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Factors Affecting Spinach Consumption in the United States

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Abstract

U.S. fresh-market spinach consumption has been increasing over the past few decades. Basic knowledge of the distribution of spinach consumption across different market channels, geographic regions, and population groups has been very limited in the past. Using data from USDA's 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, this article examines the consumption distribution of fresh-market and processed spinach in the United States. The analysis indicates that per capita spinach consumption is greatest in the Northeast and West. About 80 percent of fresh-market spinach is purchased at retail and consumed at home, while 91 percent of processed spinach is consumed at home. Per capita spinach use is strongest among Asians, highest among women 40 and older, and weakest among teenage girls.

Keywords: Spinach, consumption, per capita use, distribution, regions, ethnic background, income, age.

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Introduction

Driven by fresh-market use, the consumption of all spinach (*Spinacia oleracea*) has been on the rise in the United States after bottoming out in the 1980s. Used as both a salad green and a plate vegetable, per capita consumption of this nutritious leafy green (in the same family as table beets and swiss chard) has quintupled since 1972. According to data compiled by the Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA), per capita use of all spinach (on a fresh-weight basis) totaled 2.35 pounds during 2000-02, compared with 1.69 pounds during the 1990s and 1.57 pounds during the 1980s (table 1). During 2000-02, U.S. consumption of all spinach totaled 671 million pounds (fresh-equivalent basis)—66 percent more than in 1990-92.

Fresh-market spinach accounted for 60 percent of domestic consumption in 2000-02. Since falling to historic lows in the early 1970s, fresh-market spinach consumption has been on an upward trend, peaking at a record 453 million pounds in 2000—more than 7 times greater than in 1970. At the same time, consumption of processed spinach has been on a downward trend because consumers have generally favored fresh-market produce. Although per capita use of canned spinach has been trending sharply lower over the past 40 years, increasing use of frozen spinach the last few years has helped processed spinach use to move 6 percent higher in 2000-02, compared with the 1990s. In addition to use as a salad green and plate vegetable, spinach has long enjoyed a reputation as a functional food packed with vitamins and minerals beneficial to human health, including vitamins C and A, the carotenoid lutein (may promote eye health), iron, folic acid, and magnesium.

There has been continuing interest in information about the consumption distribution of vegetables such as spinach. Although much is known about the supply side of the U.S. spinach market, relatively little detailed information has been published about consumer demand, aside from such things as basic USDA disappearance data and retail sales information.

Economic theory suggests that wide-ranging factors directly influence movements in per capita spinach consumption, including immigration trends, changing family sizes, rising disposable incomes, and shifts in America's tastes and preferences. However, due to limited consumer research, the demographics of spinach consumption have not been quantified. Some basic questions include: What proportions of spinach are purchased at retail for use at home and purchased away from home at places such as restaurants? Who consumes spinach? Have the increasing Asian and Hispanic populations in the United States influenced spinach demand?

The purpose of this article is to provide basic economic information about the market distribution of spinach, using data from USDA's most recent individual food consumption survey. Following a short discussion of the data used in the analyses, the report describes U.S. spinach consumption by food source, region of the country, ethnic background, income class, gender, and age.

Table 1—U.S. spinach: Per capita use

Year	Fresh market	Processing[1]			Total
		All	Canning	Freezing	
		Pounds, fresh-equivalent			
1960	.84	1.77	.89	.88	2.61
1965	.51	1.50	.61	.89	2.01
1970	.30	1.54	.81	.73	1.84
1975	.29	1.42	.72	.70	1.71
1980	.44	1.35	.56	.79	1.79
1985	.67	1.06	.43	.63	1.73
1990	.76	.65	.36	.29	1.41
1994	.75	.96	.49	.47	1.71
1995	.67	.99	.45	.54	1.66
1996	.63	1.14	.44	.70	1.77
1997	1.11	.82	.30	.52	1.93
1998	.97	.77	.30	.47	1.74
1999	.98	.85	.29	.56	1.83
2000	1.60	1.07	.22	.85	2.67
2001	1.16	.84	.14	.70	2.00
2002	1.49	.88	.11	.77	2.37
2003 f	1.57	.96	.15	.81	2.53
Decade averages:					
1960s	.54	1.44	.73	.71	1.98
1970s	.32	1.46	.70	.76	1.78
1980s	.56	1.01	.42	.59	1.57
1990s	.80	.89	.38	.51	1.69
2000s	1.46	.94	.16	.78	2.39

[1]Fresh-weight basis.
f = ERS forecast.

Source: Economic Research Service, USDA.

Data and Methodology

USDA has conducted periodic surveys of household and individual food consumption in the United States since the 1930s. The most recent surveys, the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals (CSFII), conducted by USDA's Agricultural Research Service (ARS), provided the basis for this article (USDA, 1998). Each year of the 1994-96 dataset comprises a nationally representative sample of noninstitutionalized persons residing in the 50 States and Washington, DC. The 1998 CSFII was a supplemental survey to the 1994-96 CSFII, focusing strictly on children (see box "USDA Food Consumption Data," page 5, for more details).

In the CSFII, 2 nonconsecutive days of dietary data for individuals of all ages were collected 3 to 10 days apart through in-person interviews, using 24-hour recalls. The 1994-96 CSFII dataset includes information on the food and nutrient intakes of 15,303 individuals, while the 1998 CSFII dataset includes 5,559 children who were up to 9 years of age.

The respondents provided a list of foods consumed as well as information on where, when, and how much of each food was consumed. Standardized probes were used to collect details on food descriptions and amount of food eaten. The location where the food was purchased was coded into several categories. For each respondent, an array of economic, social, and demographic characteristics was also collected. This rich database enables researchers to estimate the market/consumption distribution of a food item by numerous delineations.

USDA Food Consumption Data

The United States Department of Agriculture (USDA) collects and compiles two major datasets on food consumption in the United States: the food supply and utilization—or food disappearance—data, compiled by USDA's Economic Research Service (ERS), and the Continuing Survey of Food Intakes by Individuals (CSFII), compiled by USDA's Agricultural Research Service. Both datasets are key components of ongoing Federal efforts to monitor the nutritional health and dietary status of U.S. consumers. They were mandated by Congress under the National Nutrition Monitoring and Related Research Act of 1990. When used together, these databases provide a comprehensive picture of the Nation's eating habits.

These two datasets, along with the Environmental Protection Agency's (EPA) Food Commodity Intake Database, provided statistics for this study and are described below.

Food Supply and Utilization Data, also known as food disappearance data, measures the flow of raw and semi-processed food commodities through the U.S. marketing system. They are neither a direct measure of actual consumption nor of the quantity of food ingested. The total amount available for domestic consumption is estimated as the residual after exports, industrial uses, seed and feed use, and ending inventories are subtracted from the sum of production, beginning inventories, and imports. The use of conversion factors allows for some subsequent processing, trimming, spoilage, and shrinkage in the distribution system. However, the estimates also include residual uses for which data are not available (such as miscellaneous nonfood uses and changes in retail and consumer stocks).

With data stretching back to 1909 for many commodities, the food disappearance figures are useful as indicators of trends over time. The data are most commonly used to measure the average level of food consumption in the country, to show year-to-year changes in consumption of major foods, to calculate the approximate nutrient content of the food supply, to establish long-term consumption trends, and to enable statistical analyses of effects of prices and income on food consumption. Because the data include spoilage and waste accumulated through the marketing system and in the home, they typically overstate actual consumption. A 1997 ERS study suggests that such losses may exceed 25 percent of the edible food supply.

Food disappearance data reflect the amount of major food commodities entering the market, regardless of their final use. Final product forms and consumption locations are not usually known, and little or no data exist on supplies of further-processed products. In short, relatively good information exists for many food ingredients, but not for foods actually eaten. For example, the food disappearance data provide an estimate of the annual per capita consumption of fresh, canned, and frozen spinach but provide little information on where the spinach and spinach-containing products were marketed—supermarket, school, restaurant, or food manufacturer; on how they were consumed—in frozen meals, in salads, or as a pizza topping; on how they were prepared—cooked from scratch or reheated from a canned or frozen product; or on the socioeconomic characteristics of the consumers who ultimately ate the food.

Continuing Survey of Food Intakes by Individuals (CSFII) provided the 1994-96 and 1998 survey data used in this article. The 1998 CSFII adds intake data for 5,559 children from birth through 9 years to the intake data collected in 1994-96. The CSFII, the most recent in USDA's series of food consumption surveys dating back to the 1930s, measures foods actually eaten by individuals. It records food intake over a specific period (2 nonconsecutive days in 1994-96 using 24-hour dietary recalls). It also collects demographic information such as household size, income, race, age, and sex, and information on where a food item was purchased, how it was prepared, and where it was eaten, in addition to food-intake data. The CSFII provides information for use in policy formation, regulation, program planning and evaluation, education, and research. For example, data from recent surveys have been used to evaluate the impact of food fortification on nutrient intakes, to estimate exposure to pesticide residues and other contaminants from foods, and to target nutrition assistance and education programs to those who need them most. The data are particularly valuable for measuring the effect of socioeconomic and demographic characteristics on food consumption.

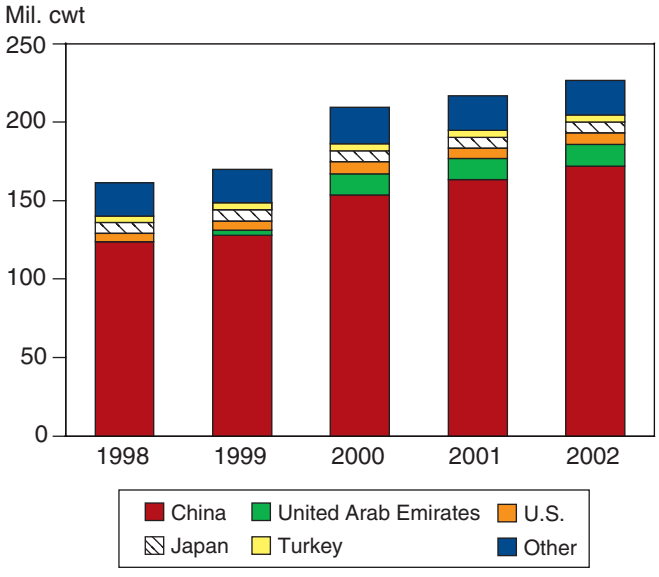
Food Commodity Intake Database (FCID) from the EPA contains human food consumption data that 5,831 people of different ages reported eating in 1994-96 and 1998. The data are presented in terms of individual agricultural commodities, that is, foods are broken down into their basic ingredients—6 ounces of spinach, 2 ounces of onions, 1 ounce of green peppers, etc. FCID provides the edible amount of the ingredient crop and livestock commodities contained in each food eaten by respondents to CSFII.

The 1994-96 CSFII data include a sample weight for each respondent, indicating the number of people the sample represents. The share of a spinach product by location can be estimated by calculating the weighted sum of the product consumed in each location. Similarly, the socioeconomic and demographic characteristics of the respondents can be used to estimate the share of spinach consumed by respondents with these characteristics.

United States a Top World Producer

According to the United Nations Food and Agriculture Organization, during 2000-02 the United States was the world's third-largest producer of spinach, with 3 percent of world output, following China, which accounts for 75 percent and the United Arab Emirates which had 6 percent (fig. 1) (United Nations, 2003). A cool-season crop that grows quickly and can withstand hard frosts, spinach is a native of Asia (some people place the origin in the Persian region) and has been cultivated in China since at least the 7th century (Yamaguchi, 1983). Spinach use was recorded in Europe as early as the mid-13th century, with seed likely accompanying colonists to the New World. California (64 percent of 2000-02 U.S. output), Texas (15 percent), and Arizona (10 percent) are the top producing States, with 16 other States reporting production of at least 100 acres (USDA, August 2003). Over the 2000-02 period, U.S. growers produced an annual average of 704 million pounds of spinach for all uses, with about two-thirds sold into the fresh market (including packaged spinach) (USDA, January 2003). Among processing uses (frozen and canned), output destined for frozen products accounted for 83 percent of processing production. An additional unknown volume is used by at least five firms to manufacture dried and dehydrated products (e.g., spinach flakes and powder). In 1997, spinach was grown on 1,173 farms—down 8 percent from 1992, but about the same as in 1982.

Figure 1
World spinach production, 1998-2002



Source: Food and Agriculture Organization, United Nations.

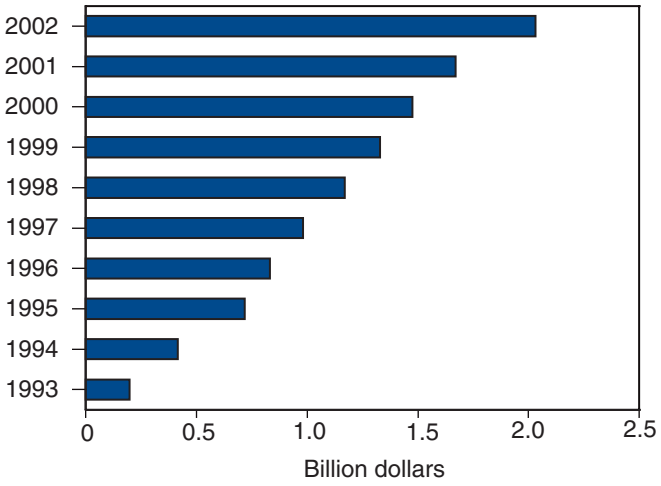
The farm value of the U.S. spinach crop (fresh and for processing) averaged $162 million per year during 2000-02, with fresh-market spinach accounting for 91 percent (USDA, January 2003). The value of fresh-market spinach has more than doubled over the past decade as stronger demand has boosted production and inflation-adjusted prices have held constant. The farm value of spinach for freezing has increased about 60 percent over the same period. However, the value of spinach destined for canning, reflecting collapsing demand, has declined by two-thirds over the past 10 years. California accounts for about two-thirds of the value of both the fresh and processing spinach crops. Average grower cash receipts for spinach during 2000-02 exceed those for such crops as garlic, green peas, pumpkins, chili peppers, and artichokes.

There are three main types of spinach in the U.S. market—*savoy* (which means wrinkled), *semi-savoy*, and *smooth* (also known as flat). Savoy and semi-savoy types are more popular in the fresh market, while smooth-flat types are better suited for processing (including fresh-cut) because their wrinkle-free leaves are easier to wash (Le Strange, 2003). Fresh-market uses for smooth varieties were limited in the past because bunched- and bulk-product quality declined during shipping; the flat leaves tend to compact together, hindering airflow. However, strong growth in packaged spinach sales, along with the ease of washing smooth-flat varieties, has spurred the use of smooth varieties in the fresh market over the last several years. New Zealand spinach (*Tetragonia tetragonioides*), which resembles *Spinacia oleracea* but features a sharper raw flavor, is frequently grown by home gardeners but is not covered in this article.

Triple-washed cello-packed spinach and baby spinach constitute one of the fastest growing segments of the packaged salad industry. These value-added products account for around a tenth of supermarket sales in the $2 billion fresh-cut salad industry (fig. 2), with the explosive growth in packaged baby spinach the primary driving force in the past few years. According to retail sales data collected by Information Resources Inc. (IRI), sales of baby spinach (including salad prod-

Figure 2

U.S. supermarket fresh-cut salad sales, 1993-2002



Source: Information Resources, Inc. (IRI).

ucts where baby spinach is the primary ingredient) rose 70 percent between September 2002 and August 2003, to $116 million. During this same period, retail sales of cello-packed "cooking" spinach increased 7 percent to $108 million. Baby spinach has been popular on the foodservice side of the market for several years for use in salads, salad bars, and various dishes.

For processed spinach, IRI retail sales of frozen spinach totaled $109 million in 2002, up slightly from 2000 and 14 percent higher than in 1998. Retail sales of canned spinach have changed little from $41 million in 2002 over the past 4 years, but 2002 sales were up 5 percent from 1998 (Food Institute, 2003).

During 2000-02, domestic consumption of all spinach rose 66 percent from 1990-92 to 671 million pounds (fresh-equivalent basis). During this period, per capita consumption of all spinach rose 42 percent to 2.35 pounds. Per capita consumption of fresh-market spinach averaged 1.4 pounds during 2000-02—the highest since the early 1950s (USDA, July 2003). Because of declining canned use, consumption of spinach for processing has trended lower since peaking in 1951 at nearly 2 pounds. Per capita use of spinach for processing averaged 0.93 pound in 2000-02—51 percent below the 1951-53 peak.

Fresh-market spinach consumption has trended higher during each of the past three decades. Per capita fresh spinach consumption peaked during 1939-41 at 2.73 pounds and then embarked on a steady long-term decline that bottomed out during 1972-74 at 0.29 pound per person. Then, in the mid-1970s, the increasing popularity of salad bars and more widespread interest in nutrition helped reverse the trend. By the 1990s, this upward trend appeared to reach a plateau of about 0.7 pound per capita. In the later years of the 1990s, the introduction of various prewashed and bagged spinach products (including baby spinach) during a period of strong economic growth seems to have given the market a further boost. In 2000, per capita consumption surged to 1.6 pounds (the highest since 1950), with this level expected to be reached again in 2003. In part, the recent increase in spinach demand could reflect public awareness of the health impact of including nutritionally superior produce in the diet. According to the CSFII, on any given day, nearly 3 percent of Americans consume spinach in some form.

"At-Home" Use Strongest

In CSFII, "at home" and "away from home" delineations are based on where a food was obtained or prepared, not where it was consumed. Food at home is generally bought at a retail store such as a supermarket, grocery, or convenience store. Food away from home is generally bought from foodservice establishments but can also be obtained in such places as school cafeterias, community feeding programs, or child/adult care centers. Both at-home and away-from-home food can be consumed either at or away from home. For example, a bagged lunch prepared at home and consumed at work is classified as at-home food. A commercially prepared pizza (with a spinach topping) delivered and consumed at home is classified as away-from-home food. Fast food places include self-service establishments and carryouts, restaurants are places with wait staff, and school cafeterias include daycare facilities and summer camps. The category "others" is a catchall grouping, including such things as community feeding centers, bars/taverns, and vending machines (Lin, 1999).

According to the CSFII, 87 percent of all spinach was purchased at retail stores and considered to be at-home food (table 2). About 80 percent of fresh-market spinach was purchased at retail stores for home use, while 91 percent of processed spinach was bought for home meal preparation. The majority of processed spinach is in frozen products, with canned and dehydrated products accounting for smaller shares of the market. About 92 percent of frozen spinach is purchased at retail vs. 90 percent of canned spinach. Industrial food demand (frozen quiche, dips, TV din-

Table 2—U.S. spinach: Consumption distribution by fresh and processed product[1]

Item	Population	All spinach	Fresh-market	Processed[2]	Canned	Frozen
			Percent			
Food sources:						
Home	97.6[3]	86.8	79.8	90.9	90.2	91.6
Away from home	56.2[3]	13.2	20.2	9.1	9.8	8.4
Fast food	26.6[3]	1.7	1.7	1.8	.1	3.6
Other restaurant	17.3[3]	8.0	13.5	4.9	6.3	3.4
School	6.8[3]	.4	.2	.4	.7	.2
Others	21.4[3]	3.1	4.9	2.0	2.8	1.2
Census region:						
Northeast	19.6	28.1	26.8	28.8	12.2	46.6
Midwest	23.5	14.1	17.0	12.4	16.7	7.9
South	34.9	31.3	27.1	33.8	37.3	30.1
West	22.0	26.5	29.1	25.0	33.9	15.5
MSA status:[4]						
Metropolitan	32.0	36.5	33.2	38.4	28.5	49.1
Suburban	46.9	44.0	55.5	37.4	44.4	29.8
Rural	21.1	19.5	11.3	24.2	27.0	21.2
Race/ethnic origin:						
White, non-Hispanic	72.5	71.3	75.3	69.0	69.7	68.1
Black, non-Hispanic	12.6	13.0	10.7	14.3	13.1	15.6
Hispanic	10.6	6.1	2.6	8.1	3.8	12.7
Mexican	4.9	1.0	1.8	.5	1.1	.0
Puerto Rican	1.1	.0	.0	.1	.1	.0
Cuban	.3	.0	.0	.1	.1	.0
Other Hispanic	4.3	5.0	.8	7.4	2.5	12.7
Asian	2.9	7.6	7.5	7.7	12.5	2.6
Others	1.5	2.1	3.9	1.1	1.0	1.2
Household income as a percentage of poverty:						
Under 130 percent	19.2	14.9	9.9	17.7	18.3	17.2
131-350 percent	41.8	36.1	30.6	39.3	46.6	31.5
Over 350 percent	39.0	49.0	59.5	43.0	35.1	51.3
Gender and age:						
Male, all	49.0	45.7	45.6	45.7	53.4	37.4
Male, 2-11	9.0	4.0	2.9	4.6	6.6	2.4
Male, 12-19	5.9	3.3	1.5	4.3	5.4	3.2
Male, 20-39	16.0	15.6	13.9	16.6	20.0	12.9
Male, 40-59	11.6	13.9	18.6	11.1	12.6	9.5
Male, 60 and over	6.7	8.9	8.7	9.1	8.8	9.4
Female, all	51.0	54.3	54.4	54.3	46.6	62.6
Female, 2-11	8.5	2.8	2.4	3.0	3.6	2.4
Female, 12-19	5.7	1.9	.5	2.6	4.7	.4
Female, 20-39	15.9	19.4	18.3	20.1	13.7	27.0
Female, 40-59	12.1	19.3	17.8	20.2	13.3	27.6
Female, 60 and over	8.6	10.9	15.4	8.3	11.3	5.2

[1]Components may not sum vertically due to rounding.
[2]Processed consists largely of canned spinach, but also includes frozen and dehydrated.
[3]Percent of population consuming at least one food at the specific location.
[4]MSA = Metropolitan Statistical Area.

Source: U.S. Department of Agriculture, Agricultural Research Service, 2000. 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals. CD-ROM. Available from National Technical Information Service, Springfield, VA.

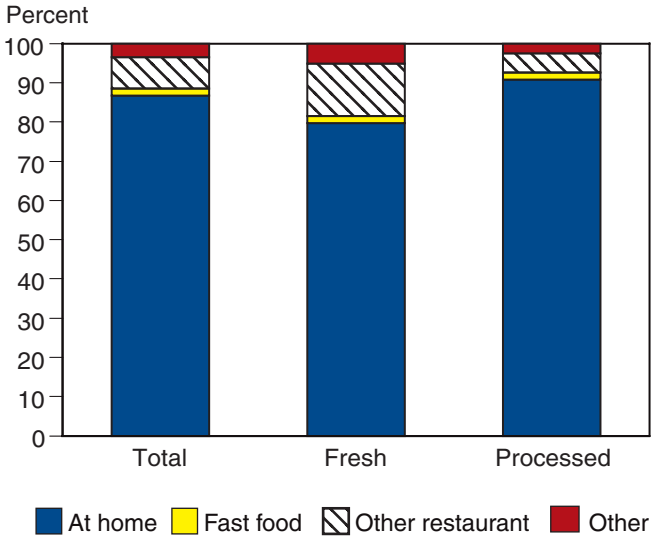
ners, etc.) and a lack of foodservice uses has resulted in the majority of frozen spinach being used in various foods purchased at retail for home use.

As is frequently the case with vegetables, there was considerable difference between the fresh and processed spinach markets as to where foods were obtained (fig. 3). About 20 percent of fresh-market spinach was acquired from away-from-home sources, while just 9 percent of processed spinach consumption consisted of food away from home. Among many other factors affecting produce sales over the past 20 years, a presence in the expanding foodservice sector has been key to market growth for several commodities (e.g., potatoes, tomatoes, mushrooms, and onions). For spinach, the fresh side of the market has enjoyed relatively steady growth as shippers have taken advantage of major food trends, such as salad bars, the popularity of stir-fry dishes, and a general increase in the diversity and ethnicity of foods. The convenience offered by mixed bagged salads (including leafy greens such as spinach), prewashed bagged spinach, and the tender taste and texture of bagged baby spinach has boosted fresh spinach consumption, while consumption of canned spinach has slumped.

According to the CSFII, nearly 14 percent of fresh spinach consumption was due to full-service restaurants and likely reflected its use in salads and on salad bars, plus in Asian stir-fry dishes. Just 2 percent of fresh spinach was reported to be consumed in meals at fast food establishments. This reflects the lack of menu choices featuring spinach, although some of the recent additions to fast food salads include baby spinach among the mixed greens. As is the case with vegetables like broccoli or artichokes, spinach in any form rarely appears (for less than 1 percent of its use) in school cafeterias.

Using the 1994-96 and 1998 CSFII data as distributors, ERS per capita disappearance data can be broken down by the various food sources (table 3). An important caveat is that this estimation procedure assumes that market shares today remain similar to those discovered by the survey during 1994-96 and 1998. The results indicate that about 0.3 pound of the 1.5 pounds of fresh spinach consumed in 2002 was obtained away from home, as was 0.1 pound of the 0.9 pound of processed spinach (fresh-weight basis).

Figure 3
Annual consumption of spinach by food source



Source: Economic Research Service, USDA.

Table 3—Spinach: Per capita use by food source, 2002

Category	Total[1]	Fresh	Processed
	Pounds per person		
At home	1.99	1.19	0.80
Away from home	0.38	0.30	0.08
Fast food	0.04	0.02	0.02
Other restaurant	0.24	0.20	0.04
School	0.01	0.00	0.00
All others	0.09	0.07	0.02
All sources	2.37	1.49	0.88

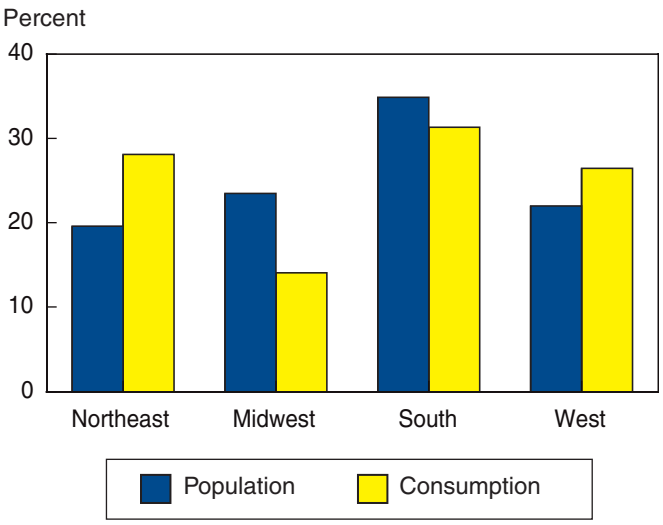
[1]Components may not sum due to rounding. See text box "Calculating Per Capita Shares," (p.13) for an explanation of methodology.

Source: Derived by ERS using data from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, U.S. Dept. of Agriculture, Agricultural Research Service.

Spinach Consumption Strongest In the West

The CSFII data are broken down by four census-defined regions—Northeast (with 20 percent of the U.S. population), Midwest (with 24 percent), South (with 35 percent), and West (with 22 percent). The regional consumption data show that during the survey period, the Northeast and West each consumed proportionately more spinach than their share of the national population (fig. 4). The Midwest, and the South to a

Figure 4
U.S. population and spinach consumption, by region



Source: Economic Research Service, USDA.

lesser degree, consumed proportionately less spinach than their share of the population.

As the 2002 per capita regional market distribution estimates in table 4 indicate, spinach appears to have the greatest following in the Northeast, where per capita use of all spinach is 3.3 pounds, followed closely by the West (3.0 pounds). While the South was just below the national average consumption rate of 2.4 pounds, people in the Midwest consumed just 1.5 pounds of all spinach (fresh and processed)—about a third less than the national average.

In the fresh market a similar pattern holds, with the Northeast and West eating the most spinach (each around 2 pounds per capita), while those in the Midwest and South eat the least (1.1 to 1.2 pounds per capita). For processed products, the consumption range narrows, with the Northeast leading at 1.3 pounds per person and consumers in the Midwest again reporting the lowest consumption at half a pound.

About 47 percent of American consumers live in suburban areas, 32 percent live in metropolitan cities, and 21 percent live in rural areas. Total spinach consumption was strongest in metropolitan areas (2.6 pounds per capita), followed by suburban sections of the country (2.5 pounds), and more distantly by rural areas (1.8 pounds). For fresh-market spinach, suburbanites reported consuming about 14 percent more per capita than those in metropolitan areas and more than twice as much as those in rural areas (table 5). On the processing side of the market, metropolitan and rural consumers reported eating the most canned and frozen spinach (1.1 and 1.0 pounds, respectively), well above the amount eaten by suburban consumers (0.7 pound).

Asians Are Leading Spinach Consumers

Asians (a category that includes Pacific Islanders), the most rapidly growing racial class in the nation, represent just 3 percent of the U.S. population but consume 8 percent of all spinach (table 2). Between 1990 and 2000, census data indicate that the U.S. Asian population expanded by 50 percent, compared with 45 percent for Hispanics and 14 percent for non-Hispanic Blacks. Expressed on a per capita basis, Asian consumers used nearly 6.2 pounds of spinach in 2002, of which 3.9 pounds consisted of fresh-market products (table 6). Long popular in Chinese stir-fry dishes,

Table 4—Spinach: Estimated regional per capita use, 2002[1]

Region	Total	Fresh	Processed
		Pounds	
Northeast	3.33	2.04	1.29
Midwest	1.54	1.08	0.46
South	2.01	1.16	0.85
West	2.97	1.97	1.00
Total	2.37	1.49	0.88

[1]See text box "Calculating Per Capita Shares," (p.13) for an explanation of methodology.

Source: Derived by ERS using data from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, U.S. Dept. of Agriculture, Agricultural Research Service.

Table 5—Spinach: Estimated per capita use by metro status, 2002

Metro status	Total[1]	Fresh	Processed
		Pounds	
Metropolitan	2.60	1.55	1.05
Suburban	2.47	1.77	0.70
Rural	1.81	0.80	1.00
Total	2.37	1.49	0.88

[1]Components may not sum due to rounding. See text box "Calculating Per Capita Shares," (p.13) for an explanation of methodology.

Source: Derived by ERS using data from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, U.S. Dept. of Agriculture, Agricultural Research Service.

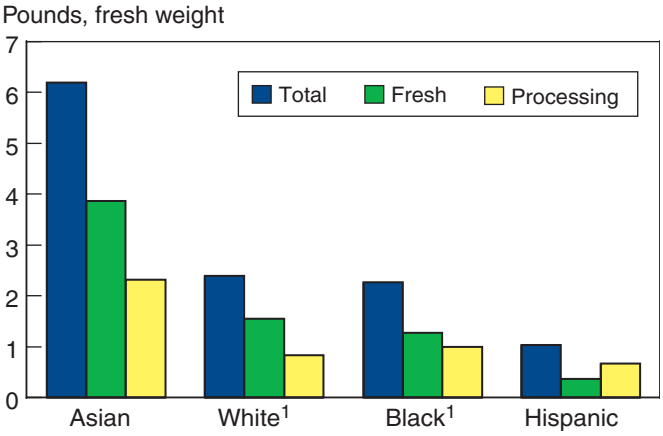
Table 6—Spinach: Per capita use by race/ethnicity, 2002

Category	Total[1]	Fresh	Processed
	Pounds per person		
White	2.39	1.55	0.83
Black	2.26	1.27	1.00
Hispanic	1.03	0.37	0.67
Mexican	0.64	0.55	0.10
Puerto Rican	0.04	0.00	0.04
Cuban	0.27	0.11	0.16
Other Hispanic	1.77	0.27	1.51
Asian	6.19	3.87	2.32
Others	4.47	3.86	0.62
Population average	2.37	1.49	0.88

[1]Components may not sum due to rounding. See text box "Calculating Per Capita Shares," (p.13) for an explanation of methodology.

Source: Derived by ERS using data from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, U.S. Dept. of Agriculture, Agricultural Research Service.

Figure 5
Annual U.S. per capita spinach consumption by racial/ethnic makeup, 2002



[1] Non-Hispanic.
Source: Economic Research Service, USDA.

spinach is also found in a host of recipes, which helps underpin demand—particularly by White, non-Hispanic consumers, who account for 71 percent of all spinach use. In addition to traditional fresh green salads, spinach is used in such fare as soufflés, quiches, creamed dishes, dips, pies, and wilted spinach salads.

Per capita use of all spinach by non-Hispanic White consumers was estimated to be 2.4 pounds in 2002. However, future use by this population segment will depend on increasing per person use, rather than on population expansion. Between 1990 and 2000, the U.S. non-Hispanic White population grew by just 4 percent, and the Bureau of the Census projects that it will increase just 7 percent by 2030. During the same time, the U.S. population as a whole is expected to increase 28 percent—meaning non-Hispanic Whites will continue to account for a declining share.

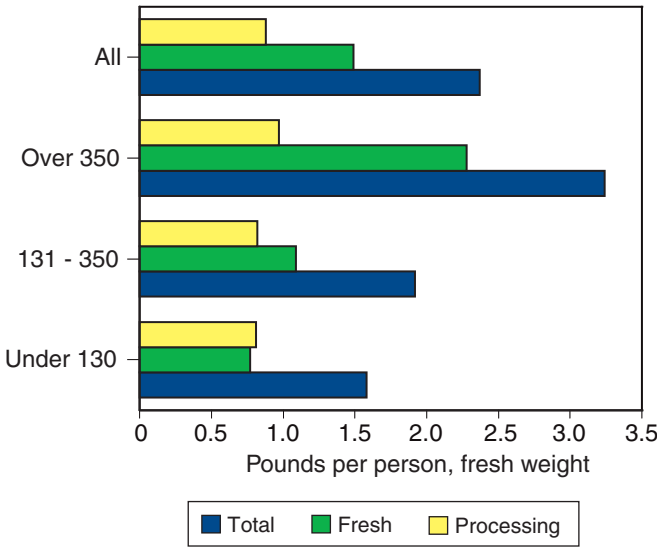
Among the four major racial/ethnic groups, per capita spinach consumption by Black consumers was just behind that of Whites at 2.3 pounds—1.3 pounds of fresh spinach and 1 pound of processed spinach. Blacks followed Asians (2.3 pounds) as leading consumers of spinach for freezing (1.0 pounds). Blacks represent nearly 13 percent of the U.S. population and accounted for 13 percent of all spinach consumption during the 1994-96/98 survey period (table 2).

Similarly, the CSFII indicated that spinach plays a limited role in the diets of many Hispanic consumers (fig. 5). During the survey period, people of Hispanic descent accounted for nearly 11 percent of the population, yet reported consuming just 6 percent of all spinach. This is an important point since Hispanics have now surpassed Blacks as the second-largest racial/ethnic group and are also the second-fastest-growing population segment in the United States. Fresh spinach, although apparently shunned by Puerto Ricans and Cubans, is accepted by Mexicans (who account for nearly half the Hispanics in the United States) and other Latinos (who prefer frozen spinach).

Per Capita Use Rises With Income

According to the CSFII, income appears to be an important determinant of spinach consumption. Households were classified into three income brackets using the Federal poverty guidelines. The poverty guidelines were developed by the U.S. Department of Health and Human Services for the implementation of Federal food programs. Some of these programs, such as the Food Stamp Program, have used 130 percent of the poverty level to determine eligibility. This figure is used in this study as the top end of the low-income category. About 39 percent of households had incomes exceeding 350 percent of the poverty level (designated as high-income households); 42 percent of households had incomes falling between 131 and 350 percent of the poverty level (middle-income group); and 19 percent of households had incomes below 131 percent of the poverty level (low-income group) (table 2).

Figure 6
Annual spinach consumption and income, 2002
Household income as a percentage of the poverty rate



Source: Economic Research Service, USDA.

The CSFII results suggest a strong positive correlation between income and fresh and processed spinach consumption (fig. 6). For all spinach, consumers in the survey's top income bracket reported the highest per capita consumption (an estimated 3.2 pounds in 2002), while those in the lowest bracket reported the lowest consumption (1.6 pounds) (table 7). Consumption of middle-income consumers ranged between the upper and lower groups at 1.9 pounds per person. Although their per capita consumption was 22 percent greater than the lowest income group, the middle-income responders reported eating proportionately less fresh spinach (31 percent of the total) than their respective population share (42 percent). This was also the case with the lower income group (table 2).

About 60 percent of all fresh-market spinach was consumed by 39 percent of the population—those whose incomes exceed 350 percent of the poverty level. Given their increased affluence, consumers in this income group are likely less price-sensitive at the supermarket and are more willing to purchase washed and bagged spinach products. Since they also take a greater percentage of their meals away from home, their exposure to spinach may be greater than for the other two income classes, given that full-service restaurants accounted for 14 percent of fresh spinach sales. Within the processed category, the top income class consumed 51 percent of spinach for freezing (1 pound per person), while per capita use in canned products was slightly favored by the middle income group—although use was still generally similar among the three income classes (each about a tenth of a pound).

Table 7—Spinach: Estimated per capita use by income class, 2002

Percent of poverty level	Total[1]	Fresh	Processed
		Pounds	
Under 130 percent	1.58	0.77	0.81
131 to 350 percent	1.92	1.09	0.82
Over 350 percent	3.24	2.28	0.97
All households	2.37	1.49	0.88

[1]Components may not sum due to rounding. See text box "Calculating Per Capita Shares," (p.13) for an explanation of methodology.

Source: Derived by ERS using data from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, U.S. Dept. of Agriculture, Agricultural Research Service.

Spinach Consumption Highest For Adult Women

The CSFII data indicated that adult women generally consume more spinach than adult men (table 8). Women accounted for 51 percent of the population and reported consuming 54 percent of all spinach. They were leading consumers of both fresh spinach (54 percent of the total) and frozen (63 percent), while men ate more canned spinach (53 percent). For fresh spinach on a per capita basis, women consumed 1.6 pounds—about 14 percent more than men. For processed spinach, the situation was very similar, with men consuming 0.8 pound (fresh-weight basis) per capita—13 percent less than women. Women consumed 61 percent more frozen spinach per capita than men (about 1 pound, compared with 0.6 pound for men). However, the CSFII indicated that men consumed about 20 percent more canned spinach than women, although the levels for both were small (around a tenth of a pound).

The CSFII also provided consumption breakdowns by selected age groups. Before age 20, the consumption of both fresh and processed spinach by males exceeds that of females. Although people under the age of 20 accounted for 29 percent of the population, they reported consuming just 12 percent of all spinach. The survey showed that consumption was relatively light for children between the ages of 2 and 11, averaging an estimated 0.8 pound per capita. This age group accounts for about 18 percent of the population but

Table 8—Spinach: Estimated per capita use by age/gender, 2002

Age/gender	Total[1]	Fresh	Processed
		Pounds	
Male, all	2.21	1.39	0.82
Male, 2-11	0.94	0.49	0.45
Male, 12-19	1.03	0.38	0.65
Male, 20-39	2.21	1.30	0.91
Male, 40-59	3.25	2.40	0.84
Male, 60 and over	3.13	1.94	1.19
Female, all	2.53	1.59	0.93
Female, 2-11	0.72	0.41	0.31
Female, 12-19	0.54	0.13	0.40
Female, 20-39	2.82	1.71	1.11
Female, 40-59	3.65	2.19	1.46
Female, 60 and over	3.51	2.67	0.85
Total	2.37	1.49	0.88
Total, 2-11	0.84	0.45	0.38
Total, 12-19	0.78	0.26	0.53
Total, 20-39	2.51	1.51	1.01
Total, 40-59	3.45	2.30	1.16
Total, 60 and over	3.35	2.35	1.00

[1]Components may not sum due to rounding. See text box "Calculating Per Capita Shares," for an explanation of methodology.

Source: Derived by ERS using data from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, U.S. Dept. of Agriculture, Agricultural Research Service.

consumed less than 7 percent of all spinach. As children entered their teen years (loosely defined as ages 12-19), spinach consumption declined; in fact, total per capita spinach consumption was lowest for teenagers (0.8 pound), with teen females eating just half a pound—the smallest amount among all identified age groups. Teens are frequent consumers of fast foods, a market segment in which spinach is not well represented.

Consumption of all spinach was highest for men and women between the ages of 40 and 59. This group accounted for 24 percent of the population but consumed one-third of all spinach. Per capita consumption of fresh spinach was higher for women (important consumers of fresh salads) than for men across the three reported adult age cohorts. Women over the age of 60 had the highest per capita use of fresh spinach at 2.7 pounds—one-third higher than men of the same age. Women between the ages of 40 and 59 also had the highest per capita use of processed spinach (largely frozen) than any other age group, at nearly 1.5 pounds. This may be a reflection of the widespread use of spinach in manufactured "light" and diet frozen meals—foods mostly favored by adult women.

While people between the age of 40 and 59 were the strongest consumers of spinach, survey respondents over the age of 59 also remained steadfast spinach eaters. Per capita use for all spinach in this group was just a tenth of a pound less than that of the middle-aged cohort. Those over the age of 59 represent about 15 percent of the population and consumed about 20 percent of all spinach (24 percent of fresh and 17 percent of processed). On a per capita basis, men and women over the age of 59 were the leading consumers of spinach for canning (0.14 pound), with 20 percent of consumption. The per capita consumption of spinach in frozen products increased steadily with age for men but remained below the national average (0.8 pound) until after age 59, when it reached 1.1 pounds per person.

Calculating Per Capita Shares

One way to describe the various consumption shares is by converting the survey shares into information already familiar to those in the agricultural industry: per capita disappearance. The per capita use data in the tables were calculated by distributing the 2002 ERS food disappearance data for spinach, using the CSFII survey data as distribution factors, and then dividing by the 2002 population. This presents the share of consumption described in the survey in terms of spinach consumption per person.

A potential shortcoming of this methodology is that each dataset represents a different time period. While the disappearance data is for the 2002 season (the latest available), the distribution factors applied to this data (also the latest available) were from survey data collected during 1994-96 and 1998. It is likely that there have been changes in the market distribution factors for spinach (especially fresh-market spinach) since the survey data were collected. Although the various levels of consumption may or may not be the same as if 2002 CSFII data had been available and used, the shares illustrated by the distributed data in the tables are a fair representation of the shares found in the 1994-96 and 1998 CSFII.

Conclusion

Although a great deal is known about the supply side of the U.S. spinach market, the knowledge base has historically remained small for the consumer side of the market. Using data from USDA's CSFII survey, we show where and how much fresh and processed spinach is consumed and link this consumption to consumers' economic, social, and demographic characteristics. Important findings in this article include the following:

- The majority of the spinach that was consumed was purchased at retail stores and considered at-home food. The standard full-service restaurant market was the strongest among the various away-from-home markets.
- Per capita consumption of spinach was strongest in the Northeast and West, but was below the national average in the South and Midwest.
- Asian and non-Hispanic White consumers were the strongest per capita consumers of spinach. Spinach was found to be of lesser importance in the diets of most Hispanic consumers, compared with its use by other consumers.
- Per capita spinach consumption was found to be positively correlated with income, with consumption among upper-income consumers about twice that of the lower-income group and two-thirds greater than that of middle-income consumers.
- Per capita consumption of all spinach was 14 percent greater for women than for men. Men and women between the ages of 40 and 59 are the strongest spinach consumers on a per capita basis, with fresh-spinach use by men and processed use by women peaking during these years. Fresh spinach use was weakest during the teen years. It remained strong for those over 59.

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