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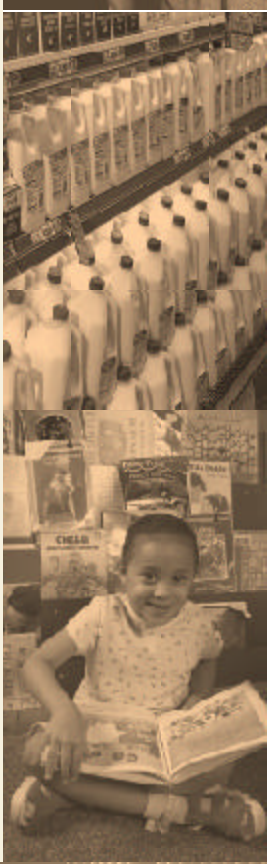

Research Articles

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Using the Interactive Healthy Eating Index to Assess the Quality of College Students' Diets

Hazel Hiza, PhD, RD
Shirley A. Gerrior, PhD, RD

U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

The Interactive Healthy Eating Index (IHEI) is an Internet application of the Healthy Eating Index (HEI)—a single summary measure of overall diet quality that was developed by the U.S. Department of Agriculture. We used this application to assess the quality of the diets of 100 students at a State university. Paired sample *t* tests were used to analyze students' 1-day dietary records to compare students' mean HEI and component scores with dietary recommendations. The mean overall HEI score (67.2 of a possible 100) for the total sample exceeded the national average for a similar age group by 6.3 points. Students who were female, less than 20 years old, or nonscience majors had the highest HEI scores. While the students' overall HEI score was higher than the national average, students' diets still need improvement. Our findings show that the IHEI can be applied in a university setting to analyze the quality of students' diets. The IHEI can also be used as a valuable component of collegiate introductory nutrition and health courses.

Extensive research has been conducted on the links between diet and chronic disease, but little has been conducted on methods to assess overall diet quality. To measure how well American diets conform to recommendations, the U.S. Department of Agriculture's (USDA) Center for Nutrition Policy and Promotion (CNPP) developed the Healthy Eating Index (HEI), a single summary measure (or "report card") of overall diet quality in 1995 (Kennedy, Bowman, Lino, Gerrior & Basiotis, 1999; Frazao, 1999). The HEI provides a "snapshot" of the types of foods people eat, the variety in their diets, and the degree to which their diets comply with Federal dietary guidance (i.e., specific recommendations of the *Dietary Guidelines for Americans*) (Bowman, Lino, Gerrior & Basiotis, 1998; U.S. Department of Agriculture [USDA] and U.S. Department of Health and Human Services [DHHS], 1995) and the *Food Guide Pyramid* (USDA, 1996). The HEI provides insight into the types of dietary changes needed to improve the eating patterns of Americans.

Many Americans are confused about what to eat (and what not to eat); others fail to follow healthful eating practices even when they understand basic nutrition (Frazao, 1999). Thus, the USDA developed the Interactive Healthy Eating Index (IHEI) to increase awareness of diet quality and to promote healthful eating habits. Based on the HEI, the IHEI is a consumer-oriented, online dietary intake assessment tool that allows Americans (2 years and older) to evaluate the quality of their diets in terms of current dietary guidance. The IHEI also provides immediate feedback via scoring options and targeted nutrition education messages. Along with increasing awareness of the quality of a person's diet, the IHEI helps those who may

have access to nutrition information but who may not have the background to apply or interpret it correctly.

College students are expected to respond favorably to the IHEI and may benefit positively from its use. They are both interested in nutrition information (Hertzler & Frary, 1992) and are computer literate. Today's college students take basic nutrition courses in record numbers. Many of these nutrition courses are now computer-assisted instruction or computer-assisted learning (Shah, George & Himburg, 1999). Also, today's young adults are the first generation to have grown up with the benefit of dietary recommendations to reduce intake of fat and cholesterol and increase intake of complex carbohydrate and fiber. Hence, college-age Americans introduced as children to dietary guidance, such as the *Dietary Guidelines for Americans*[1] and the USDA *Food Guide Pyramid* (USDA & DHHS, 1995; USDA, 1996), could be expected to have diets reflective of this guidance.

Overall, however, college students often develop poor eating habits. These practices may result from skipping meals, choosing inappropriate foods, dieting excessively, consuming inappropriate snacks, and avoiding certain foods (Harless, Koch & Slapar, 1996). Often, these practices result in low intake or imbalance of calories and important nutrients. Some college students eat foods low in fat (e.g., reduced-fat milks) and high in complex carbohydrates (e.g., pasta). Many others, however, frequently eat fast-food and restaurant foods, both of which are associated with higher intakes of fat and sodium and lower intakes of dietary fiber and calcium (Georgiou et al., 1997). These behaviors may contribute to inadequacies in the diets of college students, affect their health status during a formative period of growth and development, and eventually influence the quality of life they may experience in their middle-aged and senior years. Consequently, this population needs more information about making dietary choices that include more nutrient-dense foods (especially for calcium and iron) and reduced-fat foods (Hertzler et al., 1992).

This study assessed the quality of college students' diets. The IHEI was used to assess that quality. To our knowledge, this study is the first to use and evaluate the IHEI as a measure of the quality of people's diets.

Indices

An important definition in this study is diet quality, a definition that varies—depending on the attributes selected. As applied in this study, diet quality consists of a comprehensive set of indicators that incorporated nutrient needs and recommendations of food servings into one measure, the Healthy Eating Index (Kennedy et al., 1995).

Healthy Eating Index

The total HEI score is the sum of 10 equally weighted dietary components, each having a maximum score of 10 and a minimum score of zero. A maximum score of 10 was assigned to each of the five food group components of the HEI if a person's diet met or exceeded the recommended number of servings for a food group of the *Food Guide Pyramid*. High component scores indicate intakes close to the recommended ranges or amounts; low component scores, less compliance with the recommended ranges or amounts. The 10 components each represent various aspects of a healthful diet.

- Components 1 through 5 measure the degree to which a person's diet conforms to the recommended servings of the *Food Guide Pyramid* for the five major food groups: grains, vegetables, fruits, milk, and meat.
- Component 6 measures total fat consumption as a percentage of total food energy intake.
- Component 7 measures saturated fat consumption as a percentage of total food energy intake.
- Component 8 measures total cholesterol intake.
- Component 9 measures total sodium intake.
- Component 10 measures the variety in a person's diet. In this study, variety in the diet was based on the total number of different foods eaten in a day in amounts sufficient to contribute at least one-half of a food group.[2]

The maximum overall HEI score a person can receive is 100. A score greater than 80 classifies a diet as "good"; scores between 51 and 80 classify a diet as "needs improvement"; a score less than 51 classifies a diet as "poor."

Because no single dietary component defines the Index, doing well on only one component does not ensure a high overall score. A more detailed description of the development of the HEI is described elsewhere (Bowman et al., 1998).

[1]Since the completion of this study and the development of the IHEI, a new version of the *Dietary Guidelines for Americans* was released (USDA & DHHS, 2000). Also, an updated version of the IHEI is now available on the USDA Web site at www.cnpp.usda.gov.

[2]Others have reported diet variety as the total number of unique foods consumed in a day (Kant, 1996).

Interactive Healthy Eating Index

An online dietary assessment tool, the IHEI uses the same data sources as those used for the HEI. The food descriptor files, which contain more than 8,000 foods, were modified to best reflect users' food choices and include fast-foods and brand names for numerous food items reported as being consumed by survey respondents. These data reflected the food choices of a sample population of about 15,000 individuals.

Modified food descriptions were matched to appropriate data from several files of the USDA's Continuing Survey of Food Intakes by Individuals (CSFII): nutrients, serving measures, and Pyramid servings. When a food could not be linked directly to a Pyramid serving, it was assigned a Pyramid serving of a similar food.

Methods

Subjects

In the spring of 1999, we conducted a pilot study at a State university to test the application of the IHEI. The subjects, 250 college students enrolled in an introductory nutrition course, represented a variety of academic majors. Many students enrolled in the course to meet a science requirement. Many students did not provide demographic information or did not complete all necessary components of the IHEI; thus, the final sample size was 100.

Data Collection

As an assignment, students evaluated the IHEI and completed a 1-day dietary food record. All students were given guidelines for using the IHEI and an evaluation form to complete. After accessing the IHEI from the university's computer laboratory, students entered information about their age, gender, and diet for self-evaluation. Each student's information was processed by a Web server and linked to the databases that include information on nutrients, serving measures, and Pyramid servings. This process calculated each student's 10 component scores and an overall HEI score, as well as nutrient intakes of up to 24 nutrients and dietary components. The evaluation forms and students' IHEI information were provided to course instructors for purposes related to the assignment and then given to researchers for further analysis.

Analysis

An IHEI student database was created by using the Statistical Package for the Social Sciences (SPSS, 1997); a coding manual was developed to account for all collected data. The 106 variables consisted of the students' demographic information, HEI and component score variables, Pyramid servings of the five major food groups, national average comparisons of HEI and component scores, nutrient intakes, and recommended dietary intake for each nutrient. Subjects were divided into the following subgroups: gender, age categories (less than 20 years and 20 years or older), and majors (*science:* dentistry, engineering science, agricultural science and forestry, medicine, nursing, and pharmacy; and *nonscience:* arts and sciences, business and economics, creative arts, human resources and education, journalism, law, and social work).

SPSS for windows was used to conduct Student *t* tests (SPSS, 1997), and paired sample *t* tests were used to compare mean scores between subgroups (the students' intake and the recommendation) for HEI scores, HEI component scores, nutrient intakes, and Pyramid servings. The independent *t* test was applied to compare these variables based on selected demographic characteristics of the subjects.

Students, regardless of age category, did not meet the minimum daily recommendations for fruits, milk, and meat.

Results and Discussion

Demographics of Sample

Over twice as many female students as male students (70 vs. 30 percent) provided a 24-hour dietary record (fig. 1). Most (three-fifths) of the students were 20 years old or older, and over half were science majors (55 percent); that is, they majored in dentistry, engineering science, agricultural science and forestry, medicine, nursing, and pharmacy.

Food Guide Pyramid Servings

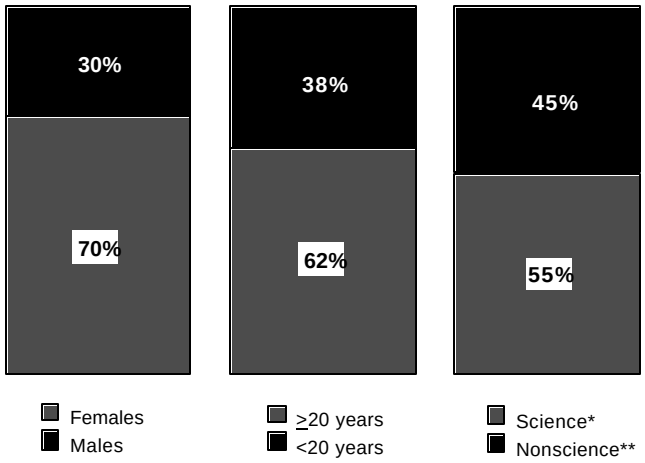
For this college group, the recommended daily minimum number of servings of the *Food Guide Pyramid* ranges from 2 to 6 (table 1). To meet the daily minimum servings, this age group needs to consume a minimum of 2 servings each of fruits, milk, and meat; 3 servings of vegetables; and 6 servings of grains. This student group (overall and by gender, age, and major) tended to meet the minimum recommendations for grains: 6.2 to 6.5 (table 2). Males consumed significantly fewer daily servings of fruits (1.3) and milk (1.6) than are recommended; females consumed significantly fewer servings of vegetables (2.5), fruits (1.4), milk (1.3), and meat (1.2).

Students, regardless of age category, did not meet the minimum daily recommendations for fruits, milk, and meat. Whereas the older group consumed 1.2 to 1.4 servings of these food groups, the younger age group consumed 1.4 to 1.6 servings. Both age groups met or exceeded—but not significantly—the minimum recommendations for grains.

Whereas nonscience majors failed to meet the recommended daily minimum servings of fruits and milk, science majors failed to meet the recommendations for vegetables, fruits, milk, and meat. Each group's intake represented shortfalls of 0.6 to 0.7 daily servings of each of these food groups. Nonscience majors met or exceeded the recommended minimum number of daily servings of grains (6.5 vs. 6.0).

On average, students in this study did not meet the maximum recommended serving of any of the five major food groups of the *Food Guide Pyramid*. Our findings disagree with those of Schuette and colleagues (1996) who reported that college students in an introductory nutrition course had daily mean intakes from each of the five groups at or above the recommended minimum number of servings. Previous research, however, shows that even

Figure 1. Selected demographic characteristics of college students



* Science majors: dentistry, engineering science, agricultural science and forestry, medicine, nursing, and pharmacy.
** Nonscience majors: arts and sciences, business and economics, creative arts, human resources and education, journalism, law, physical education, and social work.
n=100.
Mean age = 20.5 years.

Table 1. Recommended minimum and maximum number of USDA Food Guide Pyramid servings per day, by age-gender categories of college students

Category	Energy (kilocalories)	Grains	Vegetables	Fruits	Milk	Meat[1]
Females 11-24	2200	6-9	3-4	2-3	2-3	2-2.4
Females 25-50	2200	6-9	3-4	2-3	2-2	2-2.4
Males 19-24	2900	6-11	3-5	2-4	2-3	2-2.8
Males 25-50	2900	6-11	3-5	2-4	2-2	2-2.8
Males 15-18	3000	6-11	3-5	2-4	2-3	2-2.8

[1]One serving of meat equals 2.5 ounces of lean meat.
Source: Bowman, S.A., Lino, M., Gerrior, S.A., and Basiotis, P.P. 1998. The Healthy Eating Index: 1994-96. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. CNPP-5.

Table 2. Mean Pyramid servings consumed by college students, 1-day intake[1]

Pyramid food groups	Total sample (n=100)	Gender		Age		Major[2]	
		Male	Female	<20 years	≥20 years	Science	Nonscience
Grains	6.3	6.3	6.2	6.3	6.2	5.0	6.5
Vegetables	2.8	3.4	2.5*	2.9	2.7	2.4*	3.2
Fruits	1.4*	1.3*	1.4*	1.5*	1.2*	1.3*	1.4*
Milk	1.4*	1.6*	1.3*	1.4*	1.3*	1.4*	1.3*
Meat	1.5*	2.2	1.2*	1.6*	1.5*	1.3*	1.7

[1]Paired *t* tests were used to compare mean (± standard error of the mean) intake with the recommended minimum number of servings.
[2]Science majors: dentistry, engineering science, agricultural science and forestry, medicine, nursing, and pharmacy. Nonscience majors: arts and sciences, business and economics, creative arts, human resources and education, journalism, law, physical education, and social work.
* Values are significantly lower than the recommended minimum number of Pyramid servings ($p < .05$).

students consuming foods at an upper level distribution (the 75th percentile of the median) did not meet the recommended daily minimum servings of grains and vegetables but did meet the recommended servings for fruit, milk, and meat (Georgiou et al., 1997). This finding illustrates how few college students actually meet the recommended maximum serving of the *Food Guide Pyramid* and is supportive of our results. However, in each of these studies, underreporting the types of food consumed and underestimating their portion sizes may be a factor. Thus, actual intake of these food groups may be higher than indicated. Students have been found to underestimate food portion sizes when using the *Food Guide Pyramid*. This is a source of error that influences assessment of nutritional adequacy (Tavelli, Beerman, Shultz & Heiss, 1998).

Selected Nutrient Intakes

Female and male students' intakes met or exceeded the 1989 Recommended Dietary Allowances (RDA) for most of the selected nutrients—vitamins A, C, and B_6; folate; and iron (table 3). Female students' intake of calcium, however, was significantly lower than the RDA. Although students' reported intakes of vitamins A and C exceeded 100 percent of the RDA, the total sample still failed to meet the minimum Pyramid servings of fruits and vegetables (table 2).

Fruits and vegetables are the key sources of vitamins A and C as well as important contributors to folate and vitamin B_6. Underreporting of foods, such as orange juice (a beverage vs. a food), and the vegetables in grain mixtures and other mixed dishes—such as pizza and Mexican entrees, which are popular with college students—is assumed by the authors and helps to explain this discrepancy. Also, the fact that male students and nonscience majors met the minimum number of vegetable servings may be explained in part by compliance with recommendations because of an awareness of the benefits of healthful nutrition. Many non-nutrition majors enrolled in basic nutrition courses make positive dietary changes (Mitchell, 1990).

We expected a more apparent link between the mean intakes of nutrients and food sources—such as a link between vitamin A and vegetables and fruits, vitamin C and fruits, folate and fruits and grains, and iron and fortified grains and meat. The mean intakes of these nutrients appear to be adequate for both male and female students, but these same students generally consumed less than the recommended minimum number of servings (with the exception of grains) from these food groups. This finding is supported by Georgiou and colleagues (1997) who determined that college students and graduates ate more grains high in dietary fiber, more fruits, more dark-green vegetables, and more lowfat milks and meats than did nonstudents. Females, however, still failed to meet the minimum recommendations for grains, vegetables, and fruits.

Our findings are also similar to those of Tavelli and colleagues (1998) who found that although the mean intakes of nutrients appear adequate, college students often consumed less than the recommended minimum number of servings from the *Food Guide Pyramid*. Thus, using the minimum recommendations of the *Food Guide Pyramid* as criteria of dietary adequacy may be misleading in terms of actual nutrient intake for some nutrients. While the Pyramid may be a good indicator for screening nutritionally inadequate diets, further analysis of the nutritional adequacy of the total diet is needed to account for nutrient contributions from food mixtures and reported incorrect estimations of serving sizes (Schuette, Song & Hoerr, 1996).

Table 3. College students' mean dietary intakes[1] and percent Recommended Dietary Allowances (RDA) of selected nutrients, compared with the 1989 RDA

Nutrient	Dietary intake	
	Males	Females
	Mean ± SEM (% RDA)	
Vitamin A (RE)	1642.0± 468 (169)	1363.0± 352 (170)
Vitamin C (mg)	184.0 ± 49 (307)	138.0 ± 16 (231)
Vitamin B_6 (mg)	2.8 ± .22 (140)	2.5 ± .27 (167)
Folate (mcg)	371.0 ± 56 (186)	376.0 ± 59 (220)
Iron (mg)	19.6 ± 1.9 (194)	20.9 ± 3.0 (140)
Calcium (mg)	1137.0± 150 (96)	827.0* ± 71 (70)

[1]Paried *t* tests were used to compare means (± standard error of the mean).
*The value is significantly lower than the recommendation.

Female and male students' intakes met or exceeded the 1989 Recommended Dietary Allowances (RDA) for most of the selected nutrients—vitamins A, C, and B_6; folate; and iron.

Mean HEI and HEI Component Scores

National average[3] values were based on data obtained from the CSFII, 1994-1996. The data for the students were collected in 1999. Compared with the national average, student scores for fruits, total fats, saturated fats, cholesterol, and variety were significantly higher, averaging about 1 to 2 points more (table 4). Compared with the national average HEI score (60.9 of a possible 100), the overall score for the female, rather than male, college students was significantly higher—69.3 versus 62.2 (table 5). The females also had significantly higher component scores for fruits, total fats, saturated fats, cholesterol, and variety. Males, however, had a significantly lower score for grains: 5.7 versus 6.6 (national average).

HEI scores based on students' age were significantly higher than the national average (69.9 vs. 61.1 for younger students and 65.5 vs. 60.8 for older students) as were scores for total fats and saturated fats. Whereas the national average HEI scores for total fats and saturated fats were 7.0 and 6.3, respectively, the students' scores, based on their age, for total fats ranged from 8.7 to 9.0; their scores for saturated fats ranged from 8.2 to 8.4. Younger students had higher mean scores for each of the five food groups, compared with older students, but older students had higher cholesterol scores.

With total HEI scores of 66.5 to 68.0, science and nonscience majors' scores, respectively, surpassed the national by 5.4 to 7.9 points. Nonscience majors had a higher mean HEI score than did science majors because of higher scores (0.2 to 1.5 points) for grains, vegetables, meat, and variety.

Sodium scores were generally lower (but not significantly) for all groups studied, compared with the national average, except for those of science majors and females. Sodium scores ranged from 4.0 to 6.6; the national average was 6.1. Sodium intake may be related to the type of snack, as well as the mix of foods, consumed by these students. For example, lowfat grain snacks are often salty but promoted as a healthful food choice. Meals at fast-food restaurants may also make appreciable contributions to sodium intake.

[3]This average is derived from a population with similar distributions of age and gender as those of the college students.

Table 4. Mean HEI and component scores of college students, compared with a national average[1]

HEI component	National average	College students (n=100)
Total HEI	60.9 ± .10	67.2 ± 1.25
Grains	6.6 ± .03	6.6 ± .29
Vegetables	5.9 ± .02	6.5 ± .38
Fruits	3.2 ± .02	4.2 ± .40*
Milk	4.7 ± .03	4.4 ± .35
Meats	6.2 ± .08	6.0 ± .36
Total fats	7.0 ± .01	8.8 ± .26*
Saturated fats	6.3 ± .01	8.3 ± .32*
Cholesterol	7.9 ± .09	8.9 ± .28*
Sodium	6.1 ± .14	5.8 ± .42
Variety	7.1 ± .02	7.9 ± .31**

[1]Scores are for a population with age and gender distributions that are similar to those of the sample.
*Scores are significantly different from the national average, $p < 0.01$.
**Scores are significantly different from the national average, $p < 0.05$.

While we did not analyze fat and saturated fat as a percentage of total food energy, scores indicated that the fat and saturated fat intakes of these students were lower than the national average. A translation of a score to actual percentage of fat is 31.5 percent (score of 9.1) for females and 33 percent (score of 8.1) for males. Hertzler and Frary (1996) reported student fat intake ranges from 25 to 29 percent for females and males, respectively. Troyer et al. (1990) reported fat intake ranges from 34 to 36 percent. The lower intake of fat as a percentage of total kilocalories is consistent among students who select lower fat foods and have concerns about food and weight (Hertzler & Frary, 1996).

The *Dietary Guidelines for Americans*, the *Food Guide Pyramid*, and the National Council's Diet and Health Report all stress the importance of variety in a healthful diet (USDA, 1995; National Research Council, 1989). As with the nutrients of moderation (total fats, saturated fats, and cholesterol), variety scores for students who were female, less than 20 years old, and nonscience majors were significantly higher than the national average (8.0, 8.3, and 8.4, respectively, vs. 7.1).

Concerns about health and weight management commonly expressed by female students, possible younger students still living at home and eating with family members, and an increased awareness of nutrition and health issues by non-nutrition students may be factors contributing to their dietary choices and the subsequent overall HEI and component scores seen here.

Limitations of Study

The limitations of this study relate to the samples, dietary assessment, and the IHEI food database. We compared 1999 college students' HEI scores with those based on a 1994-1996 national average; hence, the differences in scores may not represent a true change in dietary intakes. Because we used a convenience sample, the subjects in this study may not have been representative of other college students. Thus, selection bias may have affected our results, and our findings may not be geographically representative of college students living in the general university community. In particular, because ethnic minorities were underrepresented in this sample, care should be used in extrapolating the findings of this study to other college populations or to young adults in general.

One-day dietary records were used to assess dietary intakes: such data may be poor indicators of a person's usual diet, but a 1-day dietary record is a generally acceptable means of characterizing a group's intake when the sample size is sufficient (Basiotis, Welsh, Cronin, Kelsay & Mertz, 1987; Levine & Guthrie, 1997). The use of a 1-day dietary record, however, may not reflect a person's normal eating pattern. When providing dietary information, survey respondents tend to both underreport consumption of certain foods—especially those high in fat and calories—and overreport consumption of other foods—such as those high in nutrients. Pertinent to this study is the possible omission of some foods consumed by college students, including high-protein and sports-type drinks. These foods are not in the foods database of the IHEI.

The IHEI used in this pilot study was a prototype, and its application was evaluated by the students. Some aspects of the IHEI program were identified as needing improvement. In particular, the types and number of food choices were somewhat limited. Future work on the IHEI design will include an updated food database that includes many more frequently consumed foods, as well as the addition of a physical activity component.

Table 5. Mean HEI and component scores of college students, by selected characteristics

HEI component	Gender		Age		Major[1]	
	Male	Female	<20 years	≥20 years	Science	Nonscience
HEI	62.2 ± 2.1	69.3 ± 1.5*	69.9 ± 1.9*	65.5 ± 1.6*	66.5 ± 1.7*	68.0 ± 1.8*
Grains	5.7 ± .61*	6.9 ± .31	6.8 ± .45	6.4 ± .37	6.5 ± .34	6.7 ± .49
Vegetables	6.8 ± .71	6.3 ± .46	6.8 ± .58	6.2 ± .51	5.8 ± .55	7.3 ± .51
Fruits	3.4 ± .71	4.6 ± .48**	4.9 ± .68**	3.8 ± .49	4.2 ± .55	4.2 ± .59
Milk	4.9 ± .72	4.2 ± .39	4.5 ± .55	4.4 ± .46	4.4 ± .46	4.4 ± .54
Meats	7.8 ± .57	5.2 ± .42	6.4 ± .60	5.7 ± .45	5.4 ± .51	6.8 ± .48
Total fats	8.1 ± .58	9.1 ± .28*	9.0 ± .35*	8.7 ± .37*	9.0 ± .30*	8.5 ± .47*
Saturated fats	7.5 ± .70	8.6 ± .33*	8.4 ± .51*	8.2 ± .40*	8.4 ± .39*	8.1 ± .51*
Cholesterol	6.7 ± .79	9.9 ± .10*	8.8 ± .47	9.0 ± .36*	9.0 ± .36*	8.8 ± .45*
Sodium	4.0 ± .78	6.6 ± .47	6.1 ± .61	5.6 ± .57	6.6 ± .54	4.8 ± .63
Variety	7.3 ± .53	8.0 ± .38*	8.3 ± .48**	7.5 ± .40	7.2 ± .47	8.4 ± .36*

[1]Science majors: dentistry, engineering science, agricultural science and forestry, medicine, nursing, and pharmacy. Nonscience majors: arts and sciences, business and economics, creative arts, human resources and education, journalism, law, physical education, and social work.
*Scores are significantly different from a national sample with comparable characteristics, p< .01.
**Scores are significantly different from a national sample with comparable characteristics, p< .05.
n=100.

Conclusions

Current research on diet and chronic disease has been lacking in appropriate methods to evaluate overall diet quality. In this study, we used the IHEI to assess the quality of college students' diets. The IHEI proved to be an effective dietary assessment tool for this sample. As such, it should be a component of basic introductory nutrition courses because the information it provides will help educators tailor their courses. For example, analyses from the IHEI can help instructors address specific topics in their course curriculum. This tailoring of nutrition education to food habits and eating practices of subgroups of the college population should result in nutrition courses and education programs that are more meaningful. Ultimately, this type of nutrition education at the college level can result in many positive lifestyle changes that can help achieve the goals of nutrition and health specified in the *Dietary Guidelines for Americans* (USDA, 2000) and in *Healthy People, 2010* (DHHS, 2000). In addition, our findings and the methods used may serve as a basis for future research on diet quality and risks of related chronic diseases among college students as well as in other subgroups of the American population.

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Consumers of Reduced-Fat, Skim, and Whole Milks: Intake Status of Micronutrients and Dietary Fiber

Helen H-C. Lee, PhD, CNS
Food and Drug Administration

Shirley A. Gerrior, PhD, RD
U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

Data from the U.S. Department of Agriculture's Continuing Survey of Food Intakes by Individuals (CSFII) 1989-91 were used to evaluate the intakes of vitamins, minerals, and dietary fiber by Americans (ages 2 years and older) who drank milk containing different levels of fat. Results show that people who drank reduced-fat or skim milk had significantly greater mean intakes of fat-soluble vitamins and carotene, water-soluble vitamins, minerals (except sodium), and dietary fiber, compared with people who drank whole milk. However, intakes of zinc and vitamin E (by males and females) and calcium (by females) did not meet 100 percent of the Recommended Dietary Allowances (RDAs), regardless of the type of milk consumed. Overall, those who drank skim milk had the most favorable micronutrient intakes. These results suggest that those individuals who chose to drink reduced-fat or skim milk also chose more micronutrient-dense foods, resulting in more healthful diets. Despite this improved dietary quality, intakes of foods rich in zinc, vitamin E, and calcium need to be encouraged, regardless of the type of milk consumed.

Scientific evidence suggests that diet plays an important role in development of chronic diseases. In particular, excessive consumption of dietary fat has been implicated with increased risk of coronary heart disease and some types of cancer (National Research Council, 1989). To promote health and reduce risk of chronic diseases, dietary recommendations have been developed for Americans by the National Cancer Institute (Butrum, Clifford & Lanza, 1988), the U.S. Surgeon General (U.S. Department of Health and Human Services [DHHS], 1988), and others (Krauss et al., 1993). These recommendations are consistent with the *Dietary Guidelines for Americans* and the *Food Guide Pyramid* to reduce dietary intakes of total fat, saturated fat, and cholesterol; to moderate intakes of sugar, sodium, and alcohol; and to increase intake of dietary fiber (U.S. Department of Agriculture [USDA], 1992; USDA & DHHS, 1995).

The *Dietary Guidelines for Americans* recommend that Americans choose a diet that provides no more than 30 percent of total calories from fat, less than 10 percent of total calories from saturated fat, and no more than 300 milligrams of cholesterol per day. Dietary fat intake as a percentage of total calories has declined over the past 20 years. In 1977-78, intake of dietary fat was about 40 percent of energy (USDA, 1984). Intake of dietary fat as a percentage of energy decreased to 36 and 37 percent in 1985-86, 34 percent in 1989-91, and 33 percent in 1994-96 (Tippett et al., 1995; USDA, 1986, 1987, 1997). Along with this decrease, saturated fat also decreased as a percentage of energy—from 13 percent in 1985-86 to 11 percent in 1994-96 (USDA, 1986, 1987, 1997). During

this time, daily grams of fat intake also decreased until 1991 when its intake increased but remained below earlier levels. Since 1991, daily grams of fat intake have remained steady or increased depending on the population subgroup studied (Anand & Basiotis, 1998; Morton & Guthrie, 1998). Nonetheless, the overall decrease in dietary fat over the past 20 years has been achieved, in part, by consumption of a variety of lower fat foods and fat-modified products (Buzzard et al., 1990; Gorbach, 1990; Lee, Gerrior & Smith, 1998; Peterson, Sigman-Grant, Eissenstat & Kris-Etherton, 1999; Wirfalt & Jeffery, 1997).

From analyzing the nationwide food intake database of the Continuing Survey of Food Intakes by Individuals (CSFII) 1989-91, Lee et al. (1998) reported that total fat intake of people who drank skim milk and reduced-fat milk[1] was significantly ($p \leq 0.05$) lower than those who drank whole milk. Thus, the dietary goal of not more than 30 percent of caloric intake from total fat was achieved by several age groups that drank skim milk. This dietary goal was not achieved by any age groups of whole milk or reduced-fat milk drinkers. The authors found that people who drank reduced-fat and skim milks consumed more fruits and vegetables and less meat, compared with people who drank whole milk.

A number of other studies also showed that inclusion of lower fat food choices—such as lower fat dairy products, leaner meats, and fat-modified bakery products—lowered intakes of total fat, saturated fat, and cholesterol and affected the micronutrient profile of the diet (Buzzard et al., 1990; Gorbach et al., 1990; Peterson et al., 1999; Wirfalt & Jeffery, 1997). Two studies that examined food intakes and dietary patterns reported that as dietary fat intake decreased, intakes of reduced-fat milk, vegetables, fruit, cereals, fish, and chicken increased and intakes of whole milk and cheese, salty snacks, peanuts, red meats, eggs, desserts, and fried potatoes decreased (Gorbach et al., 1990; Subar, Ziegler, Patterson, Ursin & Graubard, 1994). The use of a fat-reduction strategy appears to be associated with distinctively different food choices, and it has been suggested that people who choose food consistent with fat reduction make more conscious food choices that result in a more healthful diet (Lee et al., 1998; Peterson et al., 1999).

Fluid milk has provided the consumer lower fat milk options for many years and is an integral part of the American diet. One popular strategy to lower the intake of dietary fat is the use of reduced-fat or skim milk in place of whole milk in the diet. In 1994, consumption of milk and milk products contributed about 12 percent of total fat and 6 percent of saturated fat to the U.S. food supply (Gerrior & Bente, 1997). Of this, whole milk (with a 38-percent share of the market) contributed 2.0 percent of the total fat and 3.8 percent of the saturated fat; reduced-fat and skim milks combined (62-percent share) contributed 1.5 percent of the total fat and 2.8 percent of the saturated fat (Gerrior & Bente, 1997).

Milk and milk products also make important nutrient contributions to the diet. Along with providing high-quality protein, they are good sources of vitamins (A, D, B_{12}, and riboflavin) and minerals (calcium, phosphorus, magnesium, potassium, and zinc). Studies examining the effect of lower fat food choices on the nutritional profiles of the diet reported that adults who drank skim milk had significantly higher intakes of vitamin A, vitamin $B_{6,}$ and magnesium, compared with users of higher fat milk (Peterson et al., 1999; Wirfalt & Jeffery, 1997).

Understanding the effect of the use of milks on intakes of micronutrients and dietary fiber is important—considering the valuable nutrient contributions of fluid milk, its possible role in lowering the risk of osteoporosis, and the decreasing trend in consumption of fluid milk by Americans (Gerrior, Putnam & Bente, 1998). The purpose of this study was to evaluate the intakes of vitamins, minerals, and dietary fiber by Americans, 2 years and older, who drink different types of milk.[2]

Survey and Methods

This study used data from the CSFII, conducted by the U.S. Department of Agriculture (USDA) between 1989 and 1991 with a national stratified sample of 15,128 individuals residing in the 48 conterminous States and Washington, DC. Persons who were living away from home or in institutions were ineligible. The stratification took into account geographic location, degree of urbanization, and socioeconomic considerations. The survey used 1-day 24-hour recalls from an in-person interview and a 2-day dietary record. Detailed methods of the survey were published previously (Tippett et al., 1995). The present study used basic- or all-income data from respondents, aged 2 years and older, with a complete 3-day dietary intake. Excluded from the analysis were respondents who reported no food intake. The nutrient database used to

[1]The term "reduced fat" as used in this paper includes reduced-fat milk (2%) and lowfat milk (1%).

[2]For a report on energy compensation, energy-yeilding nutrient intakes, and food-group intakes by consumers of different types of milk in the present study population, see Peterson et al. (1999).

Table 1. Mean intakes of vitamins by males, by age and milk type[1]

Age and milk type	Vitamin A (RE)	Carotene (RE)	Vitamin E (alpha-TE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin B_6 (mg)	Folate (μg)	Vitamin B_{12} (μg)	Vitamin C (mg)
≥2 years										
Whole	1004[a]	390[a]	0.87[a]	1.72[a]	2.13[a]	23.1[a]	1.82[a]	272[a]	6.00[a]	91[a]
	(41)	(27)	(0.24)	(0.03)	(0.04)	(0.4)	(0.03)	(6)	(0.27)	(2)
Reduced-fat	1246[b]	476[b]	9.77[b]	1.79[b]	2.31[b]	24.6[b]	2.02[b]	307[b]	6.10[a]	104[b]
	(35)	(24)	(0.36)	(0.03)	(0.04)	(0.4)	(0.04)	(7)	(0.22)	(3)
Skim	1375[b]	579[c]	10.05[b]	1.82[b]	2.20[ab]	24.9[b]	2.10[b]	330[c]	6.29[a]	125[c]
	(113)	(54)	(0.7)	(0.07)	(0.08)	(0.9)	(0.08)	(14)	(0.95)	(6)
20 - 50 years										
Whole	1036[a]	460[a]	8.78[a]	1.83[a]	2.20[a]	26.1[a]	2.96[a]	280[a]	6.14[a]	90[a]
	(61)	(49)	(0.40)	(0.05)	(0.07)	(0.7)	(0.06)	(11)	(0.27)	(4)
Reduced-fat	1193	436[a]	10.60[b]	1.92[a]	2.44[b]	27.5[a]	2.18[b]	318[ab]	6.70[a]	99[b]
	(50)	(33)	(0.64)	(0.05)	(0.07)	(0.7)	(0.06)	(11)	(0.37)	(4)
Skim	1231[b]	480[a]	11.75[b]	2.06[a]	2.43[ab]	27.7[a]	2.23[b]	356[b]	5.95[a]	128[c]
	(79)	(66)	(1.16)	(0.12)	(0.12)	(1.4)	(0.12)	(22)	(0.37)	(11)
51 - 64 years										
Whole	1186[a]	598[a]	8.66[a]	1.66[a]	2.00[a]	23.0[a]	1.83[a]	266[a]	0.03[a]	81[a]
	(148)	(134)	(0.98)	(0.09)	(0.12)	(1.2)	(0.09)	(11)	(0.54)	(6)
Reduced-fat	1437[b]	709[b]	11.20[b]	1.76[a]	2.14[a]	25.9[a]	2.17[b]	324[b]	6.05[a]	118[b]
	(105)	(85)	(1.09)	(0.07)	(0.08)	(0.8)	(0.09)	(18)	(0.41)	(8)
Skim	1329[b]	578[ab]	9.16[ab]	1.65[a]	2.00[a]	24.5[a]	2.14[b]	326[b]	5.78[a]	129[b]
	(146)	(110)	(1.52)	(0.10)	(0.12)	(1.3)	(0.14)	(27)	(0.63)	(13)
≥65 years										
Whole	1386[a]	423[a]	7.39[a]	1.63[a]	2.04[a]	21.6[a]	1.83[a]	290[a]	8.85[a]	89[a]
	(227)	(41)	(0.52)	(0.07)	(0.12)	(0.8)	(0.09)	(15)	(2.21)	(6)
Reduced-fat	1663[a]	708[b]	11.31[b]	1.87[b]	2.28[a]	24.6[b]	2.19[a]	344[b]	7.01[a]	126[b]
	(132)	(61)	(1.19)	(0.08)	(0.12)	(1.0)	(0.11)	(21)	(0.93)	(13)
Skim	2120[a]	996[b]	9.78[ab]	1.64[ab]	2.15[a]	22.6[ab]	2.15[a]	333[b]	9.70[a]	134[b]
	(528)	(165)	(1.11)	(0.10)	(0.23)	(1.6)	(0.16)	(27)	(4.96)	(10)

[1]Standard error of mean in parentheses. For each vitamin, values with different superscript letters in the same age group are significantly different at $p \leq 0.05$.
Source: USDA's Continuing Survey of Food Intakes by Individuals (CSFII), 1989-91, 3-day intake data.

estimate intakes of various nutrients was developed by the USDA for use in this survey by using the USDA National Nutrient Data Base for Standard Reference and the USDA Nutrient Data Bank (1992). Data were weighted to reflect the general population.

Each gender was placed in one of five groups based on its milk consumption: no milk, whole milk, reduced-fat milk, skim milk, and mixed milk. Each group was also placed in a category based on age: 2 to 5 years (representing toddlers and preschoolers), 6 to 11 years (schoolchildren), 12 to 19 years (teenagers), 20 to 50 years (adults), 51 to 64 years (middle aged), and 65 years and older (elderly). Intakes of food groups by people who drank whole, reduced-fat, and skim milk were previously reported (Lee et al., 1998).

Statistical Analysis

We calculated estimates of the mean and standard error of the means (SEMs) by using Survey Data Analysis (SUDAAN), a statistical program designed for complex, stratified sampling that is used to collect survey data (Shah, Barnwell, Hunt & LaVange, 1991). SUDAAN is recommended by USDA for statistical tests of significance on weighted data from its surveys (USDA, 1989). We also used Statistical Analysis Software (SAS) to analyze the data (SAS Institute, Inc., 1990). If the *F* test, by analysis of variance (ANOVA), showed a significant difference, Scheffe's *t* test (Scheffe, 1953) was used for pair-wise comparisons between groups at the 5-percent, two-tailed probability level. The resulting comparisons between the no-milk group or the mixed-milk group and the other milk groups showed inconsistent and insignificant differences. Therefore, this paper reports only the comparisons among three groups of milk drinkers: whole milk, reduced-fat milk, and skim milk.

Table 2. Mean intakes of vitamins by females, by age and milk type[1]

Age and milk type	Vitamin A (RE)	Carotene (RE)	Vitamin E (alpha-TE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin B_6 (mg)	Folate (μg)	Vitamin B_{12} (μg)	Vitamin C (mg)
≥2 years										
Whole	818[a]	336[a]	6.17[a]	1.34[a]	1.67[a]	17.8[a]	1.45[a]	222[a]	4.26[a]	83[a]
	(26)	(16)	(0.12)	(0.02)	(0.03)	(0.2)	(0.02)	(4)	(0.17)	(2)
Reduced-fat	983[b]	411[b]	6.77[b]	1.31[a]	1.69[b]	18.1[b]	1.50[b]	231[b]	4.28[a]	86[b]
	(22)	(15)	(0.16)	(0.02)	(0.02)	(0.2)	(0.02)	(4)	(0.14)	(2)
Skim	1241[c]	670[c]	8.11[c]	1.40[b]	1.68[ab]	19.6[c]	1.69[c]	270[c]	4.10[a]	105[c]
	(71)	(66)	(0.49)	(0.04)	(0.04)	(0.5)	(0.05)	(9)	(0.17)	(4)
20 - 50 years										
Whole	816[a]	343[a]	6.58[a]	1.32[a]	1.59[a]	18.5[a]	1.43[a]	213[a]	4.55[a]	80[a]
	(52)	(26)	(0.23)	(0.03)	(0.05)	(0.4)	(0.04)	(7)	(0.40)	(3)
Reduced-fat	946[b]	391[b]	7.11[a]	1.31[a]	1.68[b]	19.0[a]	1.49[a]	228[a]	4.41[a]	82[ab]
	(32)	(23)	(0.26)	(0.03)	(0.03)	(0.4)	(0.03)	(6)	(0.26)	(3)
Skim	1152[c]	591[c]	8.30[b]	1.43[b]	1.70[b]	19.7[b]	1.93[b]	261[b]	4.16[a]	95[b]
	(20)	(117)	(0.57)	(0.05)	(0.06)	(0.6)	(0.13)	(12)	(0.22)	(6)
51 - 64 years										
Whole	887[a]	425[a]	5.46[a]	1.26[a]	1.46[a]	17.2[a]	1.38[a]	217[a]	4.15[a]	87[a]
	(71)	(59)	(0.27)	(0.05)	(0.05)	(0.7)	(0.06)	(12)	(0.42)	(93)
Reduced-fat	1092[b]	534[a]	6.96[ab]	1.31[a]	1.57[ab]	19.1[b]	1.59[b]	245[a]	4.29[a]	93[a]
	(64)	(41)	(0.40)	(0.04)	(0.06)	(0.6)	(0.07)	(10)	(0.26)	(5)
Skim	1450[c]	780[b]	9.00[b]	1.47[a]	1.80[b]	21.5[c]	1.93[c]	307[b]	4.91[a]	128[b]
	(151)	(127)	(1.65)	(0.12)	(0.12)	(1.2)	(0.14)	(28)	(0.53)	(12)
≥65 years										
Whole	958[a]	513[a]	5.91[a]	1.20[a]	1.47[a]	15.6[a]	1.36[a]	217[a]	3.62[a]	84[a]
	(67)	(60)	(0.30)	(0.04)	(0.04)	(0.4)	(0.04)	(8)	(0.24)	(5)
Reduced-fat	1134[b]	531[a]	7.09[ab]	1.28[ab]	1.60[b]	17.4[b]	1.56[b]	241[b]	4.70[a]	100[b]
	(56)	(30)	(0.37)	(0.03)	(0.04)	(0.5)	(0.05)	(7)	(0.42)	(4)
Skim	1349[b]	850[b]	7.58[b]	1.30[b]	1.54[ab]	18.1[b]	1.63[b]	266[b]	3.30[a]	111[b]
	(102)	(93)	(0.60)	(0.05)	(0.17)	(0.7)	(0.07)	(14)	(0.20)	(7)

[1]Standard error of mean in parentheses. For each vitamin, values with different superscript letters in the same age group are significantly different at $p \leq 0.05$.
Source: USDA's Continuing Survey of Food Intakes by Individuals (CSFII), 1989-91, 3-day intake data.

Results

Study Population

Fifty-six percent of the study population (n=10,759) were females. Over the 3-day period, about one-third of the population consumed whole milk (34 percent) or reduced-fat milk (31 percent); 7 percent, skim milk; 9 percent, mixed types of milk; and 19 percent, no milk. Generally, fewer people drank milk as their age increased. Compared with other age groups, the 20- to 50-year-old group was more likely not to drink milk; toddlers and preschoolers were more likely to drink whole milk. The consumption of skim milk increased for older children, indicating a shift in preference from whole milk to lower fat milks in the older age groups. A detailed description and analysis of the study population were reported previously (Lee et al., 1998).

Intakes of Fat-Soluble Vitamins

For both the males and females (age 2 and older), intakes of vitamins A and E and carotene were highest among those who drank skim milk, followed by those who drank reduced-fat milk, and then whole milk (tables 1 and 2). For males, the difference in intakes of these fat-soluble vitamins and carotene was significantly different between those who drank whole milk and those who drank reduced-fat milk or skim milk. For females, the difference was statistically significant between those who drank whole milk, compared with reduced-fat or skim milk, as well as between those who drank reduced-fat milk versus skim milk. Analysis of possible gender differences showed that for both genders the significant difference in fat-soluble vitamins among the various groups of milk drinkers occurred mostly in the adult groups (ages 20 and older).

Intakes of Water-Soluble Vitamins

For both males and females, ages 2 and older, intakes of niacin, vitamin B_6, folate, and vitamin C were significantly lower for those who drank whole milk than for those consuming reduced-fat and skim milk (tables 1 and 2). Intakes of these four nutrients by females as well as intakes of folate and vitamin C by males were significantly lower for those drinking reduced-fat milk than for

Table 3. Mean intakes of minerals by males and females age 2 and over, by milk type[1]

Gender and type of milk consumed	Calcium (mg)	Phosphorus (mg)	Magnesium (mg)	Iron (mg)	Zinc (mg)	Copper (mg)	Potassium (mg)	Sodium (mg)
Males								
Whole	905[a]	1362[a]	266[a]	15.3[a]	12.5[a]	1.19[a]	2694[a]	3650[a]
	(21)	(25)	(5)	(0.3)	(0.3)	(0.04)	(46)	(65)
Reduced-fat	982[b]	1415[b]	292[b]	16.7[b]	13.2[b]	1.27[b]	2877[b]	3619[a]
	(16)	(18)	(4)	(0.3)	(0.4)	(0.02)	(42)	(53)
Skim	969[b]	1446[b]	310[c]	16.9[b]	12.9[ab]	1.37[c]	3076[c]	3646[a]
	(36)	(44)	(9)	(0.7)	(0.5)	(0.05)	(84)	(176)
Females								
Whole	717[a]	1052[a]	211[a]	1.8[a]	9.1[a]	0.92[a]	2160[a]	2683[a]
	(13)	(15)	(3)	(0.2)	(0.1)	(0.01)	(27)	(41)
Reduced-fat	745[ab]	1059[a]	229[b]	12.6[b]	9.1[a]	0.99[b]	2237[b]	2457[b]
	(11)	(12)	(3)	(0.2)	(0.1)	(0.01)	(26)	(29)
Skim	756[b]	1105[b]	253[c]	13.6[c]	9.8[b]	1.09[c]	2482[c]	2376[b]
	(20)	(21)	(6)	(0.5)	(0.3)	(0.03)	(46)	(59)

[1]Standard error of mean in parentheses. For each mineral, values with different superscript letters in the same gender group are significantly different at $p \leq 0.05$.
Source: USDA's Continuing Survey of Food Intakes by Individuals (CSFII), 1989-91, 3-day intake data.

those drinking skim milk. Intakes of thiamin were also significantly lower for the males who drank whole milk, compared with males who drank reduced-fat or skim milk; the same was the case for females who drank whole milk or reduced-fat milk, compared with females who drank skim milk (tables 1 and 2).

The analysis of the age groups revealed that the significant difference in intakes of water-soluble vitamins according to milk type occurred among adult age groups for both males and females (tables 1 and 2). Intakes of water-soluble vitamins (including thiamin, riboflavin, niacin, vitamin B_6, folate, vitamin B_{12}, and vitamin C) were significantly lower for those who drank whole milk, compared with those who drank reduced-fat or skim milk. This finding was consistent for most adult male and female age groups (20 years and older), but not for younger age groups (data not shown). For male age groups, intakes of water-soluble vitamins between consumers of reduced-fat and skim milk were not significantly different. However, for certain female age groups, intakes of several vitamins, including niacin, folate, vitamin B_6, and vitamin C, were significantly greater for consumers of skim milk, compared with reduced-fat milk.

Intakes of Minerals

For both genders, ages 2 and older, consumers of whole milk, compared with consumers of reduced-fat milk or skim milk, had significantly lower intakes of all the minerals analyzed, except for sodium for males and zinc for females (table 3). Sodium intake was not significantly different based on the types of milk consumed by males but was significantly reduced for females who drank lower fat milk.

In the same age category (ages 2 and older), intakes of the minerals magnesium, copper, and potassium were significantly lower for males who drank reduced-fat milk, compared with males who drank skim milk (table 3). However, among females, intakes of all the dietary essential minerals studied, except for sodium, were significantly lower among those consuming whole milk, compared with those drinking skim milk. These significant increases in intakes of minerals by those drinking skim milk, compared with those drinking higher fat milk, occurred mostly in the adult age groups (ages 20 and older) of females (table 3).

Intakes of Dietary Fiber

Those ages 2 and older who drank whole milk had significantly lower intakes of dietary fiber than their counterparts who drank reduced-fat or skim milk (table 4). This significantly lower intake in dietary fiber by individuals of both sexes who drank whole milk occurred in two adult age groups (adult and elderly) but not in younger age groups. For several age groups, including elderly males as well as adult and elderly females, those who drank reduced-fat milk had significantly lower intakes of dietary fiber, compared with those who drank skim milk.

. . . people who drank reduced-fat or skim milk had significantly greater mean intakes of fat-soluble vitamins and carotene, water-soluble vitamins, minerals (except sodium), and dietary fiber, compared with people who drank whole milk.

Table 4. Mean intake of dietary fiber (in grams) by males and females, by age and type of milk consumed[1]

Age and milk type	Male	Female
≥2 yrs		
Whole	14.2[a]	11.3[a]
	(0.3)	(0.2)
Reduced-fat	15.7[b]	12.1[b]
	(0.3)	(0.2)
Skim	18.0[c]	14.5[c]
	(0.7)	(0.4)
2-5 yrs		
Whole	8.0	8.3
	(0.3)	(0.3)
Reduced-fat	10.0	9.2
	(0.5)	(0.4)
Skim	9.8	9.9
	(1.1)	(0.7)
20-50 yrs		
Whole	15.4	11.3[a]
	(0.5)	(0.3)
Reduced-fat	17.1	12.0[b]
	(0.5)	(0.3)
Skim	19.2	14.1[c]
	(1.2)	(0.6)
≥65 yrs		
Whole	14.9[a]	11.3[a]
	(0.7)	(0.4)
Reduced-fat	17.9[b]	13.2[b]
	(0.6)	(0.4)
Skim	20.3[c]	14.9[c]
	(1.5)	(0.6)

[1]Standard error of mean in parentheses. Values with different superscript letters in the same gender-age groups are significantly different at $p \leq 0.05$.

Source: USDA's Continuing Survey of Food Intakes by Individuals (CSFII), 1989-91, 3-day intake data.

Percentage of the 1989 Recommended Dietary Allowances Met

For males and females, intakes of vitamins by those ages 2 and older met or exceeded the 1989 RDAs (National Academy of Sciences, 1989). The exceptions were vitamin E for both men and women, and vitamin B_6 for women only (table 5). For vitamins in general, people who drank reduced-fat and skim milk met a greater percentage of the RDAs than did people who drank whole milk, exceeding 100 percent of the RDAs. Compared with others, those drinking skim milk also met at least 100 percent of the RDAs for vitamins E and B_6, reflecting higher intakes of these nutrients. Interestingly, those who drank whole milk met a greater percentage of RDA for vitamin B_{12} , compared with those who drank lower fat milk.

Males 2 years and older met or exceeded the RDAs for some of the minerals studied: calcium, phosphorus, and iron. They generally met the RDA for magnesium but failed to meet 100 percent of the RDA for zinc (table 6). Females 2 years and older exceeded the RDA for phosphorus only—thus failing to meet 100 percent of the RDAs for zinc, calcium, or magnesium for all three milk categories. Iron intake was below 100 percent of the RDA for women drinking whole milk but exceeded the RDA for those drinking reduced-fat and skim milk. In general, when people drank reduced-fat and skim milk, they met a significantly higher percentage of the RDAs for calcium, phosphorous, and iron than did people who drank whole milk.

Discussion

Our results indicate that the choice of milk people consumed significantly affects their intakes of essential micronutrients. In general, compared with people who drank whole milk, those who drank reduced-fat and skim milk had significantly higher intakes of fat-soluble vitamins (A, E, and carotene[3]), water-soluble vitamins (thiamin, riboflavin, niacin, vitamin B_6, folate, vitamin B_{12}, and vitamin C), minerals (calcium, phosphorus,

[3]Carotene is the precursor to vitamin A. Although not technically a vitamin, it is often measured as a predictor of vitamin A availability or activity.

Table 5. Vitamin intake as a percentage of Recommended Dietary Allowances by males and females age 2 and over, by type of milk consumed[1]

Gender and milk type	Vitamin A	Vitamin E	Thiamin	Riboflavin	Niacin	Vitamin B_6	Folate	Vitamin B_{12}	Vitamin C
Male									
Whole	113[a]	84[a]	135[a]	145[a]	140[a]	103[a]	179[a]	345[a]	165[a]
	(3)	(2)	(2)	(2)	(2)	(1)	(3)	(11)	(3)
Reduced-fat	139[b]	103[b]	103[a]	155[b]	148[b]	111[b]	191[a]	337[a]	187[b]
	(3)	(3)	(2)	(2)	(2)	(1)	(3)	(8)	(4)
Skim	143[b]	102[b]	137[a]	144[ab]	148[b]	109[b]	178[a]	323[a]	213[c]
	(8)	(5)	(3)	(4)	(3)	(3)	(5)	(34)	(7)
Female									
Whole	112[a]	80[a]	130[a]	137[a]	129[a]	99[a]	164[a]	255[a]	152[a]
	(3)	(1)	(1)	(2)	(1)	(1)	(3)	(7)	(3)
Reduced-fat	129[b]	86[b]	125[b]	136[a]	129[a]	98[a]	150[a]	236[b]	150[a]
	(2)	(1)	(1)	(1)	(1)	(1)	(2)	(5)	(2)
Skim	155[c]	100[c]	133[a]	134[a]	139[b]	106[b]	154[a]	209[b]	176[b]
	(6)	(4)	(3)	(2)	(2)	(2)	(4)	(6)	(5)

[1]Standard error of mean in parentheses. For each micronutrient, values with different superscript letters in the same gender are significantly different at $p \leq 0.05$.
Source: USDA's Continuing Survey of Food Intakes by Individuals (CSFII), 1989-91, 3-day intake data.

magnesium, iron, zinc, copper, and potassium), and dietary fiber. People consuming skim milk had the most favorable profiles regarding the intakes of micronutrients. These findings are consistent with previous reports.

Peterson et al. (1999) evaluated fat-reduction strategies and subsequent micronutrient intakes and reported that, compared with users of higher fat milk, men and women who used skim milk exclusively had improved intakes of vitamin A, vitamin B_6, and magnesium. Only females who used skim milk exclusively had improved intakes of vitamin E, iron, calcium, and zinc. Another study (Wirfalt & Jeffery, 1997) showed that users of skim milk, rather than nonusers, had higher intakes of dietary fiber, calcium, vitamin C, iron, and vitamin A. In our study, the differences in micronutrient intakes among those consuming different types of milk were more obvious among females than among males. The analysis based on people's age revealed that the statistical significance in intakes of micronutrients among those drinking different types of milk occurred among adults ages 20 and older.

Studying the same population as used here, Lee et al. (1998) reported that those who drank reduced-fat milk consumed more fruits, vegetables, and seasoning fats and oils. The observed favorable intake of micronutrients and dietary fiber by people who drank reduced-fat milk is likely linked to the larger amounts of total vegetables and fruits consumed by those who drank reduced-fat and skim milk, compared with their counterparts who drank whole milk (table 1). This increased consumption of vegetables and fruits by people who drank lower fat milk may have contributed to the significantly higher intakes of vitamins C, folate, magnesium, iron, potassium, copper, and dietary fiber in the diets of those who drank reduced-fat and skim milk. Also, the higher intakes of vitamin E-rich seasoning fats and the use of margarine and reduced-fat and skim milk (fortified with vitamin A) may have contributed to the improved intakes of vitamins E and A.

The results of the present study and previously reported studies (Peterson et al., 1999; Wirfalt & Jeffery, 1997) suggest that the use of skim milk could be a simple indicator of a healthful diet. Basically, Americans who drink skim milk appear to be making additional conscious food choices that reflect a concern for fat intake and an interest in a varied and balanced diet. The improved micronutrient profile, significantly lower intakes of red meat, and significantly higher intakes of vegetables and fruit by those who drank skim milk indicate two things: (1) a tendency to select more healthful food items and (2) a likelihood of having food intake patterns closer to dietary guidance (Gorbach et al., 1990; Peterson et al., 1999; Subar et al., 1994).

Dietary intake status for zinc has been considered a potential health issue in the United States (Federation of American Societies for Experimental Biology, 1995). For each type of milk drinker, 2 years old and older, intake of dietary zinc was at 77 to 93 percent of the RDA (table 6). Data from the

Table 6. Mineral intake as a percentage of Recommended Dietary Allowances by males and females age 2 and over, by type of milk consumed[1]

Gender and milk type	Calcium	Phosphorus	Magnesium	Iron	Zinc
Male					
Whole	103[a]	155[a]	99[a]	149[a]	90[a]
	(2)	(2)	(1)	(2)	(2)
Reduced-fat	112[b]	163[b]	104[b]	163[b]	93[b]
	(1)	(2)	(1)	(2)	(2)
Skim	115[b]	171[b]	96[a]	168[b]	88[ab]
	(3)	(3)	(2)	(5)	(2)
Female					
Whole	80[a]	118[a]	96[a]	94[a]	78[a]
	(1)	(1)	(2)	(1)	(1)
Reduced-fat	86[b]	123[b]	94[a]	101[b]	77[a]
	(1)	(1)	(1)	(1)	(1)
Skim	89[b]	130[c]	93[a]	111[c]	81[a]
	(2)	(2)	(2)	(3)	(2)

[1]Standard error of mean in parentheses. For each micronutrient, values with different superscript letters in the same gender are significantly different at $p \leq 0.05$.
Source: USDA's Continuing Survey of Food Intakes by Individuals (CSFII), 1989-91, 3-day intake data.

People consuming skim milk had the most favorable profiles regarding the intakes of micronutrients.

USDA's CSFII 1989-91 indicate that women and men consumed only 75 and 89 percent, respectively, of the RDA for zinc. The population needs to be encouraged to choose foods high in bioavailability and content of zinc. These foods include red meats (beef, pork, and veal), poultry, oysters, and dairy products. Fish, cereal, whole grain products, legumes, and beans have less zinc content. Also, the presence of phytates in whole grains negatively affects its bioavailability (Bosscher et al., 2001).

Vitamin E intake was lower for people who consumed whole milk, compared with those who consumed reduced-fat or skim milk. As previously reported, those who drank reduced-fat and skim milk consumed significantly higher amounts of seasoning fats and oils, which we believe are linked to the higher intakes of vitamin E, as found in this study (Lee et al., 1998). Nevertheless, males and females who drank whole milk as well as females who drank reduced-fat milk met only 80 to 86 percent of the RDA for vitamin E—a finding that indicates that vitamin E needs to be targeted in U.S. nutrition education efforts. Foods rich in vitamin E are vegetable oils, dark-green leafy vegetables, nuts, whole grain cereals, fortified cereals, and eggs.

Calcium intake is considered a current public health concern. Recent findings indicate that food selection practices in the United States make it difficult to meet calcium needs without having milk and milk products in the daily diet (Gerrior et al., 1998). The present study shows that calcium intake needs to improve among all people, regardless of the type of milk consumed. Consuming adequate amounts of lower fat milk and dairy products—such as skim milk or nonfat yogurt—that are as high or higher in calcium as whole milk (Gerrior et al., 1998) could be a good means for improving the intake of dietary calcium. These findings indicate that a lower fat diet does not necessarily ensure a nutritionally optimal diet. These findings also emphasize the importance

of a balanced diet—one that follows the guidance of the *Dietary Guidelines for Americans* and the *Food Guide Pyramid*.

Additional studies, with more recent data, that include a focus on greater variety of fat-modified food products are needed to better understand how Americans incorporate reduced-fat foods into their diets and how these food choices affect nutritional status. This understanding is necessary to target more effective nutrition education efforts that improve diet quality and the overall health of Americans.

Limitations

Survey Data

The data used in this study, as with any survey data, should be interpreted with appropriate care. Dietary surveys are subject to nonresponse errors, respondent errors (such as underreporting), coding and processing errors, and limitation of nutrient data. For example, the individuals included in the 1989-91 CSFII sample may not be representative of the general U.S. population. Also, compared with other days, fewer CSFII interviews were conducted on Sunday. Thus, percentages of acceptable dietary forms collected were lower for Saturday (day-1 recall), Sunday (day-2 record), and Monday (day-3 record). Weighting survey results can reduce the potential for nonresponse bias. We weighted the results of this study, and we included the interview data as a control variable. The nutrient database developed for the CSFII and used for our study reflected up-to-date nutrient information at the time the CSFII was conducted. Also, most of its nutrient values included in the database are supported by laboratory analyses, but analytical data are not always available. Hence, values are sometimes imputed.

RDA versus DRI

Adopted by the Food and Nutrition Board of the Institute of Medicine, Dietary Reference Intakes (DRIs) represent the new approach to providing quantitative estimates of nutrient intakes for use in a variety of settings. Hence, the DRIs replace and expand on the past 50 years of periodic updates and revisions of the RDAs. The DRIs differ in amounts and age categories from the 1989 RDAs. Along with the RDA category, the DRIs include three new categories of reference values: Adequate Intake (AI), the Estimated Average Requirement (EAR), and the Tolerable Upper Level (UL) (Yates, Schlicker & Suitor, 1998).

This study does not use the DRIs in the calculation of nutrient intakes and nutrient analysis. Until expert guidance is published by the Food and Nutrition Board regarding the use of the appropriate DRI category for assessing the diets of individuals in large-scale dietary surveys, USDA continues to use the 1989 RDAs to analyze nutrients. While the DRIs are published for the bone-related nutrients (calcium, phosphorus, magnesium, vitamin D, and fluoride) and are available for the B vitamins (folate, pantothenic acid, biotin, and choline), DRIs for other nutrients have not been released. Thus for consistency in reporting of micronutrient intakes and evaluating nutrient status, we used the 1989 RDAs.

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Expenditures on Children by Families, 2000

Mark Lino, PhD
U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

Since 1960 the U.S. Department of Agriculture has provided estimates of expenditures on children from birth through age 17. This article presented the most recent estimates for husband-wife and single-parent families. Data were from the 1990-92 Consumer Expenditure Survey. The Consumer Price Index was used to update income and expenditures to 2000 dollars. Data and methods used in calculating child-rearing expenses were described and estimates were provided for major components of the budget by age of the child, family income, and region of residence. Expenses on the younger child in a two-child, husband-wife household for the overall United States averaged $6,280 to $14,260 in 2000, depending on the child's age and family income group. Adjustment factors for number of children in the household were also provided. Results of this study can be used in developing State child support guidelines and foster care payments and in developing family educational programs.

Since 1960 the U.S. Department of Agriculture (USDA) has provided estimates of expenditures on children from birth through age 17. These estimates are used in setting child support guidelines and foster care payments and in developing educational programs on parenthood. This study presents the latest child-rearing expense estimates, which are based on 1990-92 expenditure data that have been updated to 2000 dollars. The study presents these new estimates for husband-wife and single-parent families. It briefly describes the data and methods used in calculating child-rearing expenses[1] and then discusses the estimated expenses.

The estimates are provided for the overall United States. The child-rearing expense estimates for husband-wife families are also provided for urban areas in four regions (Northeast, South, Midwest, and West) and rural areas throughout the United States[2] to adjust partially for price differentials and varying patterns of expenditures. For single-parent families, estimates are provided for the overall United States only because of limitations in the sample size. Expenditures on children are estimated for the major budgetary components: housing, food, transportation, clothing, health care, child care and education, and miscellaneous goods and services. The box on p. 26 describes each expenditure component.

[1]The *Expenditures on Children by Families: 2000 Annual Report* provides a more detailed description of the data and methods. To obtain a copy, contact USDA, Center for Nutrition Policy and Promotion, 3101 Park Center Drive, Room 1034, Alexandria, VA 22302 (telephone: 703-305-7600).

[2]Urban areas are defined as Metropolitan Statistical Areas (MSA's) and other places of 2,500 or more people outside an MSA; rural areas are places of less than 2,500 people outside an MSA.

Categories of Household Expenditures

Housing expenses consists of shelter (mortgage interest, property taxes, or rent; maintenance and repairs; and insurance), utilities (gas, electricity, fuel, telephone, and water), and house furnishings and equipment (furniture, floor coverings, major appliances, and small appliances). For homeowners, housing expenses do not include mortgage principal payments; in the Consumer Expenditure Survey, such payments are considered to be part of savings. So, total dollars allocated to housing by homeowners are underestimated in this report.

Food expenses consists of food and nonalcoholic beverages purchased at grocery, convenience, and specialty stores, including purchases with food stamps; dining at restaurants; and household expenditures on school meals.

Transportation expenses consists of the net outlay on the purchase of new and used vehicles, vehicle finance charges, gasoline and motor oil, maintenance and repairs, insurance, and public transportation.

Clothing expenses consists of children's apparel such as diapers, shirts, pants, dresses, and suits; footwear; and clothing services such as dry cleaning, alterations and repair, and storage.

Health care expenses consists of medical and dental services not covered by insurance, prescription drugs and medical supplies not covered by insurance, and health insurance premiums not paid by the employer or other organization.

Child care and education expenses consists of day care tuition and supplies; baby-sitting; and elementary and high school tuition, books, and supplies.

Miscellaneous expenses consists of personal care items, entertainment, and reading materials.

Data

The 1990-92 Consumer Expenditure Survey (CE) is used to estimate expenditures on children. Administered by the Bureau of Labor Statistics (BLS), the CE collects information on socio-demographic characteristics, income, and expenditures of households. The CE, conducted annually since 1980, interviews about 5,000 households each quarter over a 1-year period. Each quarter is deemed an independent sample by BLS; thus, the total number of households in the 1990-92 survey is about 60,000.

Husband-wife and single-parent families were selected from these households for this study if (1) they had at least one child of their own—age 17 or under—in the household, (2) they had six or fewer children, (3) they had no other related or unrelated people present in the household except their own children, and (4) they were complete income reporters.[3] Quarterly expenditures were annualized.

The sample consisted of 12,850 husband-wife households and 3,395 single-parent households. BLS weighting methods were used to weight the sample to reflect the U.S. population of interest. Although based on 1990-92 data, the expense estimates were updated to 2000 dollars by using the Consumer Price Index (CPI-U). (Expenditure and income data for 1990 and 1991 were first converted to 1992 dollars; then, all 3 years of data were updated to 2000 dollars.)

[3]Complete income reporters are households that provide values for major sources of income, such as wages and salaries, self-employment income, and Social Security income.

Methods

The CE collects overall *household* expenditure data for some budgetary components (housing, food, transportation, health care, and miscellaneous goods and services) and *child-specific* expenditure data for other components (clothing, child care, and education). Multivariate analysis was used to estimate household and child-specific expenditures. Income level, family size, and age of the younger child were controlled so that estimates could be made for families with these varying characteristics. Regional estimates were derived by controlling for region. The three income groups of husband-wife households were determined by dividing the sample for the overall United States into equal thirds: before-tax income under $31,000, between $31,000 and $52,160, and over $52,160 in 1992 dollars.

For each income level, the estimates were for husband-wife families with two children. The younger child was in one of six age categories: 0-2, 3-5, 6-8, 9-11, 12-14, and 15-17. Households with four members (two children) were selected as the standard because in 1990-92 this was the average household size of two-parent families. The focus was on the younger child in a household because the older child was sometimes over age 17.

The estimates are based on CE interviews of households with and without specific expenses; so for some families, expenditures may be higher or lower than the mean estimates, depending on whether they incur the expense. This applies particularly to child care and education for which about 50 percent of families in the study had no expenditure. Also, the estimates cover out-of-pocket expenditures on children made by the parents only and not by others, such as grandparents or friends. For example, the value of clothing gifts to children from grandparents would not be included in clothing expenses.

Regional income categories were based on the national income categories in 1992 dollars that were updated to 2000 dollars by using regional CPI's. The regional income categories were not divided into equal thirds for each region as was done for the overall United States.

After the various overall household and child-specific expenditures were estimated, these total amounts were allocated among the four family members (husband, wife, older child, and younger child). The estimated expenditures for clothing and child care and education were for children only. It was assumed that these expenses were allocated equally to each child; therefore, the estimated expenditures were divided by two (the number of children in the household).

Because the CE did not collect expenditures on food and health care by family member, data from other Federal studies were used to apportion these budgetary components to children by age. Shares of the food budget as a percentage of total food expenditures—for the younger child in a husband-wife household with two children—were determined by using the 1994 USDA food plans (U.S. Department of Agriculture, 1994). These shares were estimated by age of the child and household income level. The food budget shares were then applied to estimated household food expenditures to determine food expenses on children. Shares of the health care budget as a percentage of total health care expenses for the younger child in a husband-wife household with two children were calculated from the 1987 National Medical Expenditure Survey (Lefkowitz & Monheit, 1991) . These shares were estimated by age of the child and applied to estimated household health care expenditures to determine expenses on children.

No research base exists for allocating estimated household expenditures on housing, transportation, and miscellaneous goods and services among household members. The marginal cost method and the per capita method are two of the most common approaches for allocating these expenses.

The marginal cost method measures expenditures on children as the difference in expenses between couples with children and equivalent childless couples. This method depends on development of an equivalency measure; however, there is no universally accepted measure. Proposed methods have produced different estimates of expenditures on children.[4]

Some of the marginal cost approaches assume that parents or couples do not alter expenditures on themselves after a child is added to a household. Also, couples without children often buy larger-than-needed homes at the time of purchase in anticipation of children. Comparing the expenditures of childless couples with expenditures of similar couples that have children could lead to underestimated expenditures on children. Lastly, the marginal cost method does not provide a direct estimate of how much is spent on a child. It estimates how much money families with children must be compensated to bring the parents to the same utility level (as gauged by an equivalence scale) of couples without children. This is a different question from "how much do parents spend on children?"

For these reasons, the USDA uses the per capita method to allocate housing, transportation, and miscellaneous goods and services among household members. The per capita method allocates expenses among household members in equal proportions. Although the per capita method has limitations, these limitations were considered less severe than those of the marginal cost approach.

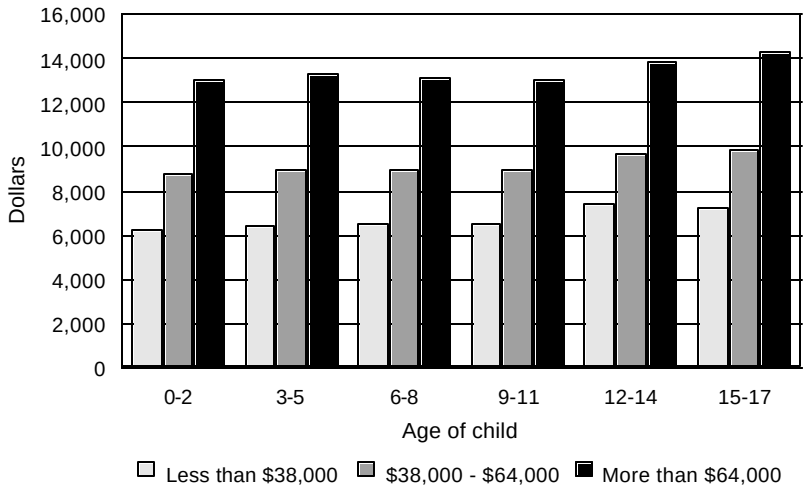
A major limitation of the per capita method is that expenditures for an additional child may be less than average expenditures. Consequently, for households of different sizes,

[4]For a review of equivalency measures and estimates of expenditures on children resulting from them, see U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, 1990, *Estimates of Expenditures on Children and Child Support Guidelines* (U.S. Department of Health and Human Services, 1990).

adjustment formulas were devised to estimate expenditures on one child or three or more children. These formulas are discussed later in the paper. Transportation expenses resulting from employment activities are not related to expenses on children, so these costs were excluded from the estimated household transportation expenses. Data used to estimate work-related transportation expenses were from a 1990 study by the U.S. Department of Transportation (1994).

Although the USDA uses the per capita approach rather than a marginal cost approach in allocating housing, transportation, and miscellaneous expenditures to children in a household, a USDA study examined how these expenses would be allocated using different marginal cost approaches (Lino & Johnson, 1995). These marginal cost approaches produced estimates of expenditures on children for housing and miscellaneous goods and services below those produced by the per capita method. In addition, these approaches produced estimates of transportation expenditures on children above those produced by the per capita method.

Figure 1. Estimated 2000 annual family expenditures on a child, by before-tax income level and age of child[1]



[1]U.S. average for the younger child in husband-wife families with children.

Estimated Expenditures on Children by Husband-Wife Households

Estimates of family expenditures on the younger child in husband-wife households with two children are presented in tables 2 through 7 on pp. 36-41. The estimates are for the overall United States, urban regions, and overall rural areas. Household income levels were updated to 2000 dollars by using the all-items category of the CPI-U, and expenditures were updated by using the CPI for the corresponding item (i.e., the CPI's for housing, food, etc.). Regional estimates were updated to 2000 dollars by using the regional CPI's. The following subsections highlight the child-rearing expense estimates for the younger child in a two-child household for the overall United States by income level, budgetary component, and age of the child. Child-rearing expenses by region are also discussed.

Income Level

Estimated expenses on children vary considerably by household income level (fig. 1). Depending on age of the child, the annual expenses range from $6,280 to $7,380 for families in the lowest income group (2000 before-tax income less than $38,000), from $8,740 to $9,860 for families in the middle-income group (2000 before-tax income between $38,000 and $64,000), and from $13,000 to $14,260 for families in the highest income group (2000 before-tax income more than $64,000). On average, households in the lowest group spend 28 percent of their before-tax income per year on a child; those in the middle-income group, 18 percent; and those in the highest income group, 14 percent. The range in these percentages would be narrower if after-tax income were considered, because a greater percentage of income in higher income households goes toward taxes.

Although families in the highest income group spend, on average, slightly less than twice the amount on a child than that spent by families in the lowest income group, the amount varies by budgetary component. In general, expenses on a child for goods and services considered to be necessities (e.g., food and clothing) do not vary as much as those considered to be discretionary (e.g., miscellaneous expenses) among households in the three income groups. For example, clothing expenses on a child age 15-17 average $670 in the lowest income group and $1,020 in the highest income group, a 52-percent difference. Miscellaneous expenses on a child of the same age average $640 in the lowest income group and $1,630 in the highest income group, a 155-percent difference.

Budgetary Component

Housing accounts for the largest share of total child-rearing expenses. The box on p. 30 shows this for families in the middle-income group. Based on an average for the six age groups, housing accounts for 33 to 36 percent of child-rearing expenses for a child; the percentage rises with income. Food is the second largest average expense on a child for families regardless of income level. It accounts for 20 percent of child-rearing expenses for a child in the lowest income group, 18 percent in the middle-income group, and 15 percent in the highest income group. Transportation, the third largest child-rearing expense, makes up 14 to 15 percent of child-rearing expenses across income levels.

Across the three income groups, miscellaneous goods and services (personal care items, entertainment, and reading materials) is the fourth largest expense on a child for families (10 to 12 percent). For families, clothing (excluding that received as gifts or hand-me-downs) accounts for 6 to 8 percent of expenses on a child, child care and education accounts for 8 to 11 percent, and health care accounts for 6 to 7 percent of child-rearing expenses across income groups. Estimated expenditures for health care include only out-of-pocket expenses (including insurance premiums not paid by an employer or other organization) and not that portion covered by health insurance.

Age of Child

Expenditures on a child are lower in the younger age categories and higher in the older age categories. Figure 2 depicts this for families in the middle-income group. This held across income groups and held even though housing expenses, the highest child-rearing expenditure, generally decline as the child ages. The decline in housing expenses reflects diminishing interest paid by homeowners over the life of a mortgage. Payments on principal are not considered part of housing costs in the CE; they are deemed to be part of savings.

For all three income groups, food, transportation, clothing, and health care expenses related to child-rearing generally increase as the child ages. Transportation expenses are highest for a child age 15-17, when he or she would start driving. Child care and education expenses are highest for a child under age 6. Most of this expense may be attributable to child care at this age. The estimated expense for child care and education may seem low for those with the expense. The estimates reflect the average of households with and without the expense.

Region

Child-rearing expenses in the regions reflect patterns observed in the overall United States: in each region, expenses on a child increase with household income level and, generally, with age of the child (fig. 3). Overall child-rearing expenses are highest in the urban West, followed by the urban Northeast, and urban South. Child-rearing expenses are lowest in the urban Midwest and rural areas. Much of the difference in expenses on a child among regions is related to housing costs. Total housing expenses on a child are highest in the urban West and urban Northeast and lowest in rural areas. However, child-rearing transportation expenses are highest for families in rural areas. This likely reflects the longer traveling distances and the lack of public transportation in these areas.

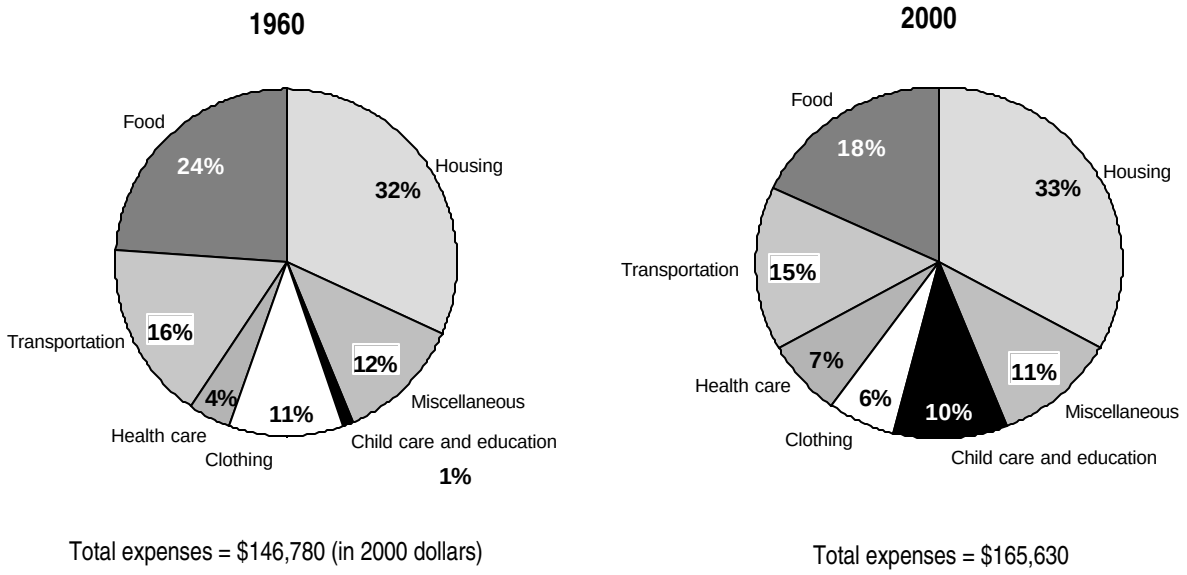
Food is the second largest average expense on a child for families regardless of income level.

Expenditures on Children Over Time

Since 1960 the U.S. Department of Agriculture has provided estimates of expenditures on children from birth through age 17. The original estimates were based on the 1960 Consumer Expenditure Survey. The figure that follows shows how these expenditure estimates have changed from 1960 to 2000. Depicted are the average total expenditures on a child from birth through age 17 in a middle-income, husband-wife family. Total expenses are in 2000 dollars (1960 expenses are adjusted for inflation).

Expenses to raise a child through age 17 have increased in real terms, from $146,780 in 1960 to $165,630 in 2000. New components of child-rearing costs, particularly child care, are among factors causing this increase. In 1960 child care expenses were negligible, because many mothers were not in the labor force. In 2000 child care expenses were among the largest expenditures made on preschool children by middle-income families.

Expenditures on a child through age 17 by middle-income, husband-wife families

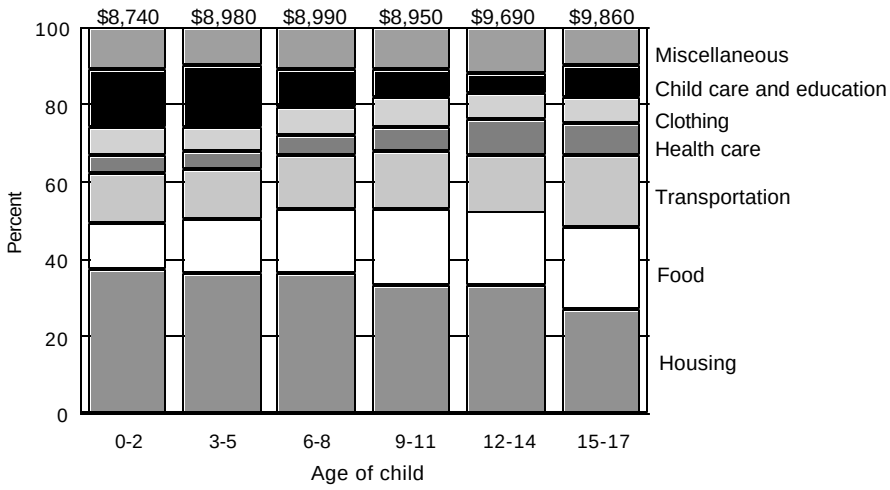


Adjustments for Older Children and Household Size

The expense estimates on a child represent expenditures on the younger child at various ages in a husband-wife household with two children. It cannot be assumed that expenses on the older child are the same at these various ages. Expenses may vary by birth order. The method described on pp. 26-28 was repeated to determine whether a difference exists, the extent of this difference, and how the expenditures may be adjusted to estimate expenses on an older child. The focus was on the older child in each of the same age categories as those used with the younger child. A two-child family was again used as the standard. Household income and U.S. region of residence were not held constant, so findings are applicable to all families.

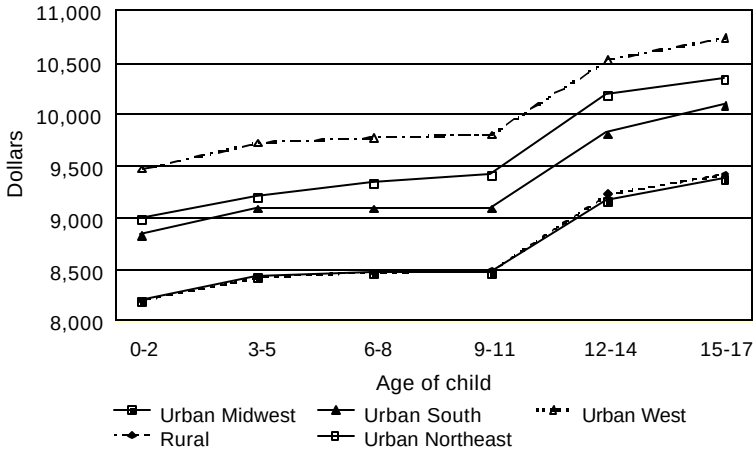
On average, for husband-wife households with two children, expenditures do not vary by birth order. So, the expenditures in tables 2 through 7 reflect those on either child in a two-child family. Thus, annual expenditures on children in a husband-wife, two-child family may be estimated by summing the expenses for the two appropriate age categories. For example, annual expenditures on children ages 9-11 and 15-17 in a husband-wife family in the middle-income group for the overall United States would be $18,810 ($8,950 + $9,860). For specific budgetary components, annual expenses on an older child vary, compared with those on a younger child: families spend more

Figure 2. Estimated 2000 annual family expenditures on a child,[1] by age and budgetary share



[1]U.S. average for the younger child in middle-income, husband-wife families with two children.

Figure 3. Estimated 2000 annual family expenditures on a child,[1] by region and age



[1]Regional average for the younger child in middle-income, husband-wife families with two children.

on clothing and education for an older child but less on transportation.

The estimates should also be adjusted if a household has only one child or more than two children. Families will spend more or less on a child depending on the number of other children in the household and economies of scale. Multivariate analysis was used to estimate expenditures for each budgetary component to derive these figures. Household size and age of the younger child were controlled; household income level and region of the country were not. The results, therefore, are applicable to all families. These expenditures were then assigned to a child by using the method described earlier. Compared with expenditures for each child in a husband-wife, two-child family, expenditures for the child in a one-child family average 24 percent more and for those with three or more children, 23 percent less on each child.

To adjust the figures in tables 2 through 7 to estimate annual overall expenditures on an only child, users of this report should, therefore, add 24 percent to the total expense for the child's age category. To estimate expenditures on three or more children, users should subtract 23 percent from the total expense for each child's age category and then sum the totals. An example of adjustments needed for different number of children follows. The total expenses for a middle-income family in the overall United States on a child age 15-17 with no siblings would be $12,230 ($9,860 x 1.24) and the total expenses on three children ages 3-5, 12-14, and 15-17 would be $21,970 ([$8,980 + $9,690 + $9,860] x .77). For a particular budgetary component, the percentages may be more or less. As family size increases, food costs per child decrease less than housing and transportation costs per child decrease.

Expenditures by Single-Parent Families

The estimates of expenditures on children by husband-wife families do not apply to single-parent families, a group that accounts for an increasing percentage of families with children. Therefore, separate estimates of child-rearing expenses in single-parent households were made by using the CE data. Most single-parent families in the survey (90 percent) were headed by a woman.

Single-parent families in this lower income group, therefore, spend a larger proportion of their income on children than do two-parent families.

The method used in determining child-rearing expenses for two-parent households was followed. Multivariate analysis was used to estimate expenditures for each budgetary component. Control variables were income level, household size, and age of the younger child (the same age categories as those used with children in two-parent families). A single parent with two children was used as the standard for household size.

Income groups of single-parent households (before-tax income under $31,000 and $31,000 and over in 1992 dollars, inflated to 2000 dollars) were selected to correspond with the income groups used in estimating child-rearing expenditures in husband-wife households. This income includes child support payments. The two higher income groups of two-parent families (income between $31,000 and $52,160 and over $52,160 in 1992 dollars) were combined because only 17 percent of single-parent households had a before-tax income of $31,000 and over. The sample was weighted to reflect the U.S. population of interest.

Children's clothing and child care and education expenditures were divided between the two children in the one-parent household. For food and health care, household member shares were calculated for a three-member household (single parent and two children, with the younger child in one of the six age categories). The USDA food plans and the 1987 National Medical Expenditure Survey were used to do this. These shares for the younger child in a single-parent family were then applied to estimated food and health care expenditures to determine expenses on the younger child in each age category.

Housing, transportation, and miscellaneous expenditures were allocated among household members on a per capita basis. Transportation expenses were adjusted to account for nonemployment-related activities in single-parent families. Income and expenses were updated to 2000 dollars.

Child-rearing expense estimates for single-parent families are in table 8, p. 42. For the lower income group (2000 before-tax income less than $38,000), a comparison is presented in table 1 of estimated expenditures on the younger child in a single-parent family with two children versus expenditures on the younger child in a husband-wife family with two children. As discussed earlier, 83 percent of single-parent families and 33 percent of husband-wife families were in this lower income group. More single-parent than husband-wife families were in the bottom range of this lower income group. Average income for single-parent families in the lower income group is $15,900; for husband-wife families it is $23,800. However, total expenditures on a child through age 17 are, on average, only 5 percent lower in single-parent households than in two-parent households.

Single-parent families in this lower income group, therefore, spend a larger proportion of their income on children than do two-parent families. On average, housing expenses are higher;

Table 1. Comparison of estimated 2000 expenditures on a child[1] by lower income single-parent and husband-wife families

Age of child	Single-parent households	Husband-wife households
0 - 2	$5,270	$6,280
3 - 5	5,950	6,420
6 - 8	6,710	6,520
9 - 11	6,260	6,530
12 - 14	6,730	7,380
15 - 17	7,460	7,280
Total (0 - 17)	$115,140	$121,230

[1]Estimates are for the younger child in two-child families in the overall United States with 2000 before-tax income less than $38,000.

whereas, transportation, health care, child care and education, and miscellaneous expenditures on a child are lower in single-parent than in husband-wife households. Child-related food and clothing expenditures are similar, on average, in single- and two-parent families.

For the higher income group of single-parent families (2000 before-tax income of $38,000 and over), child-rearing expense estimates are about the same as those for two-parent households in the before-tax income group of $64,000 and over. Total expenses, in 2000 dollars, for the younger child through age 17 are $242,910 for single-parent families versus $241,770 for husband-wife families. Child-rearing expenses for the higher income group of single-parent families, therefore, also are a larger proportion of income than they are in husband-wife families. Thus, expenditures on children do not differ much between single-parent and husband-wife households. What differs is household income levels. Because single-parent families have one less potential earner than do husband-wife families, on average, their total household income is lower, and child-rearing expenses are a greater percentage of this income.

Estimates cover only out-of-pocket child-rearing expenditures made by the parent with primary care of the child and do not include child-related expenditures made by the parent without primary care or made by others, such as grandparents. Such expenditures could not be estimated from the data. Overall expenses by both parents on a child in a single-parent household are likely greater than estimates of this study.

The procedure detailed earlier was repeated to determine the extent of the difference in expenditures on an older child in single-parent households. The focus was on the older child, and a family with two children was used as the standard. On average, single-parent households with two children spend 7 percent less on the older child than on the younger child (in addition to age-related differences). This contrasts with husband-wife households whose expenditures are unaffected by birth order.

As with husband-wife households, single-parent households spend more or less if there is only one child or three or more children. Multivariate analysis was used to estimate expenditures for each budgetary component to determine these differences. Household size and age of the younger child were control variables. Expenditures were then assigned to a child by using the method described earlier. Compared with expenditures for the younger child in a single-parent, two-child family, expenditures for an only child in a single-parent household average 35 percent more, and expenditures for three or more children in a single-parent household average 28 percent less on each child.

Other Expenditures on Children

Expenditures on a child that were estimated in this study consist of direct parental expenses made on a child through age 17 for seven major budgetary components. These direct expenditures exclude costs related to childbirth and prenatal health care. In 1996 these particular health care costs averaged $7,090 for a normal delivery and $11,450 for a Cesarean delivery (Mushinski, 1998). These costs may be reduced by health insurance.

One of the largest expenses made on children after age 17 is the cost of a college education. The College Board (2000) estimates that in 2000-2001, average annual tuition and fees are $3,420 at 4-year public colleges and $13,688 at 4-year private colleges. Annual room and board is $4,705 at 4-year public colleges and $5,447 at 4-year private colleges. For 2-year colleges in 2000-2001, average annual tuition and fees are $1,655 at public colleges and $8,210 at private colleges. Annual room and board is $4,685 at 2-year private colleges. No estimates of room and board are given for 2-year public colleges. Other parental expenses on children after age 17 include those associated with children living at home, or if children do not live at home, gifts and other contributions to them.

Estimating Future Costs

The estimates presented in this study represent household expenditures on a child of a certain age in 2000. To estimate these expenses for the first 17 years, we need to incorporate future price changes in the figures. To do this, we use a future cost formula, such that:

$C_f = C_p (1 + i)^n$

where:

C_f = projected future annual dollar expenditure on a child of a particular age
C_p = present (2000) annual dollar expenditure on a child of a particular age
i = projected annual inflation (or deflation)
n = number of years from present until child will reach a particular age

An example is presented of estimated future expenditures on the younger child in a husband-wife family with two children for each of the three income groups for the overall United States. The example assumes a child is born in 2000 and reaches age 17 in the year 2017. The example also assumes that the average annual inflation rate over this time is 3.8 percent, the average annual inflation rate over the past 20 years (U.S. Department of Commerce, 2000). Thus total family expenses on a child through age 17 would be $171,460, $233,530, and $340,130 for households in the lowest, middle, and highest income groups, respectively. In 2000 dollars, these figures would be $121,230, $165,630, and $241,770.

Inflation rates other than 3.8 percent could be used in the formula if projections of these rates vary in the future. Also, it is somewhat unrealistic to assume that households remain in one income category as a child ages. For most families, income rises over time. In addition, such projections assume child-rearing expenditures change only with inflation, but parental expenditure patterns also change over time.

Estimated annual expenditures on children[1] born in 2000, by income group, overall United States

Year	Age	Income group		
		Lowest	Middle	Highest
2000	<1	$6,280	$8,740	$13,000
2001	1	6,520	9,070	13,490
2002	2	6,770	9,420	14,010
2003	3	7,180	10,040	14,850
2004	4	7,450	10,420	15,420
2005	5	7,740	10,820	16,000
2006	6	8,160	11,240	16,460
2007	7	8,470	11,670	17,090
2008	8	8,790	12,120	17,740
2009	9	9,130	12,520	18,210
2010	10	9,480	13,000	18,910
2011	11	9,840	13,490	19,620
2012	12	11,550	15,160	21,700
2013	13	11,980	15,740	22,520
2014	14	12,440	16,330	23,380
2015	15	12,740	17,250	24,950
2016	16	13,220	17,910	25,900
2017	17	13,720	18,590	26,880
Total		$171,460	$233,530	$340,130

[1] Estimates are for the younger child in husband-wife families with two children.

The estimates do not include all government expenditures on children. Examples of excluded expenses are public education, Medicaid, and school meals. The actual expenditures on children (by parents and the government) would be higher than reported in this study, especially for the lowest income group.

Indirect child-rearing costs are also not included in the estimates. Although these costs are typically more difficult to measure than are direct expenditures, they can be substantial. The time involved in rearing children is considerable. In addition, one or both parents may need to reduce hours spent in the labor force to care for children, thus reducing current earnings and future career opportunities. The indirect costs of child rearing may exceed the direct costs. For more on these indirect costs, see Bryant, Zick, and Kim (1992); Ireland and Ward (1995); Longman (1998); and Spalter-Roth and Hartmann (1990).

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Table 2. Estimated annual expenditures* on a child by husband-wife families, overall United States, 2000

Age of Child	Total	Housing	Food	Transpor-tation	Clothing	Health care	Child care and education	Miscel-laneous†
Before-tax income: Less than $38,000 (Average=$23,800)								
0 - 2	$6,280	$2,400	$880	$770	$380	$440	$800	$610
3 - 5	6,420	2,370	980	750	370	420	900	630
6 - 8	6,520	2,290	1,260	870	410	490	530	670
9 - 11	6,530	2,070	1,510	950	450	530	320	700
12 - 14	7,380	2,310	1,590	1,070	760	540	230	880
15 - 17	7,280	1,860	1,720	1,440	670	570	380	640
Total	$121,230	$39,900	$23,820	$17,550	$9,120	$8,970	$9,480	$12,390
Before-tax income: $38,000 to $64,000 (Average=$50,600)								
0 - 2	$8,740	$3,250	$1,060	$1,150	$440	$580	$1,310	$950
3 - 5	8,980	3,220	1,220	1,130	430	560	1,450	970
6 - 8	8,990	3,140	1,550	1,250	480	630	930	1,010
9 - 11	8,950	2,920	1,830	1,330	530	690	610	1,040
12 - 14	9,690	3,150	1,840	1,450	890	690	450	1,220
15 - 17	9,860	2,710	2,050	1,830	790	730	770	980
Total	$165,630	$55,170	$28,650	$24,420	$10,680	$11,640	$16,560	$18,510
Before-tax income: More than $64,000 (Average=$95,800)								
0 - 2	$13,000	$5,160	$1,400	$1,610	$580	$670	$1,980	$1,600
3 - 5	13,280	5,130	1,580	1,590	570	640	2,160	1,610
6 - 8	13,160	5,050	1,910	1,710	620	730	1,490	1,650
9 - 11	13,020	4,830	2,220	1,790	680	790	1,030	1,680
12 - 14	13,870	5,070	2,330	1,910	1,120	790	790	1,860
15 - 17	14,260	4,620	2,450	2,310	1,020	840	1,390	1,630
Total	$241,770	$89,580	$35,670	$32,760	$13,770	$13,380	$26,520	$30,090

*Estimates are based on 1990-92 Consumer Expenditure Survey data updated to 2000 dollars using the Consumer Price Index. For each age category, the expense estimates represent average child-rearing expenditures for each age (e.g., the expense for the 3-5 age category, on average, applies to the 3-year-old, the 4-year-old, or the 5-year-old). The figures represent estimated expenses on the younger child in a two-child family. Estimates are about the same for the older child, so to calculate expenses for two children, figures should be summed for the appropriate age categories. To estimate expenses for an only child, multiply the total expense for the appropriate age category by 1.24. To estimate expenses for each child in a family with three or more children, multiply the total expense for each appropriate age category by 0.77. For expenses on all children in a family, these totals should be summed.

†Miscellaneous expenses include personal care items, entertainment, and reading materials.

Table 3. Estimated annual expenditures* on a child by husband-wife families, urban West,† 2000

Age of Child	Total	Housing	Food	Transportation	Clothing	Health care	Child care and education	Miscellaneous‡
Before-tax income: Less than $38,200 (Average=$23,800)								
0 - 2	$7,000	$2,930	$970	$850	$360	$380	$790	$720
3 - 5	7,160	2,910	1,080	830	350	360	890	740
6 - 8	7,300	2,870	1,380	940	390	410	530	780
9 - 11	7,400	2,710	1,660	1,010	440	440	320	820
12 - 14	8,200	2,910	1,730	1,140	740	460	230	990
15 - 17	8,150	2,500	1,870	1,510	650	480	380	760
Total	$135,630	$50,490	$26,070	$18,840	$8,790	$7,590	$9,420	$14,430
Before-tax income: $38,200 to $64,200 (Average=$50,800)								
0 - 2	$9,470	$3,770	$1,140	$1,240	$430	$510	$1,320	$1,060
3 - 5	9,730	3,750	1,310	1,220	420	490	1,460	1,080
6 - 8	9,770	3,710	1,670	1,330	460	550	930	1,120
9 - 11	9,810	3,550	1,970	1,410	510	600	610	1,160
12 - 14	10,520	3,750	1,980	1,540	860	610	450	1,330
15 - 17	10,730	3,340	2,200	1,920	770	630	770	1,100
Total	$180,090	$65,610	$30,810	$25,980	$10,350	$10,170	$16,620	$20,550
Before-tax income: More than $64,200 (Average=$96,100)								
0 - 2	$13,600	$5,580	$1,470	$1,710	$560	$600	$1,990	$1,690
3 - 5	13,910	5,560	1,660	1,690	550	570	2,170	1,710
6 - 8	13,810	5,520	2,000	1,800	600	650	1,490	1,750
9 - 11	13,760	5,360	2,340	1,870	660	700	1,040	1,790
12 - 14	14,550	5,550	2,440	2,000	1,080	710	810	1,960
15 - 17	14,980	5,140	2,580	2,400	980	740	1,410	1,730
Total	$253,830	$98,130	$37,470	$34,410	$13,290	$11,910	$26,730	$31,890

*Estimates are based on 1990-92 Consumer Expenditure Survey data updated to 2000 dollars using the regional Consumer Price Index. For each age category, the expense estimates represent average child-rearing expenditures for each age (e.g., the expense for the 3-5 age category, on average, applies to the 3-year-old, the 4-year-old, or the 5-year-old). The figures represent estimated expenses on the younger child in a two-child family. Estimates are about the same for the older child, so to calculate expenses for two children, figures should be summed for the appropriate age categories. To estimate expenses for an only child, multiply the total expense for the appropriate age category by 1.24. To estimate expenses for each child in a family with three or more children, multiply the total expense for each appropriate age category by 0.77. For expenses on all children in a family, these totals should be summed.

†The Western region consists of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

‡Miscellaneous expenses include personal care items, entertainment, and reading materials.

Table 4. Estimated annual expenditures* on a child by husband-wife families, urban Northeast,† 2000

Age of Child	Total	Housing	Food	Transportation	Clothing	Health care	Child care and education	Miscellaneous‡
Before-tax income: Less than $37,800 (Average=$23,600)								
0 - 2	$6,570	$2,860	$980	$640	$400	$430	$660	$600
3 - 5	6,700	2,840	1,080	610	390	410	750	620
6 - 8	6,910	2,800	1,390	720	440	470	430	660
9 - 11	7,050	2,640	1,660	800	490	510	250	700
12 - 14	7,920	2,840	1,740	930	830	520	180	880
15 - 17	7,800	2,440	1,870	1,280	730	550	290	640
Total	$128,850	$49,260	$26,160	$14,940	$9,840	$8,670	$7,680	$12,300
Before-tax income: $37,800 to $63,500 (Average=$50,200)								
0 - 2	$8,990	$3,680	$1,150	$1,030	$480	$580	$1,120	$950
3 - 5	9,200	3,660	1,310	1,000	460	550	1,250	970
6 - 8	9,330	3,620	1,670	1,120	510	630	780	1,000
9 - 11	9,400	3,460	1,970	1,190	570	670	500	1,040
12 - 14	10,190	3,660	1,970	1,320	970	690	360	1,220
15 - 17	10,330	3,260	2,190	1,690	860	720	620	990
Total	$172,320	$64,020	$30,780	$22,050	$11,550	$11,520	$13,890	$18,510
Before-tax income: More than $63,500 (Average=$95,100)								
0 - 2	$13,010	$5,440	$1,470	$1,490	$610	$670	$1,750	$1,580
3 - 5	13,310	5,430	1,650	1,470	600	650	1,910	1,600
6 - 8	13,290	5,390	1,990	1,580	660	740	1,290	1,640
9 - 11	13,250	5,230	2,320	1,650	720	780	870	1,680
12 - 14	14,160	5,420	2,430	1,780	1,200	800	670	1,860
15 - 17	14,450	5,020	2,550	2,170	1,090	830	1,160	1,630
Total	$244,410	$95,790	$37,230	$30,420	$14,640	$13,410	$22,950	$29,970

*Estimates are based on 1990-92 Consumer Expenditure Survey data updated to 2000 dollars using the regional Consumer Price Index. For each age category, the expense estimates represent average child-rearing expenditures for each age (e.g., the expense for the 3-5 age category, on average, applies to the 3-year-old, the 4-year-old, or the 5-year-old). The figures represent estimated expenses on the younger child in a two-child family. Estimates are about the same for the older child, so to calculate expenses for two children, figures should be summed for the appropriate age categories. To estimate expenses for an only child, multiply the total expense for the appropriate age category by 1.24. To estimate expenses for each child in a family with three or more children, multiply the total expense for each appropriate age category by 0.77. For expenses on all children in a family, these totals should be summed.

†The Northeast region consists of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

‡Miscellaneous expenses include personal care items, entertainment, and reading materials.

Table 5. Estimated annual expenditures* on a child by husband-wife families, urban South,† 2000

Age of Child	Total	Housing	Food	Transpor-tation	Clothing	Health care	Child care and education	Miscel-laneous‡
Before-tax income: Less than $38,000 (Average=$23,700)								
0 - 2	$6,300	$2,330	$850	$760	$400	$490	$890	$580
3 - 5	6,470	2,310	960	740	390	470	1,000	600
6 - 8	6,580	2,270	1,240	850	440	540	600	640
9 - 11	6,650	2,110	1,500	920	490	580	370	680
12 - 14	7,450	2,310	1,570	1,050	810	590	260	860
15 - 17	7,410	1,900	1,700	1,410	720	610	440	630
Total	$122,580	$39,690	$23,460	$17,190	$9,750	$9,840	$10,680	$11,970
Before-tax income: $38,000 to $63,900 (Average=$50,500)								
0 - 2	$8,830	$3,150	$1,030	$1,150	$480	$640	$1,450	$930
3 - 5	9,090	3,130	1,190	1,130	470	620	1,600	950
6 - 8	9,090	3,090	1,530	1,240	510	700	1,040	980
9 - 11	9,080	2,930	1,810	1,310	570	750	690	1,020
12 - 14	9,810	3,130	1,820	1,440	940	760	520	1,200
15 - 17	10,070	2,730	2,030	1,820	840	790	890	970
Total	$167,910	$54,480	$28,230	$24,270	$11,430	$12,780	$18,570	$18,150
Before-tax income: More than $63,900 (Average=$95,600)								
0 - 2	$12,990	$4,930	$1,360	$1,620	$620	$740	$2,160	$1,560
3 - 5	13,280	4,910	1,540	1,590	610	710	2,340	1,580
6 - 8	13,150	4,870	1,860	1,700	660	810	1,640	1,610
9 - 11	13,050	4,710	2,180	1,780	720	860	1,150	1,650
12 - 14	13,880	4,900	2,280	1,910	1,180	880	900	1,830
15 - 17	14,380	4,500	2,410	2,300	1,070	910	1,590	1,600
Total	$242,190	$86,460	$34,890	$32,700	$14,580	$14,730	$29,340	$29,490

*Estimates are based on 1990-92 Consumer Expenditure Survey data updated to 2000 dollars using the regional Consumer Price Index. For each age category, the expense estimates represent average child-rearing expenditures for each age (e.g., the expense for the 3-5 age category, on average, applies to the 3-year-old, the 4-year-old, or the 5-year-old). The figures represent estimated expenses on the younger child in a two-child family. Estimates are about the same for the older child, so to calculate expenses for two children, figures should be summed for the appropriate age categories. To estimate expenses for an only child, multiply the total expense for the appropriate age category by 1.24. To estimate expenses for each child in a family with three or more children, multiply the total expense for each appropriate age category by 0.77. For expenses on all children in a family, these totals should be summed.

†The Southern region consists of Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

‡Miscellaneous expenses include personal care items, entertainment, and reading materials.

Table 6. Estimated annual expenditures* on a child by husband-wife families, urban Midwest,† 2000

Age of Child	Total	Housing	Food	Transportation	Clothing	Health care	Child care and education	Miscellaneous‡
Before-tax income: Less than $38,300 (Average=$23,900)								
0 - 2	$5,710	$2,130	$810	$690	$340	$410	$780	$550
3 - 5	5,850	2,110	910	660	330	390	880	570
6 - 8	5,970	2,070	1,180	780	370	440	520	610
9 - 11	6,050	1,910	1,440	850	410	480	310	650
12 - 14	6,840	2,110	1,500	990	700	490	220	830
15 - 17	6,790	1,700	1,640	1,350	610	520	370	600
Total	$111,630	$36,090	$22,440	$15,960	$8,280	$8,190	$9,240	$11,430
Before tax income: $38,300 to $64,500 (Average=$51,000)								
0 - 2	$8,190	$2,960	$990	$1,090	$400	$550	$1,300	$900
3 - 5	8,430	2,940	1,150	1,070	390	520	1,440	920
6 - 8	8,460	2,900	1,470	1,180	440	600	920	950
9 - 11	8,460	2,740	1,750	1,250	490	640	600	990
12 - 14	9,160	2,940	1,750	1,390	820	650	440	1,170
15 - 17	9,370	2,530	1,970	1,770	720	680	760	940
Total	$156,210	$51,030	$27,240	$23,250	$9,780	$10,920	$16,380	$17,610
Before-tax income: More than $64,500 (Average=$96,500)								
0 - 2	$12,310	$4,760	$1,310	$1,570	$530	$640	$1,970	$1,530
3 - 5	12,600	4,740	1,490	1,540	520	610	2,150	1,550
6 - 8	12,510	4,700	1,810	1,660	570	700	1,480	1,590
9 - 11	12,400	4,540	2,120	1,730	620	750	1,020	1,620
12 - 14	13,200	4,730	2,220	1,870	1,030	760	790	1,800
15 - 17	13,630	4,330	2,350	2,270	930	790	1,390	1,570
Total	$229,950	$83,400	$33,900	$31,920	$12,600	$12,750	$26,400	$28,980

*Estimates are based on 1990-92 Consumer Expenditure Survey data updated to 2000 dollars using the regional Consumer Price Index. For each age category, the expense estimates represent average child-rearing expenditures for each age (e.g., the expense for the 3-5 age category, on average, applies to the 3-year-old, the 4-year-old, or the 5-year-old). The figures represent estimated expenses on the younger child in a two-child family. Estimates are about the same for the older child, so to calculate expenses for two children, figures should be summed for the appropriate age categories. To estimate expenses for an only child, multiply the total expense for the appropriate age category by 1.24. To estimate expenses for each child in a family with three or more children, multiply the total expense for each appropriate age category by 0.77. For expenses on all children in a family, these totals should be summed.

†The Midwest region consists of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

‡Miscellaneous expenses include personal care items, entertainment, and reading materials.

Table 7. Estimated annual expenditures* on a child by husband-wife families, Rural areas,† 2000

Age of Child	Total	Housing	Food	Transportation	Clothing	Health care	Child care and education	Miscellaneous‡
Before-tax income: Less than $38,300 (Average=$23,900)								
0 - 2	$5,690	$1,750	$830	$880	$370	$480	$790	$590
3 - 5	5,850	1,730	930	860	360	460	900	610
6 - 8	5,990	1,700	1,210	970	400	530	530	650
9 - 11	6,080	1,530	1,470	1,050	450	570	320	690
12 - 14	6,870	1,730	1,530	1,180	760	580	230	860
15 - 17	6,830	1,330	1,670	1,540	670	610	380	630
Total	$111,930	$29,310	$22,920	$19,440	$9,030	$9,690	$9,450	$12,090
Before-tax income: $38,300 to $64,500 (Average=$51,000)								
0 - 2	$8,200	$2,580	$1,010	$1,280	$440	$640	$1,320	$930
3 - 5	8,430	2,560	1,170	1,250	430	610	1,460	950
6 - 8	8,480	2,520	1,500	1,370	470	690	940	990
9 - 11	8,490	2,360	1,780	1,440	530	740	610	1,030
12 - 14	9,220	2,560	1,790	1,570	890	750	450	1,210
15 - 17	9,420	2,150	2,000	1,950	790	780	770	980
Total	$156,720	$44,190	$27,750	$26,580	$10,650	$12,630	$16,650	$18,270
Before-tax income: More than $64,500 (Average=$96,500)								
0 - 2	$12,320	$4,360	$1,340	$1,750	$570	$730	$2,000	$1,570
3 - 5	12,610	4,340	1,520	1,720	560	710	2,170	1,590
6 - 8	12,510	4,300	1,840	1,840	610	800	1,500	1,620
9 - 11	12,420	4,140	2,150	1,910	670	850	1,040	1,660
12 - 14	13,270	4,340	2,250	2,040	1,120	870	810	1,840
15 - 17	13,690	3,930	2,390	2,440	1,010	900	1,410	1,610
Total	$230,460	$76,230	$34,470	$35,100	$13,620	$14,580	$26,790	$29,670

*Estimates are based on 1990-92 Consumer Expenditure Survey data updated to 2000 dollars using the population size Consumer Price Index. For each age category, the expense estimates represent average child-rearing expenditures for each age (e.g., the expense for the 3-5 age category, on average, applies to the 3-year-old, the 4-year-old, or the 5-year-old). The figures represent estimated expenses on the younger child in a two-child family. Estimates are about the same for the older child, so to calculate expenses for two children, figures should be summed for the appropriate age categories. To estimate expenses for an only child, multiply the total expense for the appropriate age category by 1.24. To estimate expenses for each child in a family with three or more children, multiply the total expense for each appropriate age category by 0.77. For expenses on all children in a family, these totals should be summed.

†Rural areas are places of fewer than 2,500 people outside a Metropolitan Statistical Area.

‡Miscellaneous expenses include personal care items, entertainment, and reading materials.

Table 8. Estimated annual expenditures* on a child by single-parent families, overall United States, 2000

Age of Child	Total	Housing	Food	Transportation	Clothing	Health care	Child care and education	Miscellaneous†
Before-tax income: Less than $38,000 (Average=$15,900)								
0 - 2	$5,270	$2,150	$980	$720	$340	$210	$500	$370
3 - 5	5,950	2,450	1,030	630	360	310	680	490
6 - 8	6,710	2,600	1,300	740	420	370	620	660
9 - 11	6,260	2,500	1,500	530	430	470	300	530
12 - 14	6,730	2,500	1,510	610	720	500	380	510
15 - 17	7,460	2,650	1,640	960	840	490	290	590
Total	$115,140	$44,550	$23,880	$12,570	$9,330	$7,050	$8,310	$9,450
Before tax income: $38,000 or more (Average=$57,800)								
0 - 2	$12,100	$4,640	$1,510	$2,210	$480	$490	$1,230	$1,540
3 - 5	13,000	4,930	1,600	2,120	500	660	1,540	1,650
6 - 8	13,820	5,080	1,920	2,220	580	750	1,440	1,830
9 - 11	13,330	4,980	2,300	2,020	590	900	840	1,700
12 - 14	14,140	4,990	2,260	2,100	970	950	1,190	1,680
15 - 17	14,580	5,140	2,390	2,270	1,110	940	970	1,760
Total	$242,910	$89,280	$35,940	$38,820	$12,690	$14,070	$21,630	$30,480

*Estimates are based on 1990-92 Consumer Expenditure Survey data updated to 2000 dollars using the Consumer Price Index. For each age category, the expense estimates represent average child-rearing expenditures for each age (e.g., the expense for the 3-5 age category, on average, applies to the 3-year-old, the 4-year-old, or the 5-year-old). The figures represent estimated expenses on the younger child in a single-parent, two-child family. For estimated expenses on the older child, multiply the total expense for the appropriate age category by 0.93. To estimate expenses for two children, the expenses on the younger child and older child after adjusting the expense on the older child downward should be summed for the appropriate age categories. To estimate expenses for an only child, multiply the total expense for the appropriate age category by 1.35. To estimate expenses for each child in a family with three or more children, multiply the total expense for each appropriate age category by 0.72 after adjusting the expenses on the older children downward. For expenses on all children in a family, these totals should be summed.

†Miscellaneous expenses include personal care items, entertainment, and reading materials.

Selected Food and Nutrient Highlights of the 20th Century: U.S. Food Supply Series

Lisa Bente, MS, RD
Shirley A. Gerrior, PhD, RD

U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

The U.S. food supply series, beginning in 1909, reports the amounts of nutrients in food that are available for consumption on a per capita per day basis. Food supply nutrient estimates, which play a key role in U.S. nutrition monitoring activities, are used to monitor the potential of the food supply to meet the nutritional needs of the U.S. population, examine historical trends, and evaluate changes in the American diet. Significant changes in food supply nutrients and the food commodities providing these nutrients have occurred since 1909. This article provided information about the availability or consumption of the major food supply food groups and highlights the nutrient availability and contribution of food energy, folate, calcium, and iron from food supply food groups for selected years—1909, 1945, 1975, and 1999. The article also discussed critical events since 1990 that are responsible for changes in nutrients and food commodities in the U.S. food supply.

The variety and types of food commodities in the U.S. food supply and the nutrients they provide have undergone significant changes since 1909. In the 1930's, advancements in food-processing technologies introduced into the marketplace canned, frozen, and packaged food items, such as canned soups and vegetables, frozen vegetables and fruits, and packaged cereals. Nationally, the result led to an increase in the availability and shelf life of these foods. Also, in the 1930's margarine was fortified with vitamin A and its precursor beta-carotene (for color), and milk was fortified with vitamins A and D. This was followed in the 1940's with flour and flour products being enriched with thiamin, riboflavin, niacin, and iron. Such events ensured an adequate supply of some nutrients and enhanced the health benefits of the U.S. food supply. During the second half of the century, changes in animal husbandry and marketing practices ensured an adequate supply of red meat and poultry products.

Over the last three decades, changes in the demand for some foods and more variety of others were influenced by several factors: greater ethnic diversity, more elderly consumers, and effective nutrition policy—including mandatory nutrition labeling of food products, revision of grain fortification policy, the issuance of the *Dietary Guidelines for Americans,* and the release of the Dietary Reference Intakes (DRIs). These events resulted in changes in food supply commodities and nutrients. For example, the 1999 food supply provided a greater variety of grain products, fruits and vegetables, and reduced-fat meats and dairy products than did the 1970 food supply; however, the 1999 food supply also provided record-high amounts of caloric sweeteners and added fats. A change in micronutrient content was also evident in the 1999 food supply;

for example, the increased variety and availability of grain products, along with changes in grain fortification policy during this period, were responsible for the record high levels of folate and iron in the food supply.

This article provides information about the availability or consumption of the major food supply food groups and highlights the nutrient availability and contribution of food energy, folate, calcium, and iron from these food groups for selected years—1909, 1945, 1975, and 1999.[1] The article also discusses critical events since 1909 that were responsible for changes in nutrients and food commodities in the U.S. food supply.

The Source and Importance of Food Supply Data

The U.S. food supply series measures the amount of food available for consumption per capita per year and the amount of nutrients available for consumption per capita per day. Extending back to 1909, the U.S. food supply series is the only continuous source of data on food and nutrient availability in the United States. Estimates of food supply nutrients were calculated for the first time during World War II to assess the nutritive value of the food supply for civilian use in the United States and to provide a basis for international comparisons with the food supplies of our allies (U.S. Department of Agriculture [USDA], 1949; Gerrior & Bente, 2001).

[1]The initial and final years of the food supply series for which data are currently available are 1909 and 1999. In 1945 increased food production of a number of foods is associated with World War II and advances in enrichment and fortification during the 1930's and early 1940's; 1975 reflects changes in enrichment policy for grain and cereal products made in the early 1970's.

The Economic Research Service (ERS) of the USDA calculates annually the amount of food in the United States that is available for consumption on a per capita basis. Food supply data measures national consumption of several hundred basic commodities. For most commodity categories, the available food supply is measured as the sum of annual production, beginning inventories, and imports minus exports, farm and nonfood uses, and end-of-the-year inventories. Per capita consumption is calculated by dividing the available food supply by the total U.S. population as of July 1 each year. An estimated population is used between the years of the decennial census (Putnam & Allshouse, 1999).

Using per capita consumption data and information on the nutrient composition of foods from USDA's Agricultural Research Service, the Center for Nutrition Policy and Promotion calculates the nutrient content of the food supply. Per capita consumption for each commodity is multiplied by the amount of food energy and each of 27 nutrients and dietary components in the edible portion of the food. Results for each nutrient from all foods are totaled and converted to amount of nutrients per capita per day. Nutrients added commercially to certain commodities through fortification and enrichment are also included in the nutrient content of the food supply. Because food supply data represent the disappearance of food into the marketing system, per capita consumption and nutrient estimates typically overstate the amount of food and nutrients people actually ingest.

Per capita food supply estimates provide unique and essential information on the amount of food and nutrients available for consumption. They are useful in assessing trends in food and nutrient consumption over time, for monitoring the potential of the food supply to meet the nutritional needs of Americans, and for examining relationships between food availability and diet-health risk. In particular, food supply data provide useful information to policymakers who are responsible for establishing food and nutrition policy. Recently, ERS developed a method to adjust food supply data for losses and to express the data in terms of Food Guide Pyramid serving recommendations (Kantor, 1998). This method expands the usefulness of food supply data, because the availability of Pyramid serving estimates now allows researchers and policymakers to gauge the availability of food in terms of current dietary guidance and Americans' progress in following the *Dietary Guidelines for Americans.*

Availability of Food Supply Food Groups

During the 20th century, substantial changes occurred in the availability or consumption of many of the major food groups of the food supply. Many of these changes were linked to advances in food production and technology, Federal standards for enrichment and fortification, the Federal Dietary Guidance system, or increasing consumer demand for nutritionally improved foods.

Meat, Poultry, and Fish Group; Meat Alternates

Consumption from the meat, poultry, and fish group increased from 176 pounds per capita per year in 1909 to 188 pounds in 1945 and to 207 pounds in 1975 (table 1). In 1999 it reached a record high of 245 pounds—up almost 40 percent from 1909. While consumption of red meat reached a record high in 1971 at 162 pounds per person (data not shown), its consumption was much lower in 1999 at 134 pounds per person. Poultry consumption, however,

Table 1. Foods available in U.S. food supply (per person per year), by major food group for selected years[1]

	1909	1945	1975	1999
		Pounds per person		
Meat and meat alternates	228	257	261	298
Meat, poultry, and fish	176	188	207	245
Red meat	148	153	148	134
Poultry	17	26	47	95
Fish	11	10	12	15
Meat alternates				
Eggs	35	48	35	33
Legumes, nuts, and soy	17	20	19	21
Legumes	13	11	7	9
Milk and milk products	345	552	453	502
Whole milk	229	344	181	72
Lowfat milks	65	40	60	131
Cheese	4	9	19	32
Other dairy	29	130	129	138
Vegetables and vegetable juices	414	400	279	302
White potatoes	188	120	82	87
Deep-yellow and dark-green vegetables	35	46	25	36
Other vegetables	145	174	127	134
Tomatoes	46	61	44	45
Fruit and fruit juices	173	207	189	232
Citrus fruits	16	71	77	78
Noncitrus fruits	157	135	112	153
Grain products	300	204	139	200
Sugars and sweeteners	84	92	118	158
Fats and oils	41	42	56	73
Butter	18	11	5	5
Margarine	1	4	11	8
Shortening	8	9	17	22
Lard and beef tallow	13	12	3	6
Salad, cooking, and other oils	2	6	20	32
Miscellaneous foods	10	20	13	13

[1]See box for information on weight basis.

increased dramatically from the mid-1970's—doubling from 47 pounds per person in 1975 to 95 pounds per person in 1999—and thus contributing to the overall increase in availability of this group in 1999. Fish consumption increased somewhat, from 11 pounds per person in 1909 to 15 pounds per capita in 1999.

The consumption of meat alternates—eggs—increased from 35 pounds per person in 1909 to record-high levels in 1945 (and the years immediately following World War II) to 48 pounds per person. During the early and mid-1990's egg use remained stable at about 30 pounds per capita per year (data not shown). By 1999 egg use had increased to 33 pounds per person. The consumption of other meat alternates—legumes, nuts, and soy—generally remained stable over the series with somewhat higher levels consumed in the more recent years. Consumption of legumes, at 13 pounds per person in 1909, gradually dropped to 9 pounds per person in 1999.

Milk and Milk Products

The demand for whole milk has declined; whereas, the demand for lowfat milks (2%, 1%, and skim) and yogurt has increased substantially, particularly in the past two to three decades. From an initial level of 229 pounds per person in 1909 to a record-high level of 344 pounds per person in 1945, whole milk plunged to 72 pounds per person in 1999—about a 79-percent drop, from its record high. The use of lowfat and skim milks, however, doubled from 65 pounds per person in 1909 to 131 pounds per person in 1999. Cheese consumption increased eight-fold between 1909 and 1999—from 4 pounds per capita to 32 pounds per capita (table 1). From 1909 to 1999, increases in ethnic diversity, demand for hard cheeses used in pizzamaking, cheeses used in prepared foods, and the

U.S. food supply: Foods in pounds per person by major food group for the years, 1909, 1945, 1975, and 1999

Pounds of food per capita per year by major food groups in the U.S. food supply were adapted from data published in the ERS series, "Food Consumption, Prices, and Expenditures" (Putnam & Allshouse, 1999). The adaptations allow for the determination of nutrient estimates from the major commodity groups and the percentage contribution by nutrients for each of these groups.

Pounds of most foods are totaled on the basis of their retail weights to achieve consistency in grouping different foods. Summing dissimilar forms of foods—such as liquids, solids, and concentrated products—makes it difficult to interpret changes in these data. Because of increased processing of foods over the years, pounds of food measured in equivalent weights are more appropriate for analyses of food trends. Totals for other milk products, total dairy products, and total sugars and sweeteners are measured in equivalent weights. However, caution must be used in interpreting the pounds per capita for other foods in this report to avoid misleading implications from either their levels or trends. For information on levels of individual foods, see the references.

Meat: Reported as fresh retail cut equivalent, which includes all meat cuts obtained from a carcass and trimmed for retail sale. Includes game, organ meats, and fat cuts of pork.

Poultry: Reported as ready-to-cook weight. Ready-to-cook poultry weight is the entire dressed bird, which includes the bones, skin, fat, liver, heart, gizzard, and neck. Includes game birds.

Fish: Reported on edible-weight basis, which excludes such offal as bones, viscera, and shells. Includes game fish.

Eggs: Reported as shell-equivalent weight, which includes shell eggs and the approximate shell-egg equivalent of dried and frozen eggs.

Other milk products: Includes creams, evaporated and condensed milks (canned and bulk), dry milk, whey, yogurt, sour cream, eggnog, and ice cream and frozen desserts.

Reported as calcium-equivalent weight, which is the amount of fluid whole cow's milk that has the same quantity of calcium as other milk products. For example, the calcium equivalent of 1.5 pounds of cheddar cheese is calculated as follows:

1. Derive calcium conversion factor.

$$\frac{\text{calcium in 1 pound cheddar cheese}}{\text{calcium in 1 pound fluid milk}} = \frac{3{,}275 \text{ mg}}{560 \text{ mg}} = 5.85$$

2. Multiply amount of cheddar cheese by calcium conversion factor.

1.5 pounds x 5.85 = 8.78 pounds

Total milk products: Reported as calcium-equivalent weight.

Total grain products: Includes wheat flour, rye flour, rice, corn flour, corn meal, hominy and corn grits, oat products, barley products, and ready-to-cook and ready-to-eat breakfast cereals.

Lard and beef tallow: Excludes use in margarine and shortening.

Total fruits: Reported as product weight except for concentrated juices, which are on a single-strength basis.

Total other fresh vegetables: Includes dark-green and deep-yellow types, tomatoes, and others.

Miscellaneous: Includes instant and regular coffee reported on roasted basis; tea reported as leaf equivalent; cocoa reported as chocolate-liquor equivalent of cocoa beans, which is what remains after cocoa beans have been roasted and hulled; and spices.

development of the processed cheese market have increased the demand for cheese.

Vegetables and Vegetable Juices

Use of vegetables and vegetable juices in 1999 was 302 pounds per person, a somewhat higher level than the 279 pounds per person in 1975, but substantially lower than the 1909 level of 414 pounds per person. Consumption of vegetables has generally declined since 1909; however, vegetable use increased during World War II—as seen by the 1945 level of 400 pounds per person—because of the popularity of U.S. "victory" vegetable gardens.

The major reason for an overall decrease in the use of fresh vegetables has been the marked decline in the use of fresh white potatoes. In 1909 consumption of fresh white potatoes was 188 pounds per person; in 1999, consumption was 51 pounds per person (data not shown). In the past three decades, consumption of potatoes has shifted from fresh white potatoes to frozen potatoes, with an increase from 19 pounds per person in 1975 to 30 pounds per person in 1999 (data not shown). This shift is associated with the increased popularity of fried potatoes (especially french fries) at fast-food restaurants.

The decline in consumption of fresh vegetables has been slightly offset in recent years by the increased consumption of other fresh commercial vegetables, such as bell peppers, onions, and broccoli. Per capita use of dark-green and deep-yellow vegetables was similar in 1909 and 1999 at 35 and 36 pounds per person, respectively.

Fruits and Fruit Juices

Consumption of fruits and fruit juices increased by 34 percent, from 173 pounds per person in 1909 to 232 pounds per person in 1999. Per capita availability of citrus fruits and juices nearly quintupled during this time, moving from 16 to 78 pounds per person; however, limited gains in the availability of citrus fruits have occurred since 1945. Since the mid-1970's, the use of noncitrus fruits and melons has generally increased, reaching the level of 153 pounds per person in 1999. Overall, increased availability of fruits is related to increases in juice consumption and the introduction of a greater variety of fruits, including tropical fruits such as kiwi fruit, pineapples, and mangoes into the food supply.

Grain Products; Sugars and Sweeteners

The use of grain products increased to 200 pounds per capita per person in 1999, up by 61 pounds from the 1975 figure.[2] Despite the recent 44-percent increase in grain consumption since 1975, its consumption in 1999 was still 33 percent lower than the 1909 level of 300 pounds per person. In contrast, the use of sugars and caloric sweeteners has skyrocketed, from 84 pounds per person in 1909 to 118 pounds per person in 1975 and then to 158 pounds per person in 1999. The 34-percent increase in average consumption of sugars and caloric sweeteners between 1975 and 1999 reflects huge increases in the consumption of carbonated soft drinks and other sweetened beverages, such as fruit drinks and ades. Use of corn sweeteners, which was minor (less than 5 pounds per person) in 1909, surpassed the use of refined sugar in the mid-1980's and reached an all-time high in 1999 of 85 pounds per person (data not shown).

During the 20th century, advances in food production and fortification technologies resulted in more foods and nutrients being in the U.S. food supply.

[2]The record-level low of 129 pounds per person of grain prducts was in 1972.

Fats and Oils

Consumption of fats and oils was 41 pounds per person in 1909 and remained relatively stable through 1945. Then it increased 33 percent, from 42 pounds in 1945 to 56 pounds in 1975, and increased another 30 percent from the 1975 level to 73 pounds in 1999—78 percent more than in 1909. Over the series, a shift from the use of fats and oils from animal sources to vegetable sources has occurred and is due to substantial increases in the use of vegetable-fat products, such as margarine, shortening, and salad and cooking oils. The increase in total fats and oils, especially in the last three decades, probably resulted from the greatly expanded use of fried foods by the fast-food industry and food service outlets, as well as the increased use of salad oils on salads consumed both at home and away from home (Gerrior & Bente, 2001).

Availability and Contribution of Selected Nutrients

Table 2. Nutrients available (per person per day) in U.S. food supply for selected years

Nutrient	Unit	1909	1945	1975	1999
Food energy	kcal	3,500	3,300	3,100	3,800
Carbohydrate	gm	500	425	381	500
Dietary fiber	gm	29	26	19	24
Protein	gm	101	104	92	111
Total fat	gm	122	138	144	164
Saturated fat	gm	52	55	49	52
Monounsaturated fat	gm	47	54	57	70
Polyunsaturated fat	gm	13	18	27	34
Cholesterol	mg	450	540	420	430
Vitamin A	mcg RE	1,240	1,540	1,590	1,780
Carotenes	mcg RE	430	560	590	800
Thiamin	mg	1.6	2.1	2.3	3.0
Riboflavin	mg	1.9	2.6	2.6	2.9
Niacin	mg	19	22	26	33
Vitamin B_6	mg	2.2	2.0	2.0	2.5
Folate	mcg	323	347	330	641
Vitamin B_{12}	mcg	8.4	9.3	8.5	8.1
Vitamin E	mcg *alpha*-TE	7.2	10.5	14.0	17.8
Vitamin C	mg	98	119	114	132
Calcium	mg	760	1,070	870	990
Phosphorus	mg	1,500	1,670	1,420	1,690
Magnesium	mg	390	400	320	390
Iron	mg	14.2	16.4	16.4	23.6
Potassium	mg	4,060	4,270	3,450	3,890
Zinc	mg	13.7	13.3	13.1	15.5
Copper	mg	2.0	1.9	1.7	2.0
Selenium	mcg	169	150	136	178

Food Energy

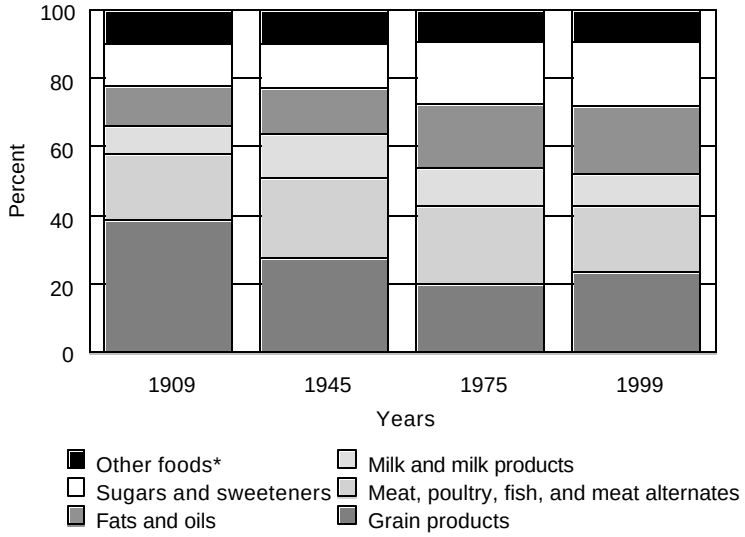
Food energy (kilocalories), the energy released from the metabolism of foods, allows the production and maintenance of body tissue cells. Over the food supply series, energy levels have been as low as 3,100 (in 1975) kilocalories (kcal) and as high as 3,800 (in 1999) kcal per capita per day (table 2). In 1909 the energy level was 3,500 kcal per person; in 1945, it was 3,300 kcal per person. Energy levels continued to drop until reaching a low of 3,100 kcal per capita per day in the early 1950's through 1965 and rose between 1965 and the early 1970's (data not shown). They dropped again to 3,100 kcal in 1975. These lower levels of food energy are associated with a decreased consumption of grain products (Gerrior & Bente, 2001). By 1999 food energy levels reached a high of 3,800 kcal per capita per day.

Various food groups have fluctuated in their contribution to the food energy in the food supply; however, grain products have consistently provided a major share—although at fluctuating levels (fig. 1). The share of kilocalories from grain products decreased from 39 percent in 1909 to 24 percent in 1999. The 1999 share, however, is higher than its 1975 share (20 percent). The fats and oils group and the sugars and sweeteners group have simultaneously and similarly increased in their share of kilocalories. Both contributed 12 percent in 1909 and 13 percent in 1945. Fats and oils provided 18 percent of the kilocalories in 1975 and 19 percent in 1999; sugars and sweeteners provided 19 percent of the kilocalories in 1975 and 20 percent in 1999. The meat, poultry, fish, and meat alternates group fluctuated in its share but provided the same percentage of kilocalories available in 1999 as in 1909 (19 percent). The milk and milk products also fluctuated in its percentage share of kilocalories but provided about a 9-percent share in both 1909 and 1999.

Folate

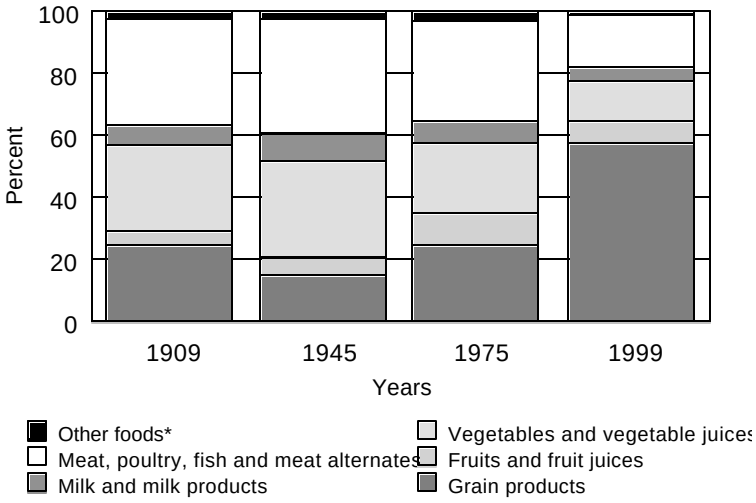
Folate functions as a coenzyme and is essential for the biosynthesis of nucleic acids and normal maturation of red blood cells. Low levels of serum folate have been associated with elevated serum homocysteine, an independent risk factor for vascular disease and, during pregnancy, it is associated with the increased risk for neural-tube defects. Among the selected years

Figure 1. Sources of food energy in U.S. food supply for selected years



*"Other foods" consists of fruits and fruit juices, vegetables and vegetable juices, spices, and miscellaneous foods.

Figure 2. Sources of folate in U.S. food supply for selected years



*"Other foods" consists of spices and miscellaneous foods.

studied, folate levels before 1999 ranged from 323 to 347 micrograms (µg) per capita per day. The lowest level of folate, 268 µg per capita per day, occurred in 1965-66 (data not shown) and was caused by a decreased use of vegetables, mostly potatoes, and grain products. The highest level of folate, 641 µg per capita per day in 1999, was mainly due to fortification of flour and breakfast cereal (table 2).

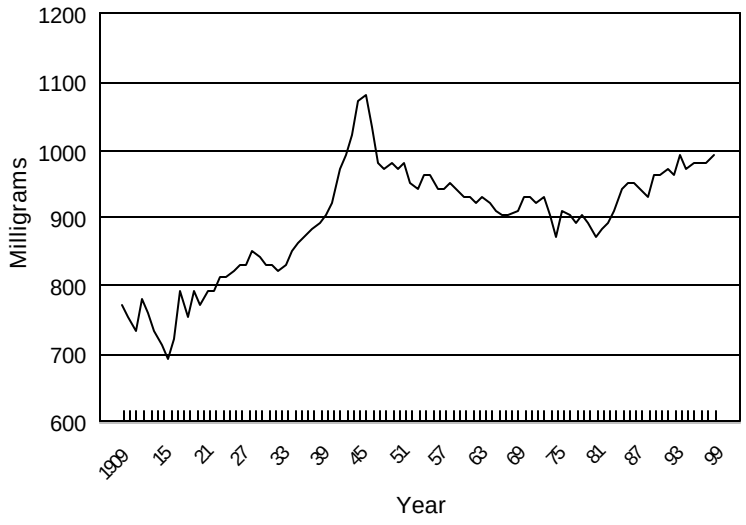
Vegetables were the leading source of folate in the food supply prior to 1974—accounting for 28 percent of the folate in 1909—whereas grain products provided 25 percent for the same year. In 1999 grain products were the leading contributors of folate, providing almost two-thirds of the total folate in the food supply (fig. 2). This increase, beginning in 1998, was due to fortification of flour and breakfast cereal with this nutrient. The meat, poultry, fish, and meat alternates group provided about one-third of the total folate in the U.S. food supply for the years 1909, 1945, and 1975, but by 1999 its share had dropped to 17 percent. Over the years, the contribution of folate from fruits has fluctuated. The 1999 contribution was almost double that of 1909, increasing from 4 to 7 percent. This reflected the increased use of fresh and processed citrus commodities. The contribution of milk and milk products to folate in the food supply dropped from 6 percent in 1909 to 4 percent in 1999.

Calcium

Calcium is essential for the formation of bones and teeth; its requirements are highest during adolescence, later adult years, pregnancy, and lactation. Calcium is very important from a public health perspective because inadequate intake of calcium may increase the risk of osteoporosis, a condition in which decreased bone mass weakens bones and leads to fractures.

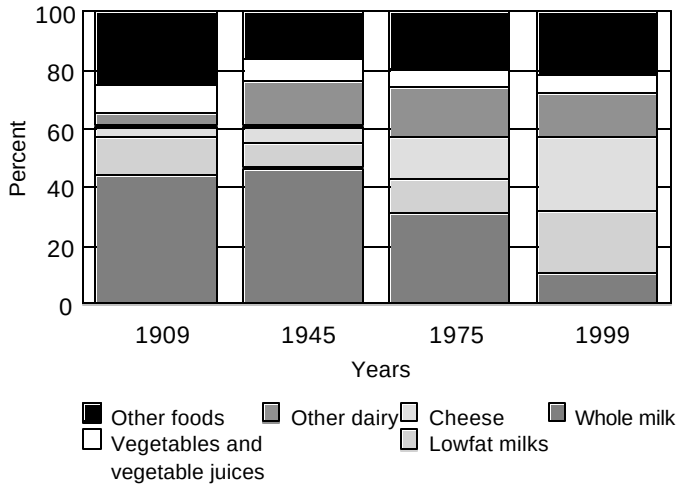
The amount of calcium available in the food supply has shifted over the years. Calcium levels dropped from 760 milligrams (mg) per capita per day in 1909 to 690 mg in 1916 (data not shown), primarily due to decreased use of whole milk during that time (fig. 3). Increased use of whole, canned, and dried milk and cheese resulted in an increase in calcium levels by 42 percent between 1909 and 1946 when calcium reached a peak value of 1,080 mg per capita per day (data not shown). This increase is attributed to the production levels associated with the years around World War II. From the mid-1940's through the 1970's to the early 1980's, calcium levels generally declined. Since then, however, levels have tended to increase because of greater use of lowfat milks, yogurt, and cheese (fig. 3, table 2).

Figure 3. Calcium available in U.S. food supply, 1909-99



Dairy products have always been the predominant source of calcium in the food supply. While they remain so, a shift within the dairy group, that is a decreased use of whole milk and an increased use of lowfat milks, has occurred over the years (fig. 4). In 1909 whole milk accounted for 44 percent of the calcium in the food supply; in 1999 it accounted for 11 percent only. Even though the share of calcium contributed by lowfat milks has increased, it does not completely compensate for the calcium loss due to the decreased use of whole milk. The share of calcium provided by cheese was more than six times higher in 1999, at 25 percent, than in 1909, at 4 percent. The share of the vegetable group contributing to calcium in the food supply has generally declined, dropping from 9 percent in 1909 to 7 percent in 1999 (fig. 4).

Figure 4. Sources of calcium in U.S. food supply for selected years



*"Other foods" consists of fruits and fruit juices; grain products; meat, poultry, and fish, and meat alternates (eggs, legumes, nuts, and soy); sugars and sweeteners; spices; fats and oils; and miscellaneous foods.

Iron

Iron is found in all cells of the body. As a component of hemoglobin in the blood and myoglobin in the muscles, iron carries oxygen. Among Americans,

Figure 5. Sources of iron in U.S. food supply for selected years

*"Other foods" consists of fruits and fruit juices, milk and milk products, fats and oils, sugars and sweeteners, spices, and miscellaneous foods.

iron deficiency anemia is the most common nutritional deficiency, with infants, adolescents, and women of childbearing age having the highest risk of developing anemia. Their greater need for iron, due to rapid growth or excessive blood loss during menstruation, usually cannot be met by dietary intake alone**.**

Iron levels increased from 14.2 mg per capita per day in 1909 to 16.4 mg in 1945 (table 2). By 1973 iron levels had dropped to 15.4 mg (data not shown). After changes in iron fortification in 1974, iron levels in the food supply increased to 16.4 mg per capita per day in 1975 and rose to 23.6 mg per capita per day in 1999. The increased use of enriched grains and fortified ready-to-eat breakfast cereals is the main reason for the higher iron levels in the food supply.

Even before the enrichment of white flour, the predominant source of iron was grain products. In 1909 grain products provided 34 percent of the iron in the food supply (fig. 5). When the use of grain products dropped, its iron share declined until the enrichment of flour began in the 1940's. With the enrichment of flour and fortification of breakfast cereals, grains remained the main source of iron despite the drop in their consumption. Grain use increased in the 1980's; by 1999, grain products accounted for over 50 percent of the iron in the food supply. After grain products, the meat, poultry, fish, and meat alternates group—particularly red meats—has ranked second as a source of iron throughout most of the years. This group provided 38 percent of the iron available in 1909 and 25 percent in 1999. The vegetable group, specifically white potatoes, was an important source of iron in earlier years. However, the share of iron from vegetables declined when the use of white potatoes declined. In 1909 the vegetable group furnished 18 percent of the iron in the food supply; in 1999, that share dropped to 10 percent. Other groups provided minimal iron to the food supply: fruits provided 3 percent over the course of the series; the dairy group, 2 percent; and "other foods," not more than 10 percent.

Conclusion

During the 20th century, advances in food production and fortification technologies resulted in more foods and nutrients being in the U.S. food supply. Americans should expect the food supply to continue to provide a safe source of nutritious foods and to reflect changes in marketing practices, food technologies, and nutrition knowledge. The U.S. food supply will also continue to reflect consumer demand for foods based on nutrition knowledge.

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The Quality of Young Children's Diets

Mark Lino, PhD
P. Peter Basiotis, PhD
Shirley A. Gerrior, PhD
Andrea Carlson, PhD

U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

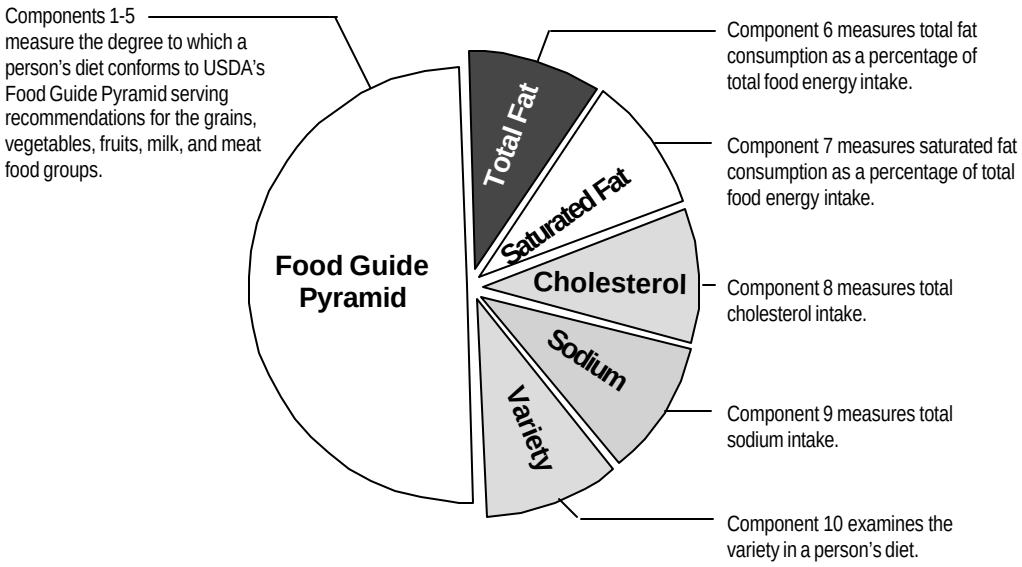
To assess the dietary status of Americans and monitor changes in these patterns, the U.S. Department of Agriculture's (USDA) Center for Nutrition Policy and Promotion (CNPP) developed the Healthy Eating Index (HEI) and first computed the Index by using 1989 data. The HEI is a summary measure of the overall quality of people's diets (broadly defined in terms of adequacy, moderation, and variety). This article presents the HEI for young children (age 2 to 9) for 1994-96/98—the most recent years for which nationally representative food intake data are available to compute the Index. The HEI is calculated for these children because they were the only subpopulation on which food intake data were collected in 1998. Most young children (81 percent) had a diet that needed improvement or was poor. The quality of children's diets varied by their sociodemographic characteristics. The diets of young children were statistically different based on age, gender, household income, receipt of food stamps, food sufficiency, and area of residence.

Most young children have diets that need to be improved. This is of concern because poor eating habits in young children may impair their growth and development and serve as the foundation for poor eating habits when they become adults. Poor eating habits, as well as inactivity among American children, are key factors that influence the degree to which children over the past decades have been overweight. Recent data show that 13 percent of American children 6 to 11 years old are overweight, compared with 4 percent in the 1960's (National Center for Health Statistics, 2002). Overweight children are at risk for cardiovascular diseases, Type II diabetes, and other serious health problems; thus, information on their diet is critical in helping nutrition and health professionals develop strategies for healthier children.

To assess the dietary status of Americans and monitor changes in these patterns, the U.S. Department of Agriculture's (USDA) Center for Nutrition Policy and Promotion (CNPP) developed the Healthy Eating Index (HEI) and first computed the Index by using 1989 data. The HEI is a summary measure of the overall quality of people's diets (broadly defined in terms of adequacy, moderation, and variety). The Index consists of scores for consumption of the recommended number of servings of each of the five major food groups of the Food Guide Pyramid, intake of total fat and saturated fat (as a percentage of calories), intake of cholesterol and sodium, and a measure of dietary variety. Computed on a regular basis, the HEI is the only index issued by the Federal Government that gauges overall quality of the population's diet.

This article presents the HEI for young children (age 2 to 9) for 1994-96/98—the most recent years for which nationally representative food intake data are available to compute the Index. The HEI is calculated for these children because they were the only subpopulation on which food intake data were collected in 1998.

Figure 1. Components of the Healthy Eating Index



Components of the Healthy Eating Index

The HEI provides an overall picture of the types and quantities of foods people eat, their compliance with specific dietary recommendations, and the variety in their diets. The total Index score is the sum of 10 dietary components, representing various aspects of a healthful diet, which are weighted equally (fig. 1). The maximum overall HEI score is 100.

- Components 1-5 measure the degree to which a person's diet conforms to the serving recommendations for the five major food groups of the USDA Food Guide Pyramid: grains (bread, cereal, rice, and pasta), vegetables, fruits, milk (milk, yogurt, and cheese), and meat (meat, poultry, fish, dry beans, eggs, and nuts).
- Component 6 measures total fat consumption as a percentage of total food energy (calorie) intake.
- Component 7 measures saturated fat consumption as a percentage of total food energy intake.
- Component 8 measures total cholesterol intake.
- Component 9 measures total sodium intake.
- Component 10 measures the variety in a person's diet.

An HEI score over 80 implies a "good" diet; a score between 51 and 80, a diet that "needs improvement"; and a score less than 51, a "poor" diet.[1] The HEI does not include a component for overconsumption of food. However, meeting the *Food Guide Pyramid* serving recommendations and dietary recommendations regarding fat and cholesterol typically should prevent overconsumption. People with a high HEI score have been found to have a low body mass index (BMI); conversely, people with a low HEI score have been found to have a high BMI (an indication of being overweight) (U.S. Department of Agriculture [USDA], 1995).

[1]In the initial HEI work, and in consultation with nutrition experts, Kennedy et al. (1995) developed this scoring system.

Food Group Components of the USDA Food Guide Pyramid

The USDA *Food Guide Pyramid* translates recommendations from the *Dietary Guidelines for Americans* into groups and amounts of foods people can eat to achieve a healthful diet (Dietary Guidelines Advisory Committee, 2000). The recommended number of *Food Guide Pyramid* servings depends on a person's caloric requirement. In developing the HEI, CNPP used serving recommendations from the *Food Guide Pyramid* for various age/gender groups. Pyramid serving recommendations for 1,600, 2,200, and 2,800 calories were used to interpolate serving recommendations for age/gender groups of children not described in the Pyramid. For grains, the recommended servings ranged from 6 to 7.8, depending on the child's age;

for vegetables, 3 to 3.7; for fruits, 2 to 2.7; for milk, 2 for all age groups; and for meat, 2 to 2.3 servings.

A maximum score of 10 was assigned to each of the five food group components of the HEI. Children whose diets met or exceeded the recommended number of servings for a food group received the maximum score of 10 points. For example, if a child's diet met serving recommendations for the fruit group, then his or her diet was awarded 10 points. For each of the five major food groups, a score of zero was assigned to the respective components if a child did not consume any item from the food group. Intermediate scores were computed proportionately to the number of servings consumed. For example, if the serving recommendation for a food group was four and a child consumed two servings, the component score was 5 points. Similarly, if three servings were consumed, a score of 7.5 was assigned.

The Recommended Energy Allowance (REA) for children 2 to 3 years of age is less than 1,600 kilocalories (National Research Council, 1989b). The recommended number of servings was kept at the minimal serving level for these children, but the serving size was scaled downward to be proportionate with their recommendations for food energy. This approach is consistent with *Food Guide Pyramid* guidance.[2]

To compute the scores for each of the five major food groups, CNPP used serving definitions that were intended to be as consistent as possible with the concepts and definitions described in the *Food Guide Pyramid* (USDA, 1996). These serving definitions reflect consistency with the underlying rationale in terms of nutrient contributions from each of the five major food groups and are also consistent with the Pyramid concept of defining servings in common household measures and easily recognizable units. The servings calculated for the HEI were based on the Pyramid servings database developed by the USDA's Agricultural Research Service.

When calculating the HEI, USDA researchers needed to assign the foods in mixtures, in the appropriate amounts, to their constituent food groups. Pizza, for example, can make significant contributions to several food groups, including grains, vegetables, milk, and meat. The approach used was a straightforward extension of the one used to estimate serving sizes. Commodity compositions of foods were identified; then commodities were assigned to appropriate food groups based on the gram/serving size factors that were calculated. Dry beans and peas were first assigned to the meat group if the recommendations for meat servings were not met, after which they were assigned to the vegetable group.

Fat and Saturated Fat Components

CNPP examined Index scores for fat and saturated fat intakes, that is, intake as a proportion of total food energy expressed as kilocalories. Total fat intake of 30 percent or less of total calories in a day was assigned a maximum score of 10 points, a percentage based on the recommendations of the 2000 edition of the *Dietary Guidelines for Americans.* Fat intake equal to, or greater than, 45 percent of total calories in a day was assigned a score of zero; intake between 30 and 45 percent was scored proportionately.

Saturated fat intake of less than 10 percent of total calories in a day was assigned a maximum score of 10 points. This percentage is also based on the recommendations of the 2000 edition of the *Dietary Guidelines for Americans.* Saturated fat intake equal to, or greater than, 15 percent of total calories in a day was assigned a score of zero; intake between 10 and 15 percent was scored proportionately. The upper limit percentages for fat (45 percent) and saturated fat (15 percent) were based on consultation with nutrition researchers and exploration of the distribution of the consumption of these components.

Cholesterol Component

The score for cholesterol was based on the amount consumed in milligrams per day, with an assigned score of 10 points when daily cholesterol intake was 300 milligrams (mg) or less. This amount is based on recommendations of the Committee on Diet and Health of the National Research Council and represents a consensus of experts in foods and nutrition, medicine, epidemiology, public health, and related fields (National Research Council, 1989a). A score of zero was assigned when daily intake reached a level of 450 mg or more, and intake between 300 and 450 mg was scored proportionately. The upper limit for cholesterol intake was based on consultation with nutrition researchers and exploration of the distribution of the consumption of this component.

Sodium Component

The score for sodium was based on the amount consumed in milligrams per day. A score of 10 points was assigned when daily sodium intake was 2,400 mg or less—the amount based on recommendations of the Committee on Diet and Health of the National Research Council (National Research Council, 1989a). Daily intake

[2]For more details on determination of *Food Guide Pyramid* serving definitions, estimation of food group serving requirements by age and gender, and design alternatives, the reader is referred to the 1994-96 HEI administrative report for the entire population (USDA, 1998).

of 4,800 mg or more received zero points, and intake between 2,400 and 4,800 mg was scored proportionately. Sodium intake, however, does not include salt added to a meal at the table. The upper limit for sodium intake was based on consultation with nutrition researchers and exploration of the consumption distribution of this component.

Variety Component

The Dietary Guidelines, the *Food Guide Pyramid*, and the National Research Council's diet and health report all stress the importance of variety in a diet. There is no consensus, however, on how to quantify variety. Thus, dietary variety was assessed by totaling the number of different foods in a day that a child ate that were in amounts sufficient to contribute at least one-half of a serving in a food group. Food mixtures were separated into their food ingredients and assigned to the appropriate food category. Foods that differed only by preparation method were grouped together and counted as one type of food. For example, baked, fried, or boiled potatoes were counted once. Different types of a food were considered to be a different food. For example, each type of fish—mackerel, tuna, and trout—was considered to be a different food.

A maximum variety score of 10 points was assigned if a child consumed, in a day, at least half a serving each of eight or more different types of foods. A score of zero was assigned if three or fewer different foods were consumed in a day by a child. Intermediate scores were computed proportionately. These upper and lower limit amounts to gauge food variety were based on consultation with nutrition researchers.[3]

[3]For more details on the coding structure used to compute the variety component of the HEI, the reader is referred to the 1994-96 HEI administrative report (USDA, 1998).

Data Used to Calculate the Healthy Eating Index

USDA's Supplemental Children's Survey of the 1994-96/98 Continuing Survey of Food Intakes by Individuals (CSFII) provides information on children's consumption of foods and nutrients and information about their demographic and socioeconomic characteristics. CNPP used these data to compute the HEI for children age 2 to 9. For the 1994-96/98 CSFII, dietary intakes of children were collected on 2 nonconsecutive days. Data on children's food intake were collected from the parent and/or caregiver (including daycare providers, baby-sitters, and teachers) through an in-person interview using the 24-hour dietary recall method. The survey was designed to be representative of the U.S. population of children living in households. Weights were used to ensure that the sample was representative of all U.S. children.

The HEI was computed for children with complete food intake records for the first day of the survey: this allows for comparisons across the years. Prior research has indicated that food intake data based on 1 day provide reliable measures of usual intakes of groups of people (Basiotis et al., 1987). The final sample size was 7,177 children.

Results

Few Children Had Good Diets

Most young children (81 percent) had diets that needed improvement or were poor (fig. 2). Less than one-fifth (19 percent) of children had good diets. Although most children had diets that needed improvement, most children met the Recommended Dietary Allowance (RDA) for many essential nutrients (USDA, 1999). However, unlike the HEI, the RDAs do not assess

Less than one-fifth (19 percent) of children had good diets.

recommended food servings, fat intake, or food variety.

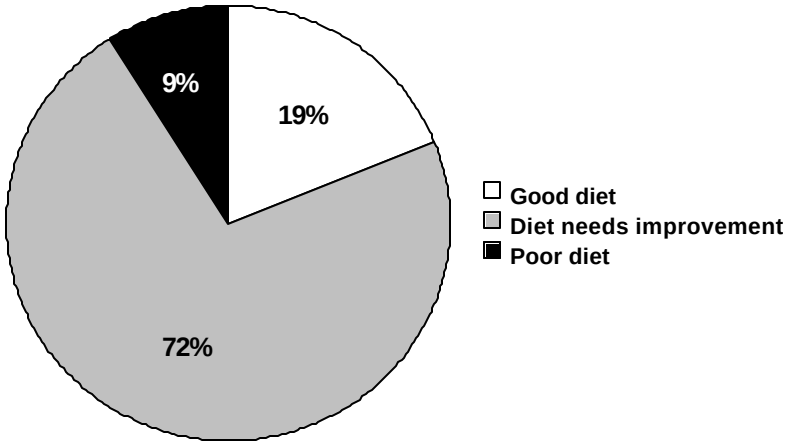
Children's scores were best on the cholesterol component: 82 percent of children met the cholesterol recommendation (fig. 3). For each of the other nine HEI components, less than half of the children met the recommendations. Children had the lowest score on the meat component: only 18 percent met the meat recommendation. The result for the meat component may seem surprising given this food group includes meat alternates such as peanut butter and eggs. Only 22 percent of children met the vegetable recommendation, 29 percent met the saturated fat recommendation, and 33 percent met the fruit recommendation. Hence, there is much room for improvement in children's diets for most HEI components.

Overall Diet Quality Varied by Sociodemographic Characteristics

The quality of children's diets varied significantly based on their socio-demographic characteristics: age, gender, household income, food stamp receipt, food sufficiency, and residency (table 1).

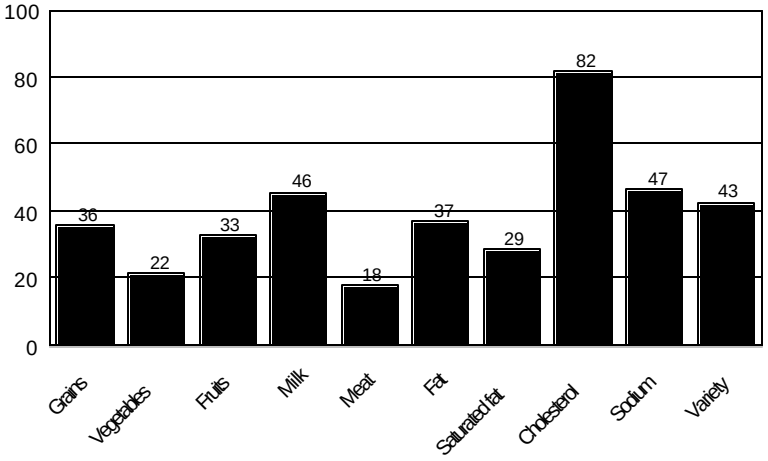
Compared with their respective counterparts, younger children, boys, and children living in suburban areas had a better diet. Over one-third (34 percent) of children age 2 to 3 had a good diet; whereas, only 16 percent of 4- to 6-year-olds and 13 percent of 7- to 9-year-olds had a good diet. Twenty percent of boys versus 18 percent of girls had a good diet, and 21 percent of suburban children, compared with 16 percent of their nonmetro counterparts, had intakes that resulted in having a good diet.

Figure 2. The quality of young children's diets



Data source: Supplemental Children's Survey of the 1994-96/98 Continuing Survey of Food Intakes by Individuals.

Figure 3. Percentage of young children meeting the dietary recommendation of the Healthy Eating Index components



Data source: Supplemental Children's Survey of the 1994-96/98 Continuing Survey of Food Intakes by Individuals.

Family resources were associated with the quality of children's diets. Children had worse diets if they were in households (1) with a low income (defined as before-tax income below 130 percent of the poverty threshold), (2) that received food stamps, and (3) who categorized themselves as food insufficient (defined as sometimes or often not having enough food to eat). Sixteen percent of children in low-income households and 16 percent in house-holds receiving food stamps had a good diet, compared with 20 percent of children in non-low-income households and 20 percent of children in house-holds not receiving food stamps. Eighteen percent of children in food-insufficient households

Table 1. The quality of young children's diets, by sociodemographic characteristics

Characteristic	Good diet	Diet needs improvement	Poor diet
		Percent	
Age (years)			
2 - 3	34[a]	60[a]	6[a]
4 - 6	16[b]	74[b]	10[b]
7 - 9	13[c]	78[b]	9[b]
Gender			
Boy	20[a]	70[a]	10
Girl	18[b]	74[b]	8
Race			
White	19	73	8
Non-White	18	72	10
Ethnicity			
Hispanic	18	74	8
Non-Hispanic	19	72	9
Household type			
Dual-headed	19	73	8
Single-headed	18	73	9
Household income			
Low-income	16[a]	73	11[a]
Non-low-income	20[b]	72	8[b]
Food stamp receipt			
Yes	16[a]	73	11
No	20[b]	72	8
Food sufficiency			
Sufficient	19	73	8[a]
Not sufficient	13	69	18[b]
Residency			
Central city	19	71	10
Suburb	21[a]	72	7[a]
Nonmetro	16[b]	73	11[b]

Note: Column percentages by characteristic with different superscripts are significantly different at the .05 level.
Data source: Supplemental Children's Survey of the 1994-96/98 Continuing Survey of Food Intakes by Individuals.

had a poor diet, compared with 8 percent of children in food-sufficient households. These results indicate that financial resources and diet quality have a positive relationship. There was no significant difference in overall diet quality among children based on their race, ethnicity, and household type (dual-headed vs. single-headed).

Obtaining the Maximum Score on the HEI Components Also Varied by Sociodemographic Characteristics

A significantly greater percentage of children age 2 to 3, compared with children age 7 to 9, obtained the maximum score (meaning they met the dietary recommendation) for grains (54 vs. 31 percent), vegetables (31 vs. 20 percent), fruits (57 vs. 20 percent), meat (28 vs. 16 percent), sodium (64 vs. 33 percent), and variety (50 vs. 41 percent) (table 2). The milk component was the only one for which a significantly greater percentage of children age 7 to 9, compared with children age 2 to 3, met the dietary recommendation (49 vs. 44 percent).

A significantly greater percentage of boys than girls met the dietary recommendation for grains (40 vs. 32 percent), milk (49 vs. 44 percent), and meat (21 vs. 16 percent). A significantly higher percentage of girls than boys met the dietary recommendation for cholesterol (85 vs. 79 percent) and sodium (52 vs. 43 percent).

Although there was no significant difference in overall diet quality among children by race, ethnicity, and household type, there were significant differences in the percentage of children obtaining a maximum score on the various HEI components by these characteristics. A significantly greater percentage of non-White children than White children met the dietary recommendation for vegetables (25 vs. 20 percent) and meat (24 vs.16 percent). A lower percentage of non-White children than White children met the dietary recommendation for milk (40 vs. 49 percent), saturated fat (26 vs. 30 percent), and cholesterol (78 vs. 83 percent). The higher prevalence of lactose intolerance among non-White children is likely the reason fewer of these children met the milk recommendation.

By ethnicity, a significantly lower percentage of Hispanic than non-Hispanic children met the cholesterol recommendation (73 vs. 83 percent). By household type, a greater percentage of children in dual-headed households than single-headed households met

Table 2. Young children meeting the dietary recommendation of the Healthy Eating Index components, by sociodemographic characteristics

	Grains	Vegetables	Fruits	Milk	Meat	Fat	Saturated fat	Cholesterol	Sodium	Variety
					Percent					
Age (years)										
2 - 3	54[a]	31[a]	57[a]	44[a]	28[a]	40	28	83	64[a]	50[a]
4 - 6	28[b]	17[b]	31[b]	45[ab]	14[b]	38	28	82	50[b]	40[b]
7 - 9	31[b]	20[b]	20[c]	49[b]	16[b]	36	30	80	33[c]	41[b]
Gender										
Boy	40[a]	22	34	49[a]	21[a]	37	27	79[a]	43[a]	44
Girl	32[b]	21	32	44[b]	16[b]	38	31	85[b]	52[b]	42
Race										
White	37	20[a]	33	49[a]	16[a]	38	30[a]	83[a]	48	43
Non-White	34	25[b]	34	40[b]	24[b]	36	26[b]	78[b]	45	43
Ethnicity										
Hispanic	32	26	37	48	20	34	28	73[a]	54	46
Non-Hispanic	36	21	33	46	18	38	29	83[b]	47	43
Household type										
Dual-headed	36	21[a]	34	47	17[a]	39[a]	31[a]	83[a]	48[a]	43
Single-headed	33	26[b]	31	44	25[b]	32[b]	23[b]	78[b]	43[b]	43
Household income										
Low-income	33	23	30[a]	45	25[a]	31[a]	22[a]	75[a]	45	40
Non-low-income	37	21	35[b]	47	16[b]	40[b]	32[b]	85[b]	48	44
Food stamp receipt										
Yes	34	23	31	44	27[a]	31[a]	20[a]	74[a]	42[a]	43
No	36	21	34	47	17[b]	39[b]	31[b]	83[b]	48[b]	43
Food sufficiency										
Sufficient	36	22	33	46	18	38	29	82[a]	47	43
Not sufficient	35	17	31	47	22	28	22	70[b]	56	35
Residency										
Central city	36[ab]	21	34[a]	45	19	36[a]	28[a]	81	46	43[ab]
Suburb	37[a]	21	37[a]	48	17	42[b]	32[b]	83	48	45[a]
Nonmetro	32[b]	26	24[b]	43	21	29[c]	25[a]	82	46	38[b]

Note: Column percentages by characteristic with different superscripts are significantly different at the .05 level.
Data source: Supplemental Children's Survey of the 1994-96/98 Continuing Survey of Food Intakes by Individuals.

the dietary recommendation for fat (39 vs. 32 percent), saturated fat (31 vs. 23 percent), cholesterol (83 vs. 78 percent), and sodium (48 vs. 43 percent). A lower percentage of children in dual-headed households than single-headed households met the dietary recommendation for vegetables (21 vs. 26 percent) and meat (17 vs. 25 percent).

As for children in low-income households, compared with children in non-low-income households, a significantly lower percentage met the dietary recommendation for fruits (30 vs. 35 percent), fat (31 vs. 40 percent), saturated fat (22 vs. 32 percent), and cholesterol (75 vs. 85 percent). A higher percentage of children in low-income households met the dietary

recommendation for meat (25 vs. 16 percent). Almost similar results were observed with children in households receiving food stamps, compared with children in households not receiving food stamps. This was expected because only low-income families qualify for food stamps.

By food sufficiency, the only significant difference between children in food insufficient households and food sufficient households was in terms of cholesterol. Fewer children in food insufficient households, compared with their counterparts, met the cholesterol recommendation (70 vs. 82 percent). By residency, a significantly greater percentage of children residing in suburbs obtained a maximum score for grains, fruits, fat, saturated fat, and variety than did their counterparts in central cities or nonmetro areas.

Conclusion

As indicated by the HEI, the diets of most young children (age 2 to 9) need substantial improvement to meet dietary recommendations—children are not eating according to the *Dietary Guidelines for Americans* and the *Food Guide Pyramid*.

The HEI was first computed by using 1989 food consumption data. It is, therefore, possible to compare the scores for children age 2 to 9 in 1989 and 1994-96/98. Although the method of calculating the milk and variety component scores of the HEI has changed between the two periods, comparisons based on average scores may be made. The overall HEI score for young children has not changed significantly between the two periods—about 70 points in both periods—indicating a diet that needs improvement.

Nutrition promotion activities need to focus on improving the quality of children's diets. It is important for children to eat healthfully to ensure adequate growth and development as well as to help lay the foundation for healthful eating behaviors throughout life. Encouraging these behaviors needs to be a shared responsibility—where health professionals, families, and communities work together to make a difference in the quality of children's diets.

The Federal Government created the *Dietary Guidelines for Americans*, the *Food Guide Pyramid*, the *Food Guide Pyramid for Young Children 2 to 6 Years Old*, and the Nutrition Facts label. Using these tools, health professionals can help busy families—of diverse incomes and ethnic backgrounds—select foods for optimal nutrition and show them how to fit nutritious meals and snacks into hectic schedules. Likewise, health professionals can work with schools, parent associations, and community agencies to discuss nutrition issues and concerns and develop activities to best promote healthful eating by America's children.

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Dietary Guidance, 1970 to 1999: Does the U.S. Food Supply Support It?

Shirley A. Gerrior, PhD, RD
Lisa Bente, MS, RD

U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

Scientific research confirms increasingly that a healthful diet reduces the risk of developing chronic diseases such as heart disease, certain types of cancer, and osteoporosis. Research has also confirmed that healthful diets play a major role in reducing the risk of developing other diseases such as diabetes, hypertension, and obesity. Federal dietary guidance as outlined in the *Dietary Guidelines for Americans* (U.S. Department of Agriculture [USDA] & U.S. Department of Health and Human Services [DHHS], 2000), which is depicted in the *Food Guide Pyramid* (USDA, 1996) and conveyed by nutrient recommendations, is intended to help consumers choose a diet that promotes health, meets their nutritional needs, and reduces the risk for chronic diseases.

The Federal Government and others (including the food industry) have worked conscientiously through nutrition education efforts, as well as food and nutrition policy and implementation, to encourage healthful eating by promoting eating patterns that conform to Federal recommendations. The Federal Government also has established policy to improve the nutritional composition of food by fortifying and enriching it. The food industry has responded to this policy by providing consumers with a variety of enriched bread and cereal products and fortified juices and dairy foods. In turn, nutrition education efforts emphasize the importance of foods such as these as components of a healthful diet, along with regular physical activity, to achieve a healthy lifestyle.

Estimates of the food supply have contributed to the Federal dietary guidance system by providing important information on the healthfulness of the diet over time. With the release in 1980 of the first edition of the *Dietary Guidelines for Americans* (USDA & DHHS, 1980), its subsequent updates (USDA & DHHS, 1985, 1990, 1995, 2000) (see box), and the 1992 release of the *Food Guide Pyramid*, nutrient estimates of the food supply have been used to assess the potential of the food supply to support this guidance.

What we also have found is that the variety and types of food in the U.S. food supply of the 1970's, 80's, and 90's parallel eating practices of consumers. Changes in these practices over the years have been influenced by several factors: increased ethnic diversity, more elderly consumers, and an effective Federal nutrition policy. Consistent with this nutrition policy, the 1970 to 1999 marketplace saw an increase in the amounts and variety of available grain products, vegetables, fruits, leaner meats, and lowfat dairy products. Despite increased consumer awareness of nutrition and more healthful food options, the availability of caloric sweeteners and fats and oils in the food supply also increased to record high amounts—each by a third more per capita in 1999 than in 1970.

The purpose of this research was to translate food estimates of the food supply into Pyramid servings to determine whether the U.S. food supply supported the tenets of Federal dietary guidance from 1970 to 1999. The 1970 Pyramid serving estimates function as baseline data prior to the release of the 1980 *Dietary Guidelines for Americans.*

Changes in the *Dietary Guidelines for Americans*, 1980 to 2000

1980	1985	1990	1995	2000
Eat a variety of foods	Eat a variety of foods	Eat a variety of foods	Eat a variety of foods	Let the Pyramid guide your food choices
Maintain ideal weight	Maintain desirable weight	Maintain healthy weight	Balance the food you eat with physical activity—maintain or improve your weight	Aim for a healthy weight Be physically active each day
Avoid too much fat, saturated fat, and cholesterol	Avoid too much fat, saturated fat, and cholesterol	Choose a diet low in fat, saturated fat, and cholesterol	Choose a diet low in fat, saturated fat, and cholesterol	Choose a diet that is low in saturated fat and cholesterol and moderate in total fat
Eat foods with adequate starch and fiber	Eat foods with adequate starch and fiber	Choose a diet with plenty of vegetables, fruits, and grain products	Choose a diet with plenty of grain products, vegetables, and fruits	Choose a variety of grains daily, especially whole grains Choose a variety of fruits and vegetables daily
Avoid too much sugar	Avoid too much sugar	Use sugars only in moderation	Choose a diet moderate in sugars	Choose beverages and foods to moderate your intake of sugars
Avoid too much sodium	Avoid too much sodium	Use salt and sodium only in moderation	Choose a diet moderate in salt and sodium	Choose and prepare foods with less salt
If you drink alcohol, do so in moderation	If you drink alcoholic beverages, do so in moderation	If you drink alcoholic beverages, do so in moderation	If you drink alcoholic beverages, do so in moderation	If you drink alcoholic beverages, do so in moderation
				Keep food safe to eat

Source: USDA and DHHS, Nutrition and Your Health: Dietary Guidelines for Americans, 1980, 1985, 1990, 1995, 2000.

Methods

Data Source

Food and nutrient estimates of the food supply were calculated by the USDA's Center for Nutrition Policy and Promotion (CNPP). CNPP used information provided by the Economic Research Service (ERS) and Agricultural Research Service (ARS), also of the USDA. ERS calculates annually the amount of food available for consumption on a per capita basis in the United States. These data measure national consumption of several hundred basic commodities. For most commodity categories, the available food supply is measured as the sum of annual production, beginning inventories, imports minus exports, farm and nonfood uses, and end-of-the-year inventories. Per capita consumption is calculated by dividing the available food supply by the total U.S. population as of July 1 each year.

ARS develops and maintains food composition data used to estimate the nutrients in the food supply. Data used in this research were obtained from the Primary Nutrient Data Set (PDS), which contains about 3,000 foods and their nutrient profiles and USDA's Nutrient Database for Standard Reference 13. Per capita consumption for each commodity is multiplied by the amount of food energy and each of 28 nutrients and dietary components in the edible portion of the food. Results are totaled

Table 1. Change in selected food commodities available for consumption in the U.S. food supply, 1970 and 1999

Commodity	1970	1999	Percentage change
	----- *Pounds per capita* -----		
Grains and cereals	142	200	+41
Fruits and fruit juices	177	232	+31
Vegetables and vegetable juices	279	302	+8
Legumes, nuts, and soy	17	21	+24
Lean meat	36	101	+180
Poultry	48	95	+98
Lowfat and skim milks	48	131	+173
Sugars and sweeteners	122	158	+30
Fats and oils	56	73	+30

By 1999 the food supply provided two-fifths more grains; about one-third more fruits and fruit juices; . . . than it did in 1970.

and converted to amount per capita per day. Commercially added nutrients to certain commodities (through fortification and enrichment) are also included in the nutrient content of the food supply. Because food supply data represent the disappearance of food into the marketing system, per capita consumption and nutrient estimates typically overstate the amount of food and nutrients people actually consume.

Estimates of Pyramid Servings

ERS has developed a method to adjust food supply data for losses and to express the data as serving recommendations based on the *Food Guide Pyramid* (Kantor, Lipton, Manchester & Oliveira, 1997; Kantor, 1998). This translation expands the usefulness of food supply data: serving estimates of the Pyramid allow researchers and policymakers to gauge the availability of food in terms of current dietary guidance and Americans' progress in following the Guidelines. Using the method developed by ERS, CNPP estimated Pyramid servings of the 1970 to 1999 food supply for more than 250 agricultural commodities. These estimates show that since 1970, the number of servings from the grain, vegetable, and fruit groups moved closer to the serving recommendations of the Pyramid. Despite this positive movement, food supply data did not always match serving recommendations for the five major Pyramid food groups. In some cases, the mix of foods within a food group often failed to meet recommendations for variety within food subgroups.

Results

Between 1970 and 1999 the foods that were available for consumption in the U.S. food supply changed (table 1). By 1999 the food supply provided two-fifths more grains; about one-third more fruits and fruit juices; 8 percent more vegetables and vegetable juices; and one-fourth more legumes, nuts, and soy products per capita than it did in 1970. Also, the percentage of change in the availability of lean meat and lowfat dairy products was substantial: 180 and 173 percent, respectively, between 1970 and 1999. The change in the availability of caloric sugars/sweeteners and fats/oils was 30 percent each.

Pyramid Serving Estimates of the Food Supply

From 1970 to 1999, changes in estimates of *Food Guide Pyramid* servings in the

food supply were positive for most major food categories, with the largest change occurring in grains and cereals and the lowest in total fruits (table 2). Pyramid serving estimates for one major category—total dairy products—declined over the years, with a decrease in fluid milk consumption contributing to that decline.

Table 2. Estimates of Food Guide Pyramid servings in the U.S. food supply, 1970 and 1999

Commodity	1970	1999
	------ *Number of servings*[1]-----	
Grains and cereals	6.9	9.4
Total vegetables	3.3	3.8
Other vegetables	1.5	1.6
White potatoes	1.1	1.3
Tomatoes and tomato products	0.4	0.4
Dark-green, deep-yellow vegetables	0.3	0.4
Total fruits	1.1	1.4
Noncitrus fruits and juices	0.6	0.8
Citrus fruits, berries, melons, and juices	0.5	0.6
Total dairy products	1.8	1.7
Fluid milk and frozen dairy	1.3	0.9
Cheese	0.2	0.5
Meat and meat alternates	3.2	3.6

[1]The sum of individual items within a category may not equal the total for that category because of rounding.

Grains

In 1999 the food supply provided an estimated 9.4 daily Pyramid servings of grains (flours, cereals, rice, and pasta) (fig. 1, table 2). This increase in total daily servings (2.5) from 1970 suggests that many consumers were more aware in 1999 of the importance of grains in their diet than they were before the release of the Guidelines and the Pyramid. The 2000 Guidelines emphasize the intake of whole grains (see box).

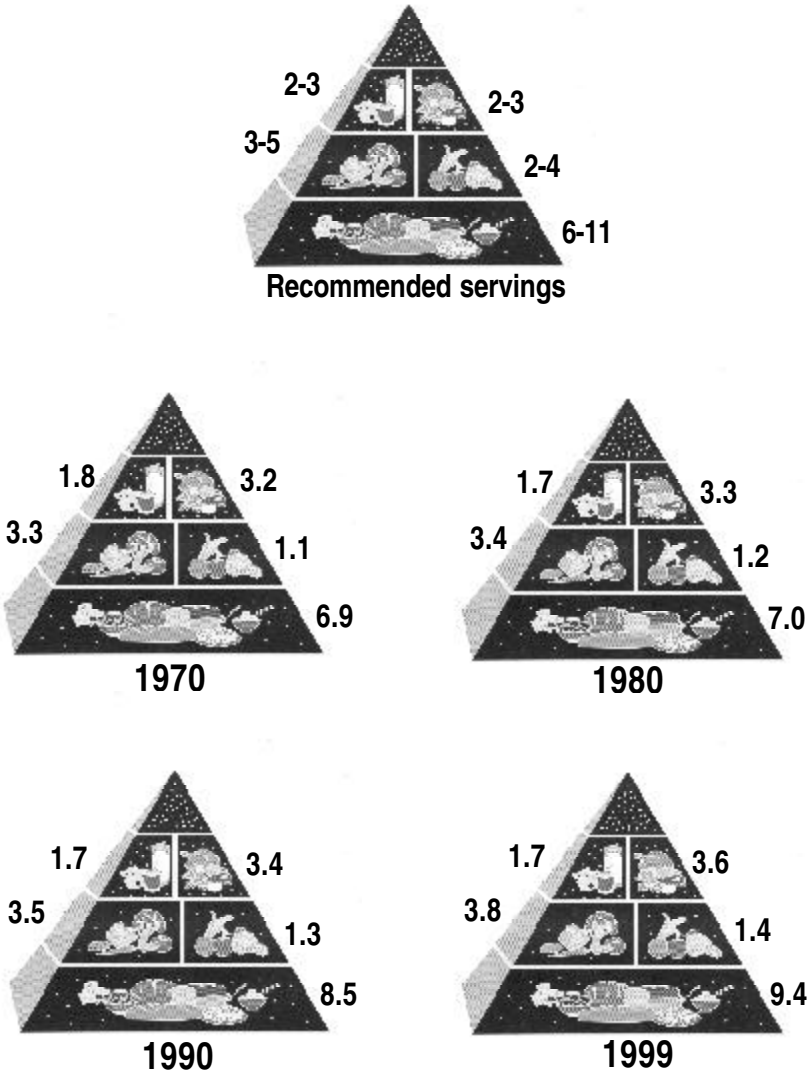
Food supply data on whole grains are somewhat limited: they do not accurately capture whole grain items, such as wheat bran, wheat germ, wheat berries, and products manufactured from these items. Also, of the total white and wheat flour in the food supply, less than 2 percent is counted. Thus the contribution of whole grains in the American diet is underestimated. Despite this, the intake of whole grains by Americans falls short of serving recommendations.

Data from USDA's Continuing Survey of Food Intakes by Individuals (CSFII 1994-96) showed that average consumption of whole grain-based foods was about 1 serving per day, compared with the recommendation of 3 servings (USDA, 1997). Not only are people eating fewer whole grain products than they should, but they also are eating grain products high in fats, oils, and added sugars (e.g., donuts, sweet pastries, and presweetened cereals). To meet the recommendation for whole grains better—as well as those for total fat, saturated fat, cholesterol, and dietary fiber—consumers may need to change the types and mix of grain products they consume.

Vegetables

Pyramid servings for vegetables provided by the food supply increased by about one-half serving, or 15 percent, from 1970 to 1999. In 1999 the food supply provided 3.8 servings of vegetables daily. While the number of vegetable servings provided by the food supply met the minimal recommendation of 3 servings daily, five vegetables dominated the mix of vegetables in the food supply: white potatoes, iceberg lettuce, tomatoes, onions, and carrots. Lettuce and onions, categorized in the food supply as "other vegetables," provided 1.6 Pyramid servings, accounting for 42 percent of the total vegetable servings. White potatoes accounted for 34 percent (1.3 servings) of the estimated total vegetable serving, reflecting Americans' increased use of frozen and processed potatoes. Tomatoes and tomato products accounted for 12 percent (0.4 servings) of the total vegetable servings in the food supply in 1970 and 11 percent in 1999. Despite increases in broccoli and carrots in the food supply, dark-green and deep-yellow vegetables, respectively, accounted for only 11 percent (0.4 servings) of the total vegetable servings (table 2). Vegetable shortfalls, based on the food supply, are a concern because of the positive association between vegetable intake and health. Vegetables provide essential vitamins and minerals, fiber, and other substances that are important to good health.

Figure 1. Food Guide Pyramid serving recommendations versus estimated servings available in the U.S. food supply, by selected years



Fruits

Estimates of Pyramid servings for fruit in the 1970 to 1999 food supply increased by almost one-third serving (27 percent). In 1999 the food supply provided 1.4 servings of fruit daily. Of total fruit servings, noncitrus fruits and juices made up 57 percent (0.8 servings); citrus fruits, berries, melons, and their juices, 43 percent (0.6 servings).

Milk Products

The U.S. food supply database provides data for available Pyramid servings and nutrients related to milk and milk products. In the 1999 food supply, milk and milk products provided only 1.7 Pyramid servings of the 2 to 3[1] recommended daily milk servings—a slight drop from 1.8 servings provided by the 1970 food supply. From 1970 to 1999, servings from fluid milk-based products (milks, dairy desserts, and yogurts) decreased by 0.4 servings and those from cheese increased by 0.3 servings daily. The decrease in fluid milk-based products is a concern, because dairy foods are the primary source of calcium in the U.S. food supply, accounting for 72 percent of the calcium available in the food supply in 1999 (data not shown). Although many dairy foods are naturally high in fat and saturated fat, many more skim and lowfat fluid milk products were available in the food supply in 1999 than in 1970. Consumption of fluid milk was less than 1 serving daily in 1999.

Consumption of cheese, which is naturally high in fat and saturated fat, increased in 1999 to one-half serving daily. A number of lowfat and skim milk products are available to the consumer, and many Americans shifted from whole milk to lowfat milk products as a means to lower intakes of total fat, saturated fat, and cholesterol. The use of dairy foods in 1999, nonetheless, was less than optimal for a nutritious diet and good health.

Meat and Meat Alternates

The 1999 estimates of daily food supply Pyramid servings for the meat and meat alternates group (meat, poultry, fish, dry beans, eggs, and nuts) was 3.6, a level above the recommendation of 2 to 3 servings (equivalent to 5 to 7 ounces of cooked meat). Beef and pork cuts in the 1990's were significantly leaner than they were in 1980, and a wider selection of lean cuts was available in the marketplace (Gerrior & Bente, 2001). Also, U.S. food supply database estimates of the 1970 to 1999 food supply Pyramid servings for dry beans, peas, and lentils increased by almost 50 percent. This increase provides consumers with low-cost and lowfat

[1]The serving recommendation is based on gender and age category; for example, the higher serving recommendation is for pregnant and lactating women, teenagers, and older adults.

alternatives to meat, poultry, or fish selections.

Other Foods

From 1970 to 1999 the availability of sugars/sweeteners and fats/oils increased by almost one-third to record- high amounts: 154 and 73 pounds per capita, respectively (table 1). A large share of the increase came from sugar and fat added to foods such as from soft drinks, cakes, cookies and pies, fruit ades, and rich dairy desserts. Estimates of food supply Pyramid servings are not available for sugars/ sweeteners and fats/oils.

Discussion

Estimates of food supply Pyramid servings indicate that the food supply failed in 1999 to provide the minimal number of daily Food Guide Pyramid servings of fruits and dairy products, a failure that limits the availability of these foods to the consumer. Despite these barriers to healthful eating, if the American consumer followed dietary guidance more exactly, the resulting demand for healthful foods should lead to more meaningful changes in the mix of foods available for purchase and could result in improvement in the overall quality of the American diet.

With the release of the *Dietary Guidelines for Americans, 2000* (USDA & DHHS, 2000), the food supply is further challenged to provide a variety of grains, vegetables, and fruits, while limiting foods high in sugars and added fat. Compared with previous versions of the Guidelines, the 2000 edition places greater emphasis on—and makes more explicit recommendations for—particular nutrients and foods. For example, recommendations for fat intake differentiate among total fat, saturated fat, and cholesterol. This particular guideline advises Americans to choose a diet that is low in saturated fat and cholesterol and moderate in total fat. Americans also are advised to include a variety of grains (including more whole grains) in their diet, as well as include more variety within the vegetable and fruit groups. Concern about added sugar from beverages and foods is reflected in the guidance to moderate intake of sugars. Based on this new guidance, the food supply of the 2000's must provide an ample supply and variety of grains (especially whole grains), a variety of vegetables and fruits, fat-free and lowfat dairy foods, and lean meats and meat alternates. The food supply must also curtail excess production of foods high in sugars and added fat.

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Insight 20
October 2000

Consumption of Food Group Servings: People's Perceptions vs. Reality

P.P. Basiotis, PhD
Mark Lino, PhD
Julia M. Dinkins, PhD

U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

How accurate are people at remembering what they eat on an average day? Very accurate? Fairly accurate? Or just plain wrong? This *Nutrition Insight* helps answer those questions. We compared the average number of servings people estimate *usually* consuming on an average day from the five major food groups (grains; fruits; vegetables; milk products; and meat, poultry, fish, dry beans, eggs, and nuts) and fats, oils, and sweets with the average number of servings estimated from records of what they eat over a 14-day period.

We also compared "usual" and actual consumption with serving recommendations based on the USDA Food Guide Pyramid. The Pyramid translates nutritional recommendations from the *Dietary Guidelines for Americans* and the Recommended Dietary Allowances (RDAs) into the number of servings of the five major food groups a person should consume for a healthful diet. The Pyramid suggests servings for people with varying levels of caloric (energy) intake. With the exception of the milk products group, we set serving recommendations for six gender/age groups based on the energy RDA for each group.

We used data from Market Research Corporation of America (MRCA) Information Services. MRCA conducts a continuous sampling program by using a multistage stratified random design to identify participants for its National Consumer Panel. Households are selected based on demographic criteria matched to the U.S. Census.

For this Insight, we used information from 5,752 adults in these households for the 1992-94 period. This information includes their gender and age. It also includes their estimates or perceptions of usual daily servings consumed of grains; fruits; vegetables; milk products; meat, poultry, fish, dry beans, eggs, and nuts; and fats, oils, and sweets as well as their consumption from these food groups, based on detailed diaries of what foods were eaten over a 14-day period. However, portion sizes (quantities) eaten were estimated from data in national surveys of average serving sizes consumed by various gender/age groups.

For most food groups, the food servings in the MRCA data were estimated according to USDA Food Guide Pyramid recommendations. The exception was for milk products where MRCA serving measures were lower than Pyramid measures. Also, the amount of vegetables in vegetable chips, such as potato chips, was not added to vegetable consumption.

The Food Pyramid does not provide serving sizes or recommendations for fats, oils, and sweets. MRCA measured a serving of these foods as 1 teaspoon of butter or margarine, 12 ounces of carbonated soft drink, 1 teaspoon of sugar, 1 ounce of potato chips, 1 tablespoon of salad dressing, or 1 teaspoon of jam or jelly.

Food group servings: Perceived, average daily consumed, and recommended* by gender/age group

	Grains	Fruits	Vegetables	Milk	Meat, etc.	Other (fats, oils, and sweets)
Females 19-24						
Perceived	3.2	2.6	2.6	3.2	3.5	2.2
Consumed	4.2	0.8	1.7	1.2	1.6	3.0
Recommended	9.0	3.0	4.0	2.0	2.4	Use sparingly
Females 25-50						
Perceived	2.9	2.2	2.5	2.3	3.0	2.1
Consumed	4.6	0.8	2.0	1.0	1.7	3.2
Recommended	9.0	3.0	4.0	2.0	2.4	Use sparingly
Females 51+						
Perceived	2.5	2.4	2.6	2.1	2.7	1.6
Consumed	4.7	1.5	2.2	1.0	1.7	3.1
Recommended	7.4	2.5	3.5	3.0	2.2	Use sparingly
Males 19-24						
Perceived	2.9	2.1	2.2	3.1	3.7	2.1
Consumed	5.5	0.6	2.3	1.6	2.3	4.1
Recommended	11.0	4.0	5.0	2.0	2.8	Use sparingly
Males 25-50						
Perceived	2.9	2.2	2.4	2.2	3.4	2.1
Consumed	5.9	0.9	2.5	1.2	2.5	4.0
Recommended	11.0	4.0	5.0	2.0	2.8	Use sparingly
Males 51+						
Perceived	2.7	2.2	2.5	2.1	3.1	1.7
Consumed	6.2	1.3	2.7	1.1	2.4	4.5
Recommended	9.1	3.2	4.2	3.0	2.5	Use sparingly

*Recommended servings based on energy RDA for gender/age groups.

Grains

All gender/age groups perceived they consumed fewer grain servings (2.5 to 3.2) daily than what they actually ate (4.2 to 6.2) (see table). Although all gender/age groups' actual consumption of grains per day was above what they believed, it was still below the Pyramid recommendations. For example, females ages 19 to 50 consumed 4.2 to 4.6 servings of grains per day: for them, the recommendation is 9 servings, based on their energy RDA.

Fruits

On average, each gender/age group perceived it consumed more fruit servings daily than what was actually the case. Males ages 19 to 50 believed they consumed 2.1 to 2.2 servings of fruit on a given day. Based on their food diaries, they actually consumed less than 1 serving per day. Since the recommendation for males ages 19 to 50 is 4 servings of fruit each day, based on their energy RDA, their actual daily consumption of fruit was below their perceptions as well as the recommendations. This held across all other gender/age groups—adults consume less fruit servings than they think and much less than is recommended.

Vegetables

Adult females perceived they consumed more vegetable servings per day than they actually consumed: 2.5 to 2.6 (perceived) versus 1.7 to 2.2 (actual). Adult males, on the other hand, believed they consumed slightly less vegetable servings per day than they actually consumed: 2.2 to 2.5 (perceived) versus 2.3 to 2.7 (actual). Both women's and men's daily vegetable consumption was below the recommendation for their respective gender/age group—3.5 to 5 servings a day.

Milk Products

All gender/age groups perceived their usual daily milk servings to be far more than what they actually consumed. They thought they consumed, on average, 2.1 to 3.2 servings of milk products per day. Their food diaries indicated they consumed 1 to 1.6 servings per day. For most groups, what they actually consumed of milk products was about half the amount they thought they consumed.

Milk consumption per day was also below Pyramid recommendations for all gender/age groups. Given that the MRCA serving measures for milk are below the Pyramid measures, actual milk consumption per day is even further below Pyramid recommendations.

Meat

All gender/age groups perceived their usual daily servings of meat, poultry, fish, dry beans, eggs, and nuts to be more than what they actually consumed. They thought they consumed 2.7 to 3.7 servings, but their food diaries indicated they consumed 1.6 to 2.5 servings per day. Meat consumption per day was below Pyramid recommendations. For example, females ages 19 to 50 consumed 1.6 to 1.7 servings of meat per day; the recommendation for this group is 2.4.

Other Foods (Fats, Oils, and Sweets)

Each gender/age group perceived its average daily servings of fats, oils, and sweets to be far less than what was actually consumed: 1.6 to 2.2 (perceived) versus 3.0 to 4.5 (actual).

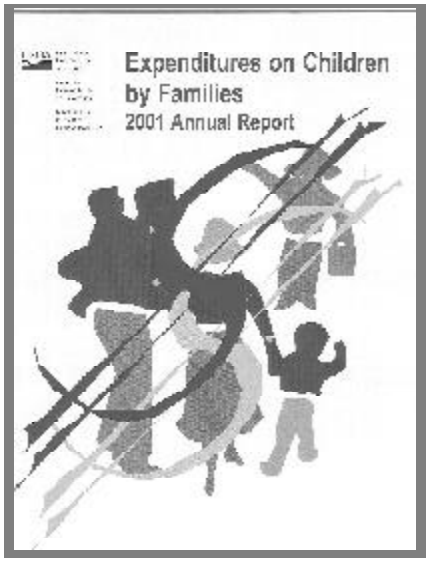
The Food Guide Pyramid does not specify the number or size of servings of these other foods a person should consume. It only recommends that people consume these foods sparingly. Based on this analysis, it does not appear that people are consuming these foods sparingly.

Conclusion

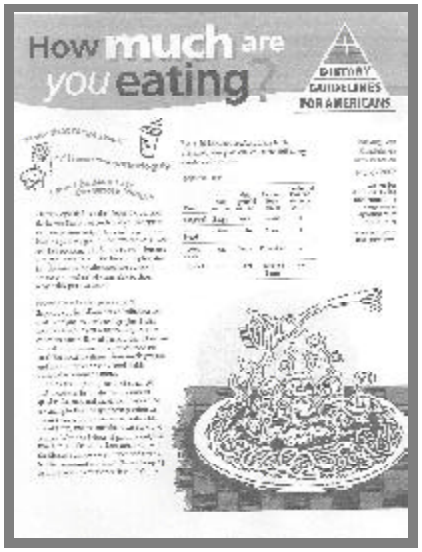
People's perceptions of their food group consumption are very different from their actual consumption, based on diaries. Adults underestimated their consumption of servings of grains, as well as servings of fats, oils, and sweets. They overestimated their consumption of fruit; milk products; and meat, poultry, fish, dry beans, eggs, and nuts servings. The only exception was for vegetable servings by males. The difference between what people thought they ate and the number of servings they consumed may be the result of their not understanding what constitutes a serving. Nutrition education needs to focus on explaining to people what constitutes a serving for the various food groups and how to estimate the number of servings they eat.

New Publications
from the
Center for Nutrition Policy and Promotion

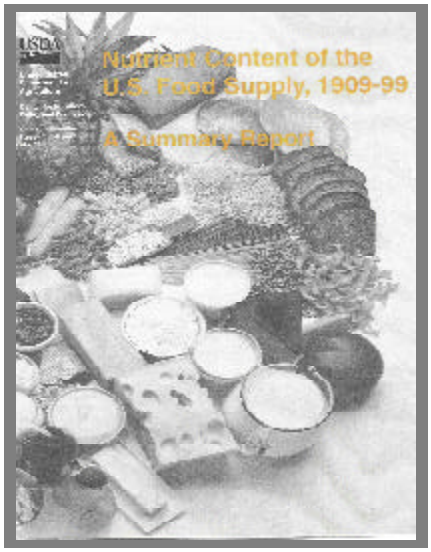
Expenditures on Children by Families: 2001 Annual Report



How much are you eating?
Home and Garden Bulletin No. 267-1



Nutrient Content of the U.S. Food Supply, 1909-99 A Summary Report
Home Economics Research Report No. 55



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Insight 22
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Serving Sizes in the Food Guide Pyramid and on the Nutrition Facts Label: What's Different and Why?

David Herring, MS
Patricia Britten, PhD
Carole Davis, MS, RD
Kim Tuepker, BS

U.S. Department of Agriculture
Center for Nutrition Policy and Promotion

How many bread products should I eat every day?
How much cheese equals a glass of milk?

Consumers are interested in knowing how much and what type of foods to eat for continued or improved health. Two Federal nutrition education tools use standard serving sizes: the Food Guide Pyramid and the Nutrition Facts label. The Pyramid was released by the U.S. Department of Agriculture (USDA) in 1992. The Nutrition Facts label, which is under the regulation of the Food and Drug Administration (FDA), has been required on virtually all food labels since August 1994. While both tools contain serving sizes that are standard—thus enabling nutritional and caloric comparisons of similar food—serving sizes for a particular food are not necessarily the same *between* the Pyramid and the Nutrition Facts label. Attempts to compare directly Pyramid and label servings may, therefore, generate confusion.

For many foods, the serving sizes in the Pyramid and on the label are the same—such as 1 cup of milk and ½ cup of cut-up fruits or vegetables—but there are notable differences. For example, the Pyramid serving size for pasta is ½ cup cooked (about 1 ounce uncooked), while on the label, it is about 1 cup cooked (2 ounces uncooked). To understand why serving sizes are sometimes different for the Pyramid and the Nutrition Facts label, it is important to understand the purpose of each and to distinguish how these serving sizes were derived for individual foods. These are explained, and a way to help consumers use both more effectively is proposed in this Insight.

Food Guide Pyramid

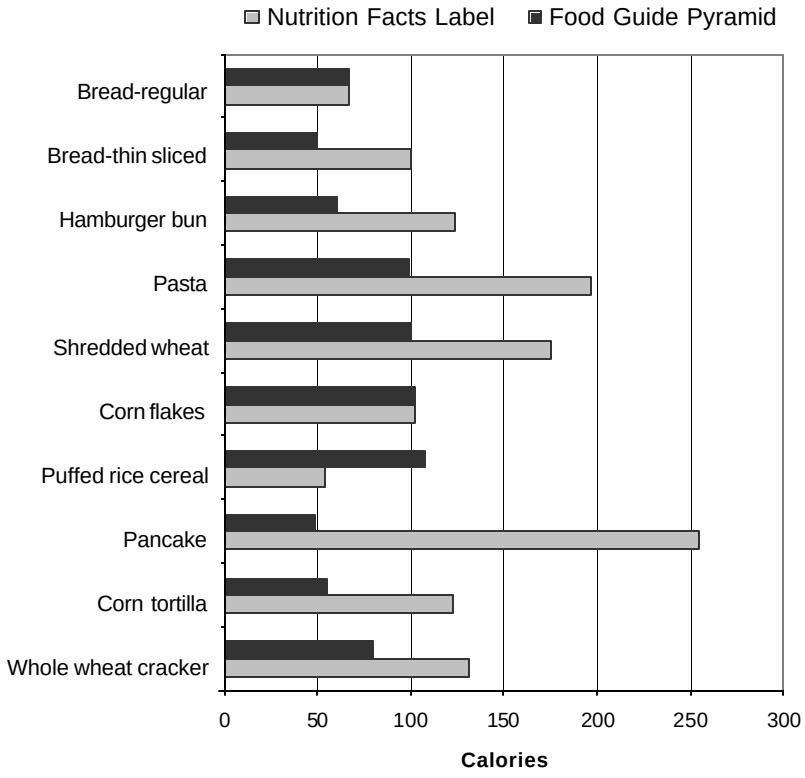
The Food Guide Pyramid translates recommendations of the *Dietary Guidelines for Americans (1)* and nutrient standards like the Recommended Dietary Allowances into food group-based advice for a healthful diet. The Pyramid graphically illustrates a research-based food guidance system built on the foods typically eaten by Americans, the nutrients in these foods, and recommendations on how to make the best food choices to promote good health *(2)*. The Pyramid suggests the type and amount of foods to eat each day without prescribing rigid guidance and can be used as a general guide in choosing individualized healthful diets from a variety of common foods. Since its release, the Pyramid has been widely used by nutrition educators, teachers, the media, and the food industry, in nutrition curricula, articles, and food packaging and advertising *(3)*.

Determination of Serving Sizes in the Pyramid

To establish serving sizes for the food groups in the Pyramid, four factors were considered: *typical portion sizes* (from food consumption surveys), *ease of use*, *nutrient content*, and *tradition* (of use in previous food guides). For some food groups, certain factors were given more emphasis than others.

For example, the serving size for cooked or raw cut-up fruits and vegetables was set at ½ cup based on *typical portion sizes* and for easy recognition and use. Although fruits and vegetables vary in nutrient content, the number of different serving size units was kept to a minimum to make the Pyramid *easier to use*. For the Milk group, on the other hand, *nutrient content* was a more important consideration in determining serving sizes. Serving sizes were set to be equivalent in calcium content to a *typical portion size* for milk, which is 1 cup. In the Meat and Beans group, *nutrient content* was also an important consideration. The specified amount of eggs, nuts, and dry beans provides about the same protein and mineral content as 1ounce of meat. In the Grains group, the *traditional* serving size of 1 slice of bread was maintained as the serving size. For other grain products, *nutrient content* was considered, as serving sizes were set to be approximately equivalent in calories to 1 slice of bread.

Figure 1. Calories in one standard serving—Food Guide Pyramid and Nutrition Facts Label



Nutrition Facts Label

The Nutrition Facts label lists the serving size of the food and the number of servings per container. It also identifies and quantifies key nutrients in a serving as a percentage of Daily Values (% DV) for a 2,000-calorie diet. Before FDA regulation, the choice of serving sizes on food labels was up to the discretion of individual food manufacturers. Serving sizes are now more uniform. The Nutrition Facts label, therefore, enables nutritional comparisons of similar foods. The label is now ubiquitous on food packages and widely recognized by consumers *(4)*.

Determination of Serving Sizes on the Nutrition Facts Label

Nutrition Facts label serving sizes are *based on*—but not necessarily *equal to*—the amount of food customarily eaten at one time (called the "reference amount") as reported from nationwide food consumption surveys. As explained next, label serving sizes and reference amounts are related but not necessarily the same.

Serving sizes are based on reference amounts in one of three ways *(5)*. For *bulk* products, such as cereals and flour, the Nutrition Facts labels use common household terms such as cup, tablespoon, teaspoon, and fluid ounce at a quantity that is closest to the reference amount for that item. For products that are usually divided for consumption, such as cake or pizza, the serving size is a *fractional* amount of the product (e.g., "1/4 pizza"). Products that come in defined, *discrete* units—such as eggs and sliced products—are normally listed as the number of whole units that *most closely approximates* the reference amount. For example, cookies have a reference amount of 30 g. Thus, the serving size on a package of cookies weighing about 30 g each would be "1 cookie." For foods like cookies that come in discrete units, serving sizes for a single item may vary from 50 to 200 percent of the reference amount. Another example is bread—

with a reference amount of 50 g. The Nutrition Facts label serving size for bread that weighs 25 g per slice could either read "1 slice (25 g)" or "2 slices (50 g)." Additionally, it is possible for a single slice of two different types of bread, with very dissimilar weights, to be listed as a serving on a food label.

Because serving sizes may vary from the reference amount, and because the reference amount for different foods may vary widely in caloric content, there is considerable variation in the calories in a label serving for different products from the Grain group (fig. 1). The caloric variation between a single Pyramid serving of these foods is less, which reflects the effort to make Pyramid serving sizes nutritionally similar. For example, the number of calories in a Pyramid serving of the foods shown in Figure 1 ranges from about 60 to 110, while the number of calories in a label serving ranges from about 55 to 250.

Why the Differences?

Serving sizes in the Pyramid and on the Nutrition Facts label are sometimes different because the two serve different purposes. The Pyramid is designed to help people meet daily nutrient recommendations. Serving sizes in combination with the recommended number of daily servings are an educational component of the Pyramid to help consumers select appropriate amounts to eat daily. Therefore, the Pyramid provides relatively few, easy-to-remember serving sizes for each of the food groups that, in most cases, are nutritionally comparable.

Nutrition Facts label serving sizes, on the other hand, provide detailed nutritional information on a food for easy comparison with similar foods. The label is deliberately specific for similar food products to allow consumers to determine differences in important nutrients among these foods and to select among similar foods based on nutritive values of comparable quantities.

If the purposes of the Pyramid and the Nutrition Facts label are understood, the two can be used together to complement each other and to help consumers make food choices for a healthful diet from a wide variety of foods. The usefulness of both tools would be enhanced and confusion lessened if food product labels included a statement of the number of Pyramid servings contained in one label serving.

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3. Shaw, A., Fulton, L., Davis, C., and Hogbin, M. *Using the Food Guide Pyramid: A Resource for Nutrition Educators*. www.usda.gov/cnpp/using.htm

4. FDA Press Office. 1997. FDA Talk Paper T97-54. *FDA Food Label Wins Presidential Design Achievement Award.*

5. FDA Center for Food Safety and Applied Nutrition. 2000. *Food Labeling and Nutrition*.

For more information on this topic, see *Food Portions and Servings: How Do They Differ?* CNPP Insight #11, 1999.

Research and Evaluation Activities in USDA

From the Food, Nutrition, and Consumer Services; Center for Nutrition Policy and Promotion

The Center for Nutrition Policy and Promotion (CNPP) has several new and ongoing projects of interest to the nutrition and family economics communities. Most publications listed below are available by writing to USDA-CNPP, 3101 Park Center Drive, Room 1034, Alexandria, VA 22302-1594; by calling 703-305-1254; or by reaching CNPP at www.cnpp.usda.gov.

Expenditures on Children by Families, 2000

Since 1960, USDA has published an annual report that provides estimates of annual expenditures on children from birth through age 17. USDA estimates are used to set State child support guidelines and payments for foster care. This latest report, which is based on data from the 1990-92 Consumer Expenditure Survey, presents the figures for the year 2000 for husband-wife and single-parent families. The Consumer Price Index is used to update the estimates to 2000 dollars.

For husband-wife families, the report provides child-rearing expenses for three income groups; for single-parent families, two income groups. Estimates are also provided for husband-wife families in urban areas in the West, Northeast, South, and Midwest; rural areas throughout the United States; and the United States overall to adjust, in part, for differences in prices and expenditure patterns. For single-parent families, estimates are provided for the overall United States only. Expenditures on children are provided for the major budgetary components: housing, food, transportation, clothing, health care, child care and education, and miscellaneous goods and services.

For the overall United States, annual child-rearing expenses are between $8,740 and $9,860 for a child in a two-child, married-couple family in the middle-income group. Housing and food account for the largest percentage of total child-rearing expenses. Expenditures are lower for younger children and higher for older children.

Thrifty, Low-Cost, Moderate-Cost, and Liberal Food Plans

The Thrifty Food Plan (TFP) serves as a national standard for a nutritious diet that is at practically the lowest possible cost. Used as the basis for food stamp allotments, the Plan specifies the types and quantities of foods that people in 12 age-gender groups could consume to have a nutritious diet at a minimal cost. CNPP revised the TFP market basket to account for the most current knowledge of nutritional needs. This revision of the TFP was the first one to incorporate the serving recommendations of the *Food Guide Pyramid*. Data used were from the 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII) and various national price databases. The cost of the revised TFP was set so that it did not exceed the average real cost of the TFP for 1989-91.

CNPP also developed menus and recipes based on this new market basket. These menus and recipes represent low-cost and nutritious meals that those on a limited food budget can follow to make the best use of their food dollars. These menus and recipes are published in *Recipes and Tips for Healthy, Thrifty Meals*.

The Low-Cost, Moderate-Cost, and Liberal Food Plans serve as national standards for nutritious diets at other cost levels. The Low-Cost Plan is often used by bankruptcy courts to determine the portion of a bankruptee's income to allocate to necessary food expenses. The Moderate-Cost and Liberal Plans are used by the Department of Defense to set the Basic Allowance for Subsistence rate for all enlistees. Many courts also use the food plans to set alimony payments. CNPP is revising the market baskets for these three food plans to account for new knowledge of people's nutritional needs. Data used are from the 1989-91 CSFII and various national price databases.

Healthy Eating Index

To report how well the American diet conforms to healthful eating patterns, CNPP publishes the Healthy Eating Index (HEI), which provides a summary measure of overall diet quality. The Index, based on different aspects of a healthful diet, examines 10 dietary components.

The first five components of the HEI measure the degree to which a person's diet conforms to recommended servings of grains, fruits, vegetables, meats and meat alternates, and dairy products. The recommended servings are based on a person's age and gender. The next four components measure compliance with recommended intake of total fat, saturated fat, cholesterol, and sodium.

The final component is a measure of dietary variety. The total HEI score ranges from 0 to 100, with each of 10 individual component scores ranging from 0 to 10.

CNPP used the 1998 CSFII-Supplemental Children's Survey to calculate the latest HEI for children 2 to 9 years old (the age range surveyed). As indicated by the HEI, the diet of most children 2 to 9 years old needs substantial improvement to meet dietary recommendations. Children ages 7 to 9 have a lower quality diet than do younger children. The decline in children's diet as they get older is associated with a decline in their fruit and sodium HEI scores. From 1989 to 1998 the quality of children's (ages 2 to 9) diets has not changed significantly.

Interactive Healthy Eating Index

The Interactive Healthy Eating Index (IHEI), released in April 2000, is an on-line dietary assessment tool available on CNPP's Web site (www.cnpp.usda.gov). The IHEI allows users to input their daily food intakes and provides a quick summary measure of the quality of their diet in terms of current dietary guidance. Users receive feedback on their HEI score and their nutrient intakes. The IHEI also generates a graphical representation of each user's Food Guide Pyramid, based on the specific foods eaten. By saving up to 20 days of dietary intake scores, the IHEI allows users to view trends in the nutrient intakes.

With the use of "emoticons," the IHEI provides graphical feedback on the 10 component HEI scores: a happy face for a good score, a sad face for a poor score, and a neutral face for an intermediate score. Users can click on these emoticons to receive nutrition education messages that are tailored to their score.

The IHEI database includes over 7,000 foods. For each food, the database provides both nutrient information and Pyramid servings data, which are used to calculate the HEI scores. Based on users' requests, CNPP is updating the IHEI database so that it includes even more foods.

Food Supply Series

CNPP published *Nutrient Content of the U.S. Food Supply 1909-97*. This report shows that the variety and types of food in the U.S. food supply parallel consumer eating practices. Changes in practices in the early years were mainly influenced by World Wars I and II. In later years, changes in eating practices were influenced by an increase in ethnic diversity; more elderly consumers; and Federal Government policy on nutrition, with subsequent consumer demand for more healthful foods, and the food industry's response to this demand. In 1997 the U.S. food supply, and thus the American market place, provided a greater variety of fruits and vegetables, leaner meats, and more dairy products. But the U.S. food supply also had record-high amounts of caloric sweeteners and fats in 1997 than in 1909.

The U.S. food supply, a historical series (dating back to 1909) measuring the amount of nutrients per capita per day available for consumption, is the only continuous source of data on the availability of food and nutrients in the United States. Per capita food supply estimates provide unique and essential information. They are useful in assessing trends in food and nutrient consumption over time, for monitoring the potential of the food supply to meet the nutritional needs of Americans, and for examining relationships between food availability and diet-health risk. Food supply nutrients are linked closely to food and nutrition policy, with prominence in areas related to nutrition monitoring, Federal dietary guidance, nutritional requirements, nutrition education, fortification policy, and food-marketing strategies. Hence, the U.S. food supply series is one of the five major components of the National Nutrition Monitoring and Related Research Program, which is mandated by the National Nutrition and Related Research Program Act of 1990.

Dietary Guidelines for Americans

The *Dietary Guidelines for Americans*, first released in 1980 and revised in 1985, 1990, 1995, and 2000, are published jointly by the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (DHHS). The Guidelines provide the basis for Federal nutrition policy and nutrition education activities. Nutrition and health professionals actively promote these Guidelines as a means of focusing Americans' attention on a healthful diet. The Guidelines provide advice to healthy Americans 2 years of age over. This advice is about food choices that promote health and prevent disease. Revisions to the Guidelines every 5 years are based on the recommendations of a Dietary Guidelines Advisory Committee (DGAC)—a panel of nationally recognized nutrition and health experts.

The fifth edition of the *Dietary Guidelines for Americans*, released in 2000, contains 10 principles for healthful eating. A grouping scheme—"Aim for fitness, Build a healthy base, and Choose sensibly…for good health"—organizes the Guidelines into an easy-to-remember format and links Guidelines with similar messages. *Nutrition and*

Your Health: Dietary Guidelines for Americans, a bulletin, presents the official text of the *Dietary Guidelines for Americans. Using the Dietary Guidelines for Americans*, a consumer brochure that is based on the Guidelines, was developed by CNPP. This brochure is more brief, more consumer-friendly in style and content, and easier for information multipliers to purchase or reproduce for their audiences. Ordering information and downloadable files are available from the CNPP Web site: www.cnpp.usda.gov. Additional information about the Guidelines, including a chart of how they have been modified over time and transcripts of DGAC meetings, can also be accessed through this site.

CNPP has developed an innovative Internet-based continuing education course to educate health professionals about the Guidelines—*The ABCs of the Dietary Guidelines for Americans: Science and Application*. The course is designed to help professionals understand the science and rationale of the *Dietary Guidelines for Americans* as national nutrition policy. The course is also designed for nutrition educators, dietitians, physicians, and other health care professionals who provide food and nutrition education to the public. It offers Continuing Professional Education (CPE) credit for Registered Dietitians and is also available on the CNPP Web site.

CNPP is also developing a series of consumer brochures focused on specific topics in the *Dietary Guidelines for Americans.* These brochures are intended for interested consumers and for professionals to use as handouts in nutrition education programs, such as worksite-wellness and employee-training programs. The series will be made available for downloading from the CNPP Web site and will be designed for easy reproduction.

USDA's Food Guide Pyramid

Since the early 1900's, USDA has produced food guides for consumers. The current food guide is depicted graphically by the *Food Guide Pyramid*, which was released in 1992. The Pyramid translates nutritional recommendations—the Dietary Guidelines and Dietary Reference Intakes—into the types and amounts of food to eat each day. The Pyramid is also based on actual food consumption patterns of Americans, thus making it practical and useful to consumers. The Pyramid graphic is one of the most widely recognized and imitated nutrition education tools in history. The accompanying *Food Guide Pyramid* booklet has been widely distributed through nutrition education programs and schools. It provides additional information about the Food Guide and examples to help people understand and put the Pyramid into use.

As new data on food consumption and nutrients become available, the research base for the Pyramid is updated. More recent data on food consumption have been analyzed to determine whether recommended food patterns still meet nutritional goals, given consumers' food choices among foods in each group. Nutrient recommendations from the 1989 RDAs and the 1995 Dietary Guidelines have also been compared with Pyramid food patterns. No changes in the Pyramid recommendations have been needed to date.

With a number of new nutrition recommendations now released, CNPP has begun a comprehensive reassessment of the Pyramid to ensure that the Food Guide continues to meet its nutritional goals as well as provides useful advice to consumers. This process involves several components. The technical research component makes use of 1994-96 data on food consumption and food composition to determine what, if any, changes are needed to make the Pyramid food patterns meet new nutritional recommendations.

Additional information for the reassessment is being gathered from stakeholders, including nutritionists and dietitians, industry representatives, educators, communications experts, and government scientists. To do this, CNPP is holding a series of listening sessions and discussions to explore nutritional and communications issues related to the Pyramid and to explore ideas for how the Pyramid and other current dietary guidance materials can be made more useful.

Another essential part of the reassessment process is to conduct research with consumers to examine their understanding of Pyramid concepts and their use of, and barriers to, using the Pyramid. Some of the information collected through this consumer research will attempt to answer questions about how Americans use dietary information to help them make choices—for example, how individuals hear and understand dietary guidance messages and whether and how they use these messages to make decisions about food choices.

Information gathered through all the components of this reassessment will be considered in determining what, if any, changes may be needed in the underlying food guide recommendations or in the Pyramid's graphic presentation and explanatory materials. Professional and consumer input gathered through this reassessment process will also be important to CNPP in the development of future educational materials to improve consumer understanding of food guidance messages.

Dietary Guidance Working Group

The Dietary Guidance Working Group (DGWG), established January 2, 1986, is under the Subcommittee for Human Nutrition of the Research and Education Committee (now the Human Nutrition Coordinating Committee), Secretary's Policy and Coordination Council (now the Nutrition Education and Research Coordinating Council (NERCC)). The Working Group was formed to help agencies meet the objectives of legislation related to dietary guidance and USDA's Food and Nutrition Policy Statement. Nine USDA Agencies are represented; DHHS has a liaison member.

Title III of the National Nutrition Monitoring and Related Research Act of 1990 calls for the Secretaries of Agriculture and Health and Human Services to publish the *Dietary Guidelines for Americans* at least every 5 years and for the Secretaries to review and approve prior to its release dietary guidance for the general population. The purpose is to ensure that Federal dietary guidance is consistent with the *Dietary Guidelines for Americans* or is based on new medical or scientific knowledge determined to be valid by the Secretaries.

Federal Studies

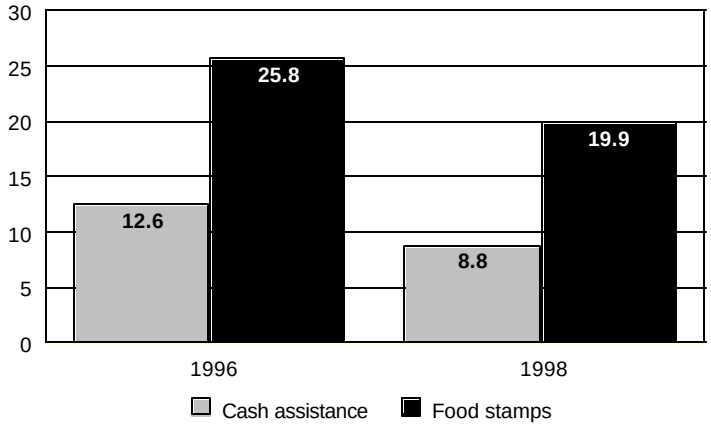
Food Stamp Participation Rate Down in Urban Areas But Not in Rural Areas

The 1996 Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) completely overhauled the cash welfare system. While PRWORA, or "welfare reform" as it is more commonly known, decentralized the cash welfare system and moved from a cash entitlement to a work focus, it made relatively small changes to the Food Stamp Program. The most important change to the Food Stamp Program was to restrict eligibility for food stamps for two groups: permanent resident noncitizens and able-bodied adults without children. Welfare reform also had important unintended consequences on the Food Stamp Program. Changes in the cash welfare system may have led to a decline in the food stamp rolls by reducing the likelihood that people who are eligible for food stamps would participate in the program. Persons who are no longer receiving cash welfare may be less likely to know they are eligible for food stamps.

Cash assistance and food stamp caseloads down

To encourage self-sufficiency, PRWORA imposed work requirements and time limits for the receipt of benefits on recipients of cash assistance. As a result, cash welfare caseloads fell dramatically—31 percent between 1996 and 1998. This decline in the number of cash welfare recipients was accompanied by a decline in the number of food stamp recipients—23 percent between 1996 and 1998.

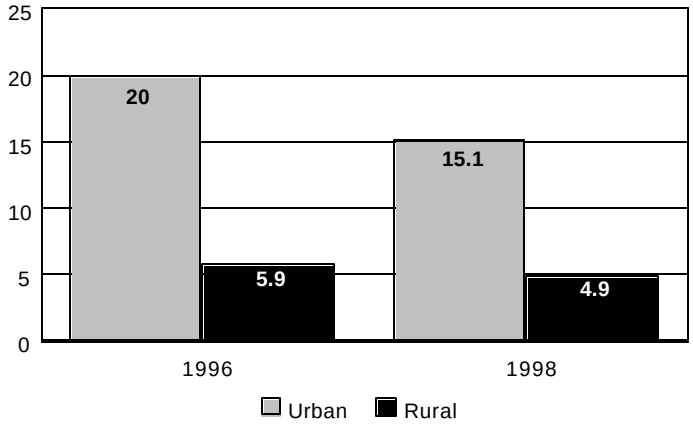
People (in millions) receiving cash assistance and food stamps



Food stamp rolls fell more in urban areas

Food stamp use fell more in urban counties than in rural counties. Between 1996 and 1998, the number of food stamp recipients fell from 20.0 million to 15.1 million in urban counties (a 25-percent decline). Over the same period, the number of food stamp caseloads fell from 5.9 million to 4.9 million in rural counties (a 17-percent decline). The number of food stamp participants can decrease for two reasons: (1) the number of people who are eligible falls, and (2) fewer people who are eligible for food stamp benefits decide to participate.

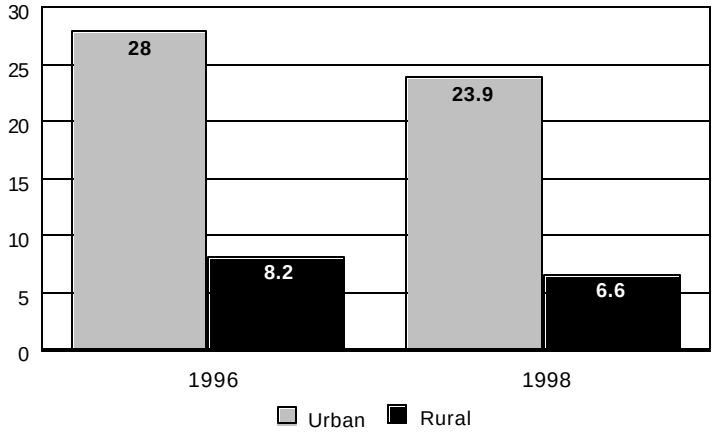
People (in millions) receiving food stamps, by area



However, the number of people eligible for food stamps fell more in rural areas

The number of people eligible for food stamps decreased in both rural and urban areas, but the decline was greater in rural areas. Overall, the number of people eligible for food stamps in the United States fell 16 percent between 1996 and 1998. The decline in rural areas was 19 percent (from 8.2 to 6.6 million), compared with a 15-percent drop in urban areas (from 28.0 to 23.9 million). One reason for the larger decline in the number of eligible people in rural areas is the larger decline in poverty in rural areas.

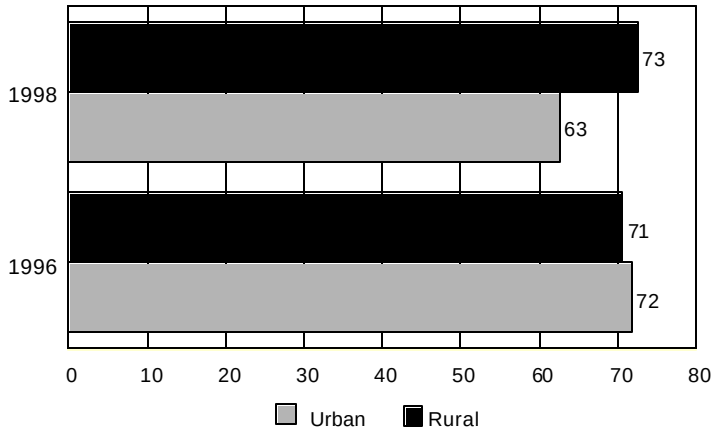
People (in millions) eligible for food stamps, by area



But, urban areas had bigger declines in food stamp participation

The Food Stamp Program is designed to provide food assistance to anyone in need, regardless of where the person lives. The participation rate is an important indicator of how well the program is fulfilling its mission. The overall participation rate in the Food Stamp Program fell from 71 percent in 1996 to 65 percent in 1998. This fall was due to a decline in the participation rate in urban areas—from 72 percent in 1996 to 63 percent in 1998. The participation rate increased slightly in rural areas over this time—from 71 to 73 percent.

Food stamp participation rate, by area



Source: McConnell, S. and Ohls, J. 2001. Food stamp participation rate down in urban areas but not in rural. FoodReview 24(1):8-12.

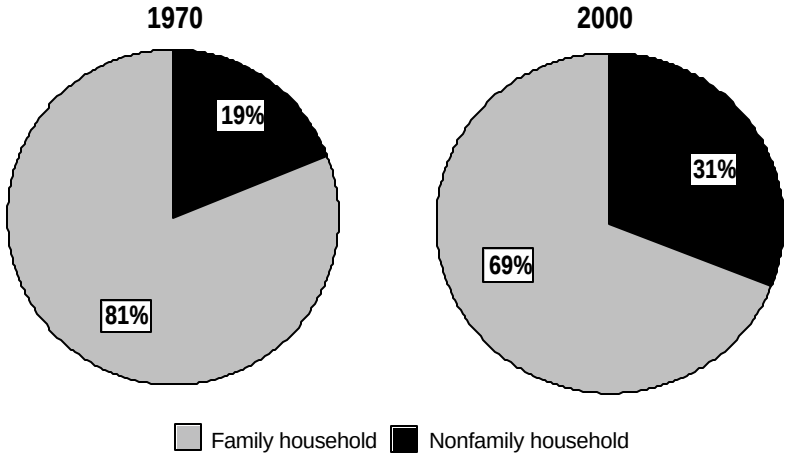
America's Families and Living Arrangements

In 2000 the number of U.S. households reached 105 million, up from 63 million in 1970. Since 1970 both the composition of households and families and the marital status and living arrangements of adults in the United States experienced marked changes. For example, the proportion of the population consisting of married couples with children decreased, and the proportion of single mothers increased, while the median age at first marriage grew over time. In addition, the characteristics of single-parent families, the living arrangements of younger and older adults, and the number of unmarried-couple households changed.

Family households less common in 2000 than in 1970

Traditionally, family households (one or more people where at least two members are related by blood, marriage, or adoption) have accounted for most households—81 percent of all households in 1970 were family households. But, by 2000, family households made up only 69 percent of all households.

Family and nonfamily households



Married couples with own children especially less common

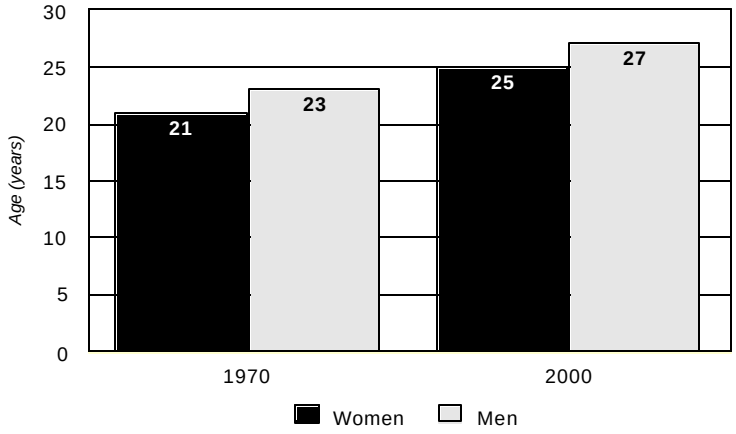
The most noticeable trend in families and living arrangements is the decline in the proportion of married-couple households with own children, from 40 percent of all households in 1970 to 24 percent in 2000. Other family households—families whose householder has no spouse present, but lived with other relatives, including children—increased from 11 percent of all households in 1970 to 16 percent in 2000.

Households by type

Median age at first marriage rising

One reason that nonfamily households have been increasing over time is the postponement in marriage as characterized by the rise in the age of couples when they married for the first time. In 1970 the median age at the first marriage was 21 years for women and 23 years for men. By 2000 these ages had risen to 25 and 27 years, respectively.

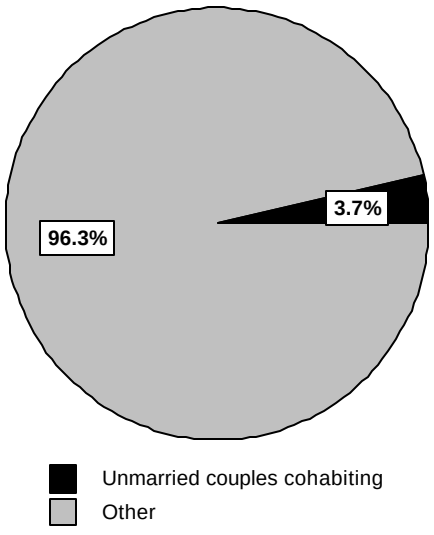
Median age at first marriage



In 2000 more than 3 million unmarried couples cohabited

In addition to couples identifying themselves as married, a householder may identify the person he or she is cohabiting with as an unmarried partner. In 2000 there were 3.8 million households that were classified as unmarried-partner households, representing 3.7 percent of all U.S. households. These numbers may underrepresent the actual number of cohabiting couples because only the number of householders and their partners are tabulated (not all unmarried couples present in a household), and respondents may be reluctant to classify themselves as such.

Unmarried-partner households as a percentage of all households, 2000



Source: Fields, J. 2001. America's families and living arrangements.Current Population Reports P20-537. U.S. Census Bureau.

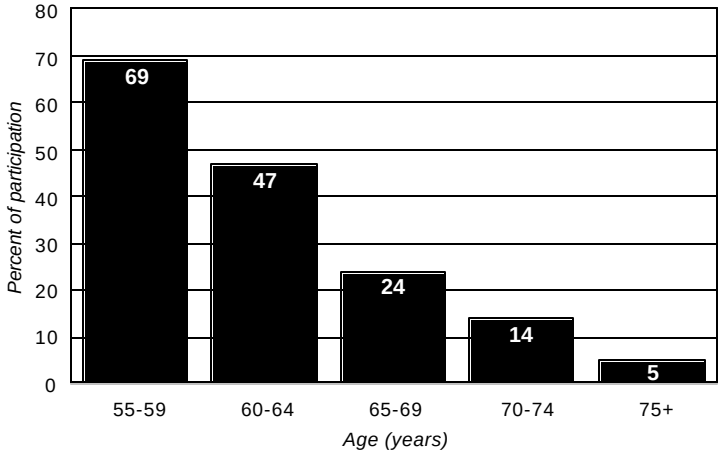
Changing Retirement Age: Ups and Downs

In the past, age 65 was considered retirement age. Retirement benefits were available at age 65, and in many cases, retirement at that age was mandatory. Workers today face many choices regarding retirement age. Legislative changes, new types of retirement plans, and increases in life expectancy have led to differences in retirement ages. For example, many defined benefit pension plans allow retirement with full benefits at age 60 or 62, and most plans allow early retirement at age 55 or younger. This is in light of the fact that a child born today can be expected to live until age 76.

Most older people not in labor force

Most people ages 60 and over are not in the labor force. In 2000, 69 percent of people ages 55-59 were in the labor force, but this percentage declined to 47 percent for people ages 60-64. Only 5 percent of people ages 75 and older were in the labor force. Some of the people in the labor force moved from full-time to part-time employment.

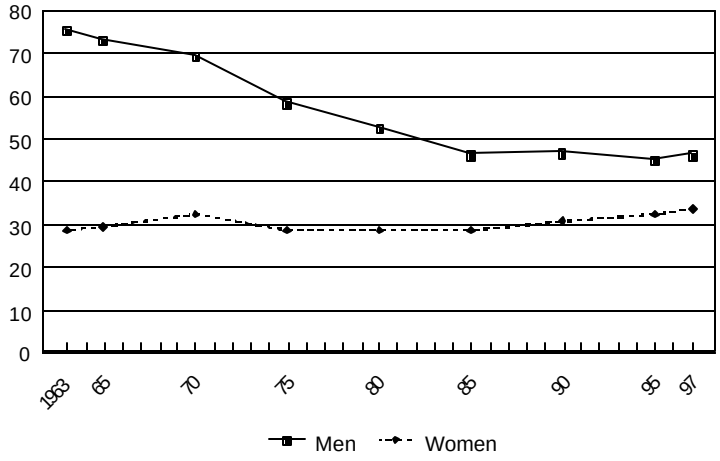
Labor force participation rate by workers' age, 2000



Declining percentage of men and rising percentage of women ages 62-64 in labor force

The percentage of men ages 62-64 who are in the labor force declined steadily from the 1960's—when early retirement at age 62 was made available through the Social Security system—through the mid-1980's. Labor force participation of men this age dropped from 76 percent in 1963 to 46 percent in 1997. Labor force participation for women in this same age group slightly increased over this time, from 29 percent in 1963 to 34 percent in 1997. Regardless of their age, women have increased their participation in the labor force since the 1960's.

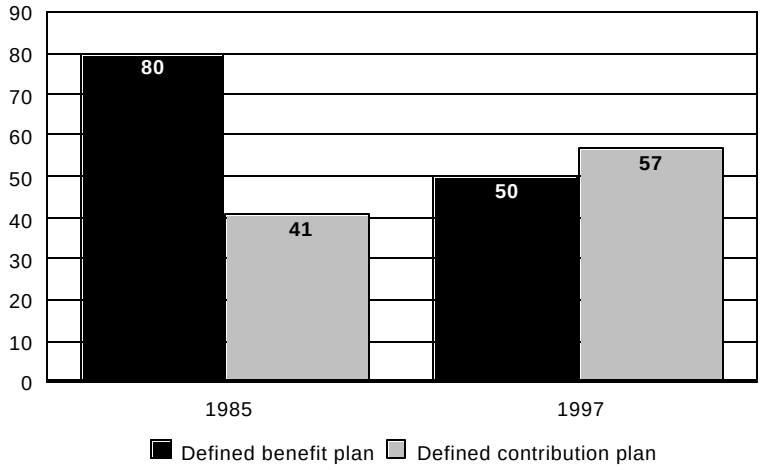
Labor force participation rate of men and women ages 62-64, over time



Participation in different types of employer retirement plans has changed over time

Employer retirement plans take two basic forms—defined benefit plans and defined contribution plans. Under a defined benefit plan, future benefits are based on earnings and years of service. With a defined contribution plan, employees make voluntary contributions. Participation in defined benefit plans by full-time employees has declined from 80 percent in 1985 to 50 percent in 1997; whereas, participation in defined contribution plans has risen from 41 percent in 1985 to 57 percent in 1997. Some employees may participate in both types of plans, so the participant rates are not mutually exclusive.

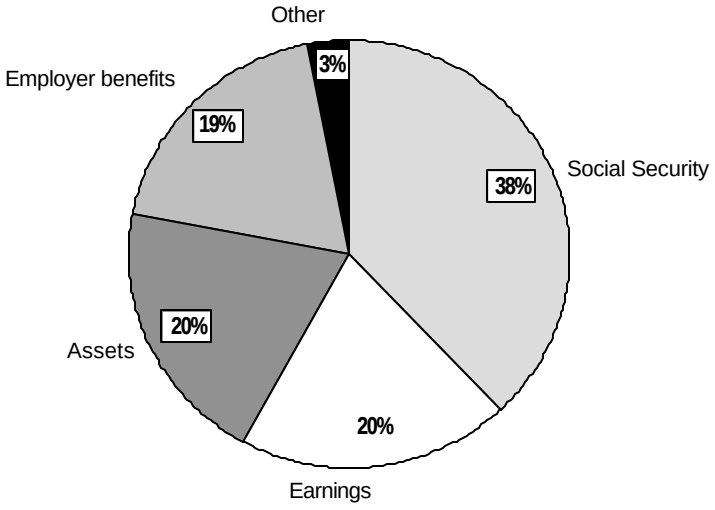
Percent of employees participating in retirement plans



Social Security accounts for the single largest source of income for people ages 65 and over

The traditional model of retirement income is a three-legged stool—Social Security, employer retirement benefits, and personal savings. While this may describe the ideal model for retirement income, it has never actually been achieved, largely because employer-provided plans are not universal, and many retirees have little or no savings. In 1998 Social Security accounted for 38 percent of the income of people ages 65 and older; income from employer benefits accounted for 19 percent of income.

Source of income for people ages 65 and over, 1998



Source: Wiatrowski, W.J. 2001. Changing retirement age: Ups and downs. Monthly Labor Review 124(4):3-12.

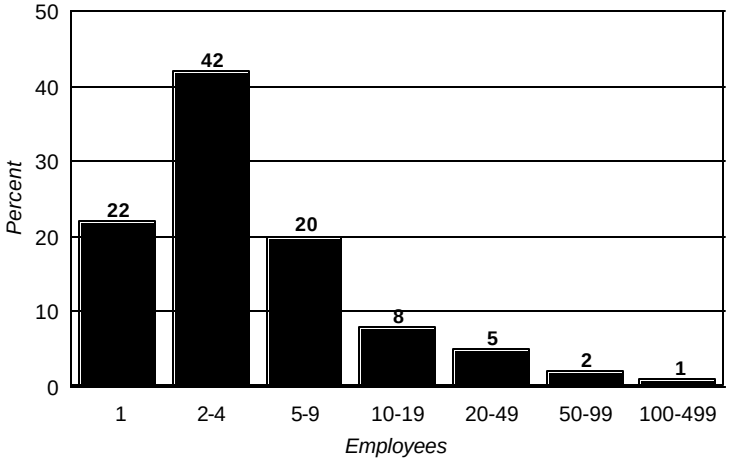
Small Businesses: Evidence From the 1998 Survey of Small Business Finances

Small businesses (firms having fewer than 500 employees) are an integral part of the U.S. economy. They account for about half of private-sector output, employ more than half of private-sector workers, and provide about three-fourths of net new jobs each year. Newly available data from the Survey of Small Business Finances provide a detailed look at these firms—their characteristics and their use of credit and other financial services. The latest survey gathered data for fiscal year 1998 from 3,561 firms selected to be representative of small businesses operating in the United States in December 1998.

Most small businesses employed fewer than 10 employees

In terms of employment, most small businesses were very small in 1998: 64 percent had fewer than 5 employees, and 84 percent had fewer than 10 employees. The number of employees includes owners working in the business and both full- and part-time employees. In terms of sales and assets, the businesses were similarly small: about 40 percent had fiscal year sales of less than $100,000, and just over 61 percent had year-end assets of less than $100,000.

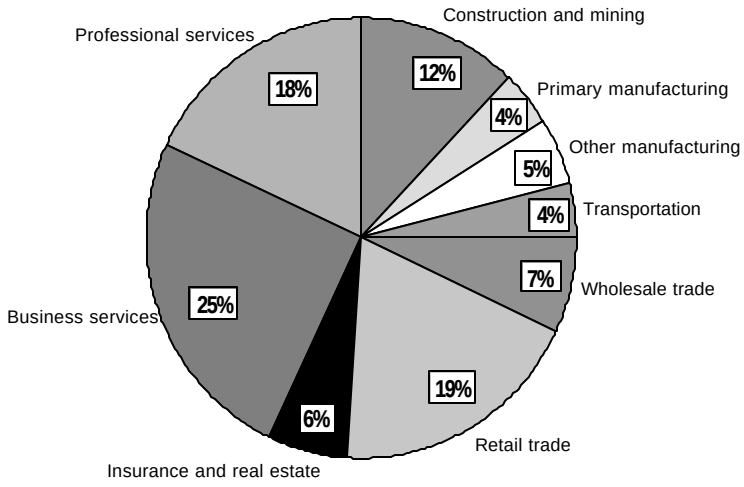
Number of employees in small businesses, 1998



Work of small businesses varied

The primary activity of 43 percent of small businesses was business or professional services. Nineteen percent were in retail trade, and 12 percent were in construction or mining. Average time the firms had been in business was 13.3 years. The firms were also dispersed across the country: about 33 percent were located in the South, 27 percent in the West, 22 percent in the Midwest, and 19 percent in the Northeast.

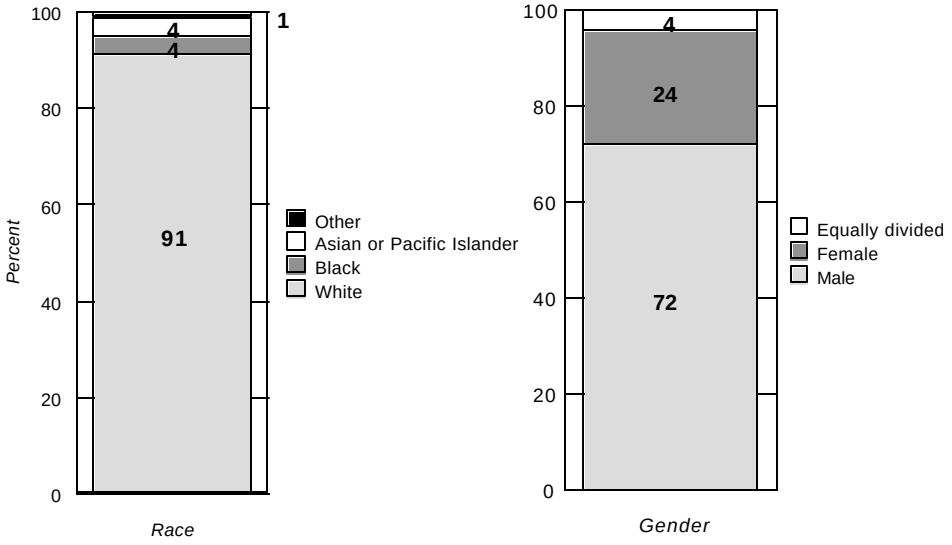
Primary activity of small businesses, 1998



Whites and males were most likely to own small businesses

A firm was classified as being owned by individuals of a specific race or gender if more than 50 percent of the firm was owned by such individuals. Ninety-one percent of small businesses were White-owned, 4 percent were Black-owned, and an additional 4 percent were Asian-owned. Seventy-two percent of the firms were owned by men; this represented a slight decline from 1993, where the corresponding percentage was 74.

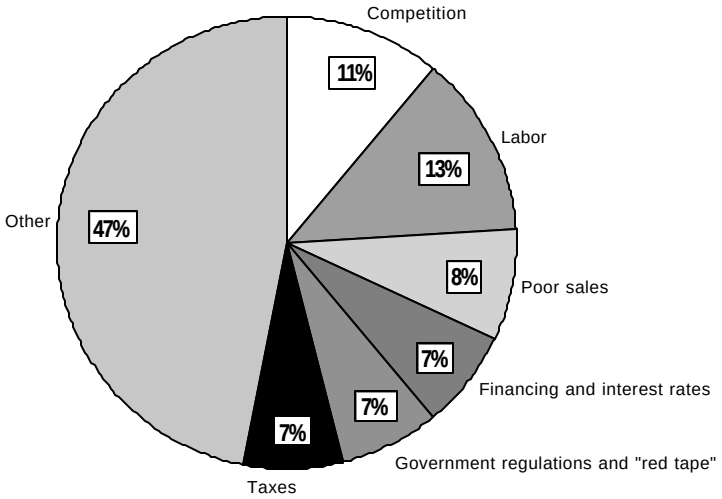
Race and gender of small business owners, 1998



Labor issues and competition were greatest concern of small businesses

The quality, cost, and availability of labor and competition from larger, international, or Internet firms were the greatest concern for small businesses with less than 10 employees (the majority of such businesses). Government regulations and "red tape" were mentioned by 7 percent of small businesses as the most important problem they face. The primary concerns of small businesses were markedly different in 1993; in that year, health care and health insurance were cited most often.

Most important problem small businesses say they face,1998



Source: Bitler, M.P., Robb, A.M., and Wolken, J.D. 2001. Financial services used by small businesses: Evidence from the 1998 Survey of Small Business Finances. Federal Reserve Bulletin April:183-205.

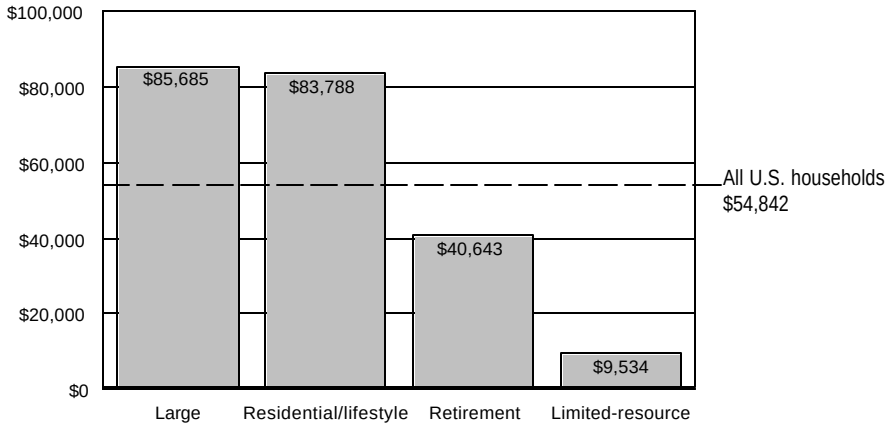
Farm Households Are Often Dual-Career

As with nonfarm households, many farm households are pursuing more than one career. To examine variations in the level and sources of farm household income, as well as variations in off-farm jobholding, this study used data from the 1999 Agricultural Resource Management Study (ARMS). ARMS is an annual survey that collects information from farmers across the United States. Farms were grouped by typology, and four types are reviewed here: (1) large family farms (sales between $250,000 and $499,999—accounting for 4 percent of all family farms), (2) residential/lifestyle farms (small farms with sales less than $250,000, and whose operators report a major occupation other than farming—accounting for 43 percent of all family farms), (3) retirement farms (small farms whose operators report they are retired—accounting for 14 percent of all family farms), and (4) limited-resource farms (generally small farms with sales less than $100,000—accounting for 6 percent of all family farms).

Levels of income varied by type of farm

Households on large family farms or on residential/lifestyle farms received an average household income above the average for all U.S. households. Households on retirement farms or limited-resource farms had income less than the U.S. average, with limited-resource farms having an income just one-fifth of the U.S. household average.

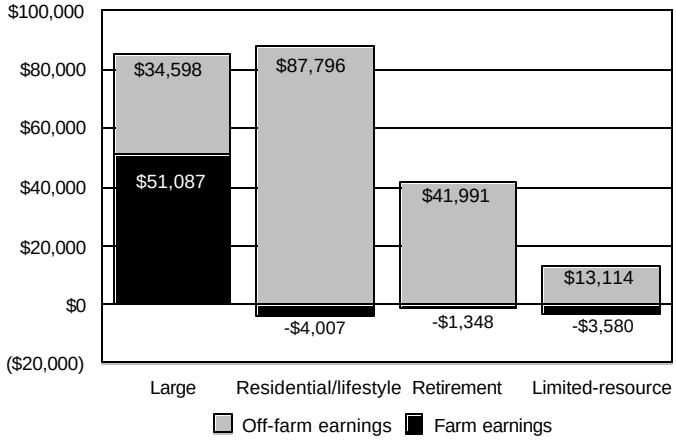
Household income of farm types vs. U.S. average, 1999



Sources of farm and nonfarm income also varied

Farm income was a substantial source of total income (60 percent) for households operating large family farms. For limited-resource, retirement, and residential/lifestyle farms, virtually all income came from off-farm sources, and most households in these groups lost money farming. The sources of income contradict one of the most persistent myths of farm structure—that farmers rely almost entirely on their farms for a living.

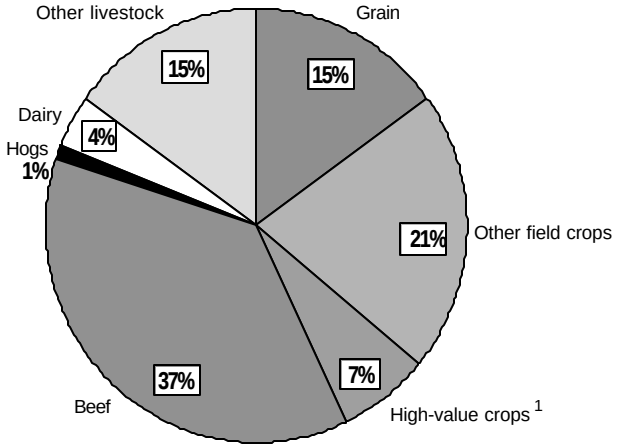
Sources of income of farm types, 1999



Many farms specialize in cattle

Thirty-seven percent of all U.S. farms specialized in beef and 21 percent in other field crops. More than 40 percent of limited-resource, retirement, and residential/lifestyle farms specialized in beef. Beef cattle usually requires relatively low and flexible labor on the part of individuals, consistent with an off-farm job or retirement. Only 9 percent of large farms specialized in beef; 37 percent specialized in grain.

Specialization of farms, 1999

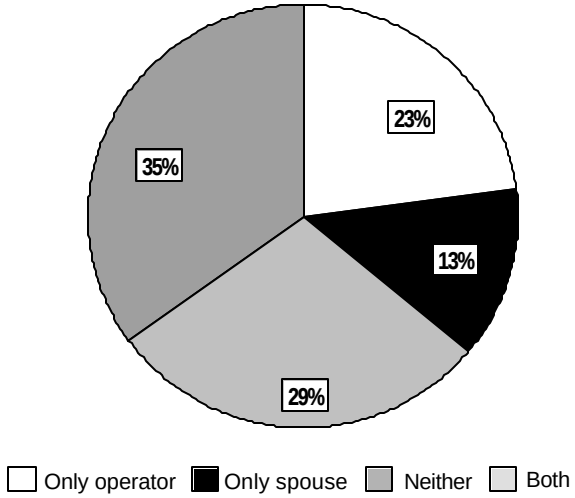


[1]High-value crops are vegetables, fruits, tree nuts, and horticultural specialities.

Most farm operators and spouses employed off the farm

Most farm operators and their spouses hold off-farm jobs. Seventy-one percent of all farm operators and/or their spouses worked off-farm. Only 29 percent of both farm operators and their spouses worked only on the farm.

Off-farm work of farm operators and spouses, 1999



Source: Hoppe, R.A. 2001. Farm households are often dual-career. Rural America 16(2):41-51.

Journal Abstracts

The following abstracts are reprinted verbatim as they appear in the cited source.

Culica, D., Rohrer, J., Ward, M., Hilsenrath, P., and Pomrehn, P. 2002. Medical checkups: Who does not get them? *American Journal of Public Health* 92(1):88-91.

Objectives. This study determined which predisposing, enabling, need, behavioral, and disease factors predict the use of medical checkups.
Methods. The Behavioral Risk Factor Surveillance System was used to obtain state estimates in Iowa.
Results. A decreased likelihood of recent checkups was noted for persons aged 25 to 44, men, and those who faced cost barriers. An increased likelihood of recent checkups was associated with married people, highest household income, health insurance, fair and poor health status, physical exercise, occasional smoking, and some chronic diseases.
Conclusions. A profile of persons not having a checkup in the past 12 months emerged from the investigation.

Crutchfield, S., Kuchler, F., and Variyam, J.N. 2001. The economic benefits of nutrition labeling: A case study for fresh meat and poultry products. *Journal of Consumer Policy* 24:185-207.

New rules issued by the U.S. Department of Agriculture requiring provision of nutrition information on raw meat and poultry products may encourage consumers to make healthier food choices. Reduced intake of fat and cholesterol may prevent future cases of stroke, heart disease, and cancer. The benefits of these rules are estimated to be $62 to $125 million annually.

Dwyer, J.T., Garceau, A.O., Evans, M., Li, D., Lytle, L., Hoelscher, D., Nicklas, T.A., and Zive, M. 2001. Do adolescent vitamin-mineral supplement users have better nutrient intakes than nonusers? Observations from the CATCH tracking study. *Journal of the American Dietetic Association* 101(11):1340-1346.

Objective. Describe whether users of vitamin-mineral supplements differed from nonusers in micronutrient intakes or in nutrition awareness.
Design. Cross-sectional, observational study.
Subjects. One thousand five hundred thirty-two students now in grade 8, who participated in the Third Child and Adolescent Trial for Cardiovascular Health tracking study and who also provided a single 24-hour dietary recall.
Statistical analyses performed. Mixed-model analysis of covariance was used to ascertain if supplement users had higher vitamin and mineral intakes from food sources, and to examine if supplement users had better nutrition awareness than nonusers.
Results. The 24-hour recall showed that 17.6% of the students reported using vitamin-mineral supplements. Users reported a mean of 1.4 supplements, of which 47% were multivitamin or mulitmineral preparations, 37% were single nutrients, and 16% were combinations. White persons and residents of Minnesota and California were more likely to be supplement users. Users had higher micornutrient intakes from food sources for 16 of the 20 nutrients studied after adjusting for gender, race/ethnicity, site, treatment condition, and within-school variability. Users had higher scores on a health behavior survey for food choice and slightly but not significantly higher nutrition knowledge scores.
Conclusions. Vitamin-mineral supplement use is prevalent among eighth-grade students. Users have higher nutrient intakes from foods, higher total intakes for several micronutrients, higher nutrition awareness, and differ in their demographic characteristics from nonusers.

Gundersen, C. and Oliveira, V. 2001. The Food Stamp Program and food insufficiency. *American Journal of Agricultural Economics* 83(4):875-887.

Food stamp participants have higher food insufficiency rates than eligible nonparticipants, even after controlling for other factors. Given the Food Stamp Program's prominent role in the alleviation of hunger, this is a counterintuitive result. We conjecture that these higher rates are due to adverse selection insofar as households more likely to be food insufficient are also more likely to receive food stamps. We establish a theoretical framework to address this adverse selection. Using a simultaneous equation model with two probits, we show that once one controls for this adverse selection, food stamp recipients have the same probability of food insufficiency as nonrecipients.

Leppel, K., Williams, M.L., and Waldauer, C. 2001. The impact of parental occupation and socioeconomic status on choice of college major. *Journal of Family and Economic Issues* 22(4):373-394.

This study examines the effects of socioeconomic status and parental occupation on choice of college major, with special attention directed toward female and male differences. The study uses multinomial logit analysis and data from the National Center for Education Statistics (NCES) 1990 Survey of Beginning Postsecondary Students (BPS). Having a father in a professional or executive occupation has a larger effect on female students than does having a mother in a similar occupation. The opposite holds for males. Women from families with high socioeconomic status are less likely to major in business; the opposite holds for males. Students who believe that being very well off financially is very important are more likely to major in business than are other students.

Thornton, A. and Young-DeMarco, L. 2001. Four decades of trends in attitudes toward family issues in the United States: The 1960s through the 1990s. *Journal of Marriage and Family* 63(4):1009-1037.

This article examines trends in family attitudes and values across the last 4 decades of the 20th century, with particular emphasis on the past 2 decades. The article focuses on attitudes toward a wide range of family issues, including the roles of men and women, marriage, divorce, childlessness, premarital sex, extramarital sex, unmarried cohabitation, and unmarried childbearing. More generally, the article considers trends in 3 broad contemporary values: freedom; equality; and commitment to family, marriage, and children. Five data sets are used for the article: Monitoring the Future, General Social Survey, International Social Science Project, Intergenerational Panel Study of Parents and Children, and the National Survey of Families and Households. These 5 data sets reveal substantial and persistent long-term trends toward the endorsement of gender equality in families, which may have plateaued at very high levels in recent years. There have also been important and continuing long-term trends toward individual autonomy and tolerance toward a diversity of personal and family behaviors as reflected in increased acceptance of divorce, premarital sex, unmarried cohabitation, remaining single, and choosing to be childless. At the same time, marriage and family life remain important in the cultural ethos, with large and relatively stable fractions of young people believing that marriage and family life are important and planning marriage and the bearing and rearing of children.

Variyam, J.N., Shim, Y., and Blaylock, J. 2001. Consumer misperceptions of diet quality. *Journal of Nutrition Education* 33*(6)*:314-321.

Objective: This study compares consumers' self-perceived diet quality with calculated diet quality to assess the degree of consumer misperception regarding one's own diet quality and to identify factors associated with such misperception.
Design: The perceived diet quality was measured by consumers' self-perception of the overall healthfulness of their diet. The calculated diet quality was measured by the Healthy Eating Index, a 10-component indicator of overall diet quality developed from 3 consecutive days of 1-day 24-hour dietary recall and 2-day diet record.
Subjects/Settings: Measures of perceived and calculated diet quality were obtained for a sample of 2862 household meal planners/preparers from the 1989-90 Continuing Survey of Food Intakes by Individuals and the Diet and Health Knowledge Survey.
Outcome: Dietary misperception was assessed by classifying respondents based on categories of perceived and calculated diet quality into three groups: optimists, realists, and pessimists.
Statistical Analyses: Bivariate statistical tests and multivariate logistic regression were used for comparing the characteristics of optimists with the other two groups.
Results: An estimated 40% of the population of household meal planners/preparers were optimists who perceived the quality of their diets to be better than their calculated diet quality. In multivariate analysis, household size, gender, education, smoking status, perceived health status, importance of nutrition in grocery shopping, and belief about the need for dietary change were found to be significant predictors of being optimistic about diet quality. Nutritionists and health professionals need to be aware of this misperception and alert dietary optimists about their false perceptions of diet quality.

Wilde, P.E. 2001. The food stamp benefit formula: Implications for empirical research on food demand. *Journal of Agricultural and Resource Economics* 26(1):75-90.

To understand how food stamps affect food spending, nonexperimental research typically requires some source of independent variation in food stamp benefits. Three promising sources are examined: (a) variation in household size, (b) variation in deductions from gross income, and (c) receipt of minimum or maximum food stamp benefits. Based on results of a linear regression model with nationally representative data, 90% of the total variation in food stamp benefits is explained by gross cash income and household size variables alone. This finding raises concern about popular regression approaches to studying the Food Stamp Program.

Official USDA Food Plans: Cost of Food at Home at Four Levels, U.S. Average, May 2002 [1]

AGE-GENDER GROUPS	WEEKLY COST				MONTHLY COST			
	Thrifty plan	Low-cost plan	Moderate-cost plan	Liberal plan	Thrifty plan	Low-cost plan	Moderate-cost plan	Liberal plan
INDIVIDUALS [2]								
CHILD:								
1 year	$16.60	$20.50	$24.10	$29.20	$71.90	$88.80	$104.40	$126.50
2 years	16.70	20.50	24.10	29.20	72.40	88.80	104.40	126.50
3-5 years	18.10	22.50	27.80	33.30	78.40	97.50	120.50	144.30
6-8 years	22.60	29.90	37.30	43.30	97.90	129.60	161.60	187.60
9-11 years	26.80	33.90	43.40	50.20	116.10	146.90	188.10	217.50
MALE:								
12-14 years	27.80	38.30	47.50	55.90	120.50	166.00	205.80	242.20
15-19 years	28.70	39.60	49.30	56.90	124.40	171.60	213.60	246.50
20-50 years	30.70	39.40	49.00	59.40	133.00	170.70	212.30	257.40
51 years and over	27.70	37.50	46.10	55.40	120.00	162.50	199.80	240.00
FEMALE:								
12-19 years	27.70	33.00	40.10	48.40	120.00	143.00	173.80	209.70
20-50 years	27.60	34.40	41.90	53.70	119.60	149.10	181.60	232.70
51 years and over	27.00	33.50	41.50	49.60	117.00	145.20	179.80	214.90
FAMILIES:								
FAMILY OF 2 [3]:								
20-50 years	64.10	81.20	100.00	124.40	277.90	351.80	433.30	539.10
51 years and over	60.20	78.10	96.40	115.50	260.70	338.50	417.60	500.40
FAMILY OF 4:								
Couple, 20-50 years and children—								
2 and 3-5 years	93.10	116.80	142.80	175.60	403.40	506.10	618.80	760.90
6-8 and 9-11 years	107.70	137.60	171.60	206.60	466.60	596.30	743.60	895.20

[1]Basis is that all meals and snacks are purchased at stores and prepared at home. For specific foods and quantities of foods in the Thrifty Food Plan, see *Thrifty Food Plan, 1999, Executive Summary,* CNPP-7A; for specific foods and quantities of foods in the Low-Cost, Moderate-Cost, and Liberal Plans, see *Family Economics Review*, No. 2 (1983). The Thrifty Food Plan is based on 1989-91 data and the other three food plans are based on 1977-78 data; all four plans are updated to current dollars using the Consumer Price Index for specific food items.

[2]The costs given are for individuals in 4-person families. For individuals in other size families, the following adjustments are suggested: 1-person—add 20 percent; 2-person—add 10 percent; 3-person—add 5 percent; 5- or 6-person—subtract 5 percent; 7- (or more) person—subtract 10 percent.

[3]Ten percent added for family size adjustment.

Consumer Prices

Average percent change for major budgetary components

Group	*Annual average percent change from December of previous year to December:* 1990	1995	2000	Percent change 12 months ending with May 2002
All Items	6.1	2.5	3.4	1.2
Food	5.3	2.1	2.8	1.9
Food at home	5.8	2.0	3.0	1.6
Food away from home	4.5	2.2	2.4	2.6
Housing	4.5	3.0	4.3	2.2
Apparel	5.1	0.1	–1.9	–2.1
Transportation	10.4	1.5	4.3	–3.4
Medical care	9.6	3.9	4.2	4.7
Recreation	NA	2.8	1.4	1.3
Education and communication	NA	4.0	1.2	2.5
Other goods and services	7.6	4.3	4.5	4.0

Price per pound for selected food items

Food	*Price per pound unless otherwise noted (as of December in each year)* 1990	1995	2000	May 2002
Flour, white, all purpose	$ .24	$ .24	$ .28	$ .32
Rice, white, long grain, uncooked	.49	.55	NA	.47
Spaghetti and macaroni	.85	.88	.88	.90
Bread, white	.70	.84	.99	1.01
Beef, ground, uncooked	1.63	1.40	1.63	1.74
Pork chops, center cut, bone-in	3.32	3.29	3.46	3.49
Chicken, fresh, whole	.86	.94	1.08	1.09
Tuna, light, chunk	2.11	2.00	1.92	1.96
Eggs, grade A, large, per dozen	1.00	1.16	.96	1.00
Milk, fresh, lowfat, per gallon	NA	2.31	2.66	2.62
Butter, salted, grade AA, stick	1.92	1.73	2.80	3.22
Apples, red delicious	.77	.83	.82	.92
Bananas	.43	.45	.49	.52
Oranges, navel	.56	.64	.62	.85
Potatoes, white	.32	.38	.35	.51
Lettuce, iceberg	.58	.61	.85	.72
Tomatoes, field grown	.86	1.51	1.57	1.33
Broccoli	NA	.76	1.52	1.04
Carrots, short trimmed and topped	.43	.53	NA	NA
Onions, dry yellow	NA	.41	NA	NA
Orange juice, frozen concentrate per 16 oz.	2.02	1.57	1.88	1.82
Sugar, white, 33-80 oz. pkg.	.40	.39	.40	.41
Margarine, stick	.87	.79	NA	NA
Peanut butter, creamy	2.09	1.78	1.96	1.98
Coffee, 100% ground roast	2.94	3.75	3.21	3.01

NA = Data not available.

Selected items from CPI Detailed Reports, Bureau of Labor Statistics, various issues. Price changes are for all urban consumers. Food prices are U.S. city average.

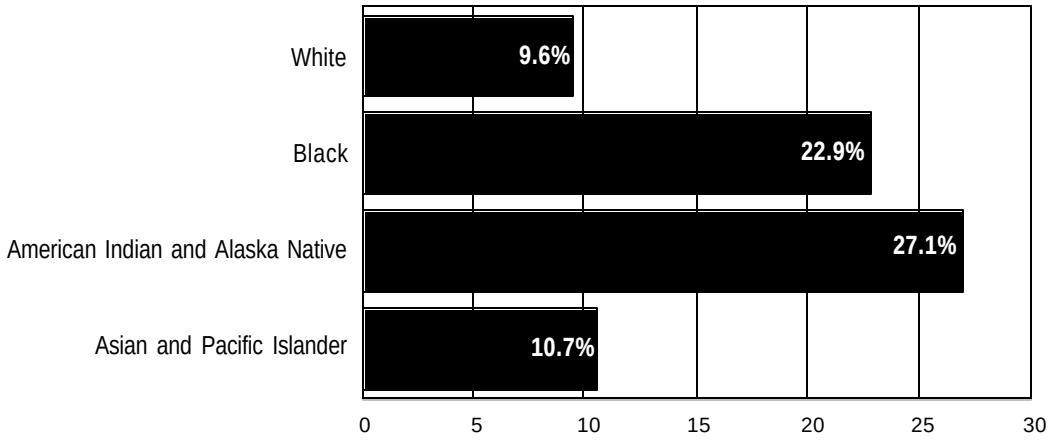
U.S. Poverty Thresholds and Related Statistics

Poverty Thresholds in 2001, by size of family and number of related children under age 18

	Related children under age 18								
Size of family unit	None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person									
Under age 65	$9,214								
Age 65 and over	8,494								
Two people									
Householder under age 65	11,859	$12,207							
Householder age 65 and over	10,705	12,161							
Three people	13,853	14,255	$14,269						
Four people	18,267	18,566	17,960	$18,022					
Five people	22,029	22,349	21,665	21,135	$20,812				
Six people	25,337	25,438	24,914	24,411	23,664	$23,221			
Seven people	29,154	29,336	28,708	28,271	27,456	26,505	$25,462		
Eight people	32,606	32,894	32,302	31,783	31,047	30,112	29,140	$28,893	
Nine people or more	39,223	39,413	38,889	38,449	37,726	36,732	35,833	35,610	$34,238

Source: U.S Census Bureau.

Poverty rate by race, 1999-2000



Source: U.S. Census Bureau.

United States Department of Agriculture

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Check the CNPP Web site (www.cnpp.usda.gov) for the following information and publications:

- Web-Based Training on the "The ABCs of the Dietary Guidelines 2000: Science and Application"
- "How Much Are You Eating"
- Dietary Guidelines for Americans, 2000, 5th Edition
- Interactive Healthy Eating Index
- Recipes and Tips for Healthy, Thrifty Meals
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- Dietary Guidelines for Americans
- Food Guide Pyramid
- Food Guide Pyramid for Young Children
- USDA Healthy Eating Index
- Expenditures on Children by Families
- Family Economics and Nutrition Review
- Nutrient Content of the U.S. Food Supply Summary Report
- Interactive Nutrient Content of the U.S. Food Supply
- Official USDA Food Plans
- Childhood Obesity Symposium Proceedings
- Symposium on Breakfast and Learning in Children
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Julia M. Dinkins, PhD
USDA, Center for Nutrition Policy and Promotion
3101 Park Center Drive, Room 1034
Alexandria, VA 22302-1594

For specific questions or further information, contact the editor:

Phone: (703) 305-2732
Fax: (703) 305-3300
email: julia.dinkins@cnpp.usda.gov