250). We excluded foods with rice bran. Baby foods were also eliminated because most of the analysis focused on adults.

Consumers were classified based on the amount of rice consumed. The actual amount of rice consumed by reporting individuals was the individual’s reported food intakes (amounts) matched to the commodity amounts in the foods. This matching to the FCID is possible through the common set of food codes between the surveys (CSFII 1994-96 and NHANES 2001-02) and FCID (available in USDA and EPA Technical Data files). The CSFII 1994-96 data has 7,352 food codes. The NHANES 2001-02 data has 6,974 food codes. There are 6,804 common food codes in these two surveys. There are 548 foods codes in CSFII 1994-96 that are not in NHANES 2001-02. There are 170 food codes in NHANES 2001-02 that are not in CSFII 1994-96. Of the selected 784 food

codes (this list of food codes includes 35 repeated food codes) from the FCID that include white rice, brown rice, and rice flour (and not including the food codes for beer), used in the CSFII 1994-96 data to classify consumers based on amount of rice eaten, there are 39 food codes that do not appear in NHANES 2001-02. In other words, of the 548 food codes in CSFII 1994-96 that are not in NHANES 2001-02, only 39 food codes do not appear in the list of food codes selected for our analysis.

Of the 170 food codes in the NHANES 2001-02 that are not in the CSFII 1994-96, there are 6 food codes for which we assigned a rice amount value using proxy values from the selected list of food codes for the analysis. After these adjustments, the new list of food codes available to classify consumers based on amount eaten using NHANES data has 751 food codes.

Pyramid Servings Database version 2.0 (December, 2004)

The Pyramid Servings Database for USDA Survey Food Codes Version 2.0 (PyrServDB_v2) provides servings for use with national food consumption surveys (Cook and Friday 2004). The PyrServDB_v2 was produced by USDA's Community Nutrition Research Group (CNRG) and updates the earlier version (PyrServDB_v1). This database provides serving amounts consistent with the 1992 USDA Food Guide Pyramid recommendations. The database also provides Pyramid servings intake data files for the national surveys "What We Eat in America," which is the dietary interview component of the NHANES 2001-02, and the CSFII 1994-96. There were methodological differences between the previous release of the Pyramid Servings Database (PyrServDB_v1) and the new release (PyrServDB_v2) in the algorithms used to calculate ounces of cooked lean meat, grams of discretionary fat, and teaspoon equivalents of added sugar. These changes were made to provide a more accurate estimate of servings from these three groups of food. The algorithms that were previously used and those used for the data in PyrServDB_v2 are documented in Section 3.2.2.5 and 3.2.2.6. of the "Documentation Pyramid Servings Database for USDA Survey Food Codes Version 2.0 (PyrServDB_v2). The revised methods (v2 compared to v1) led to small increases in intake of lean ounces of meat, poultry, and fish and discretionary fat, and small decreases in intake of added sugar.

USDA Food and Nutrient Database for Dietary Studies version 1.0 (June 2004)

The USDA Food and Nutrient Database for Dietary Studies version 1.0 (FNDDS-1.0) is a database of foods, their nutrient values, and weights for typical food portions used to process and analyze food intake data. FNDDS-1.0 was used to process What We Eat in America/NHANES 2001-02. The Technical Support Database, which is the database used to code food data collected in the CSFII 1994-96 and to calculate the nutrient value of those food, did not include folate in dietary folate equivalents (DFE). Therefore, to estimate the average folate intake by individuals, we used the FNDDS-1.0 in combination with the CSFII 1994-96 data.

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