



United States
Department
of Agriculture

VGS319-01
March 2007



Outlook Report from the Economic Research Service

www.ers.usda.gov

Factors Affecting Carrot Consumption in the United States

Gary Lucier and Biing-Hwan Lin

Abstract

Carrots are one of the most popular vegetables in the United States and fresh-market carrot consumption has been increasing over the past few decades. Basic knowledge of the distribution of carrot consumption across different market channels, geographic regions, and population groups is very limited. Using a combination of ACNielsen Home-scan panel data and USDA's Continuing Survey of Food Intakes by Individuals, this article examines where and how much fresh and processed carrots are eaten and links this consumption to various economic, social, and demographic characteristics of consumers. The analysis indicates that per capita carrot consumption is greatest in the East and Central regions of the country. About 80 percent of fresh-market carrots are purchased at retail and consumed at home, with the majority consisting of fresh-cut (including baby) carrots. Per capita use of fresh carrots is strongest among Asians, with per capita use of both fresh and freezing carrots greatest among upper income households.

Keywords: Carrots, consumption, fresh-cut, per capita use, distribution, regions, ethnic background, income.

Acknowledgments

The authors gratefully acknowledge the reviews of Linda Calvin and Cheryl Christensen of ERS, John Love of the World Agricultural Outlook Board, Jim Smith of the National Agricultural Statistics Service, Shari Kosco of the Foreign Agricultural Service, and Enrique Ospina and Joyce Witters of the Agricultural Marketing Service, USDA; Phil Gruszka of Grimmway Farms, Tim McCorkle of Bolthouse Farms, Ed Estes of North Carolina State University, and Jose Pena of Texas A&M University. The authors also appreciate the observations and support provided by Jerry Munson of the California Fresh Carrot Advisory Board. Excellent support was provided by the editor, Dale Simms, and by the designer, Wynnic Pointer-Napper.

Contents

Introduction	2
The United States Is a Leading Carrot Producer	4
Market Share By Location	7
At-Home Carrot Consumption Strongest in the East	10
Non-Hispanic Whites and Asians Are Dominant Carrot Consumers	14
Fresh and Frozen Use Rises With Income	16
Carrot Consumption Increases With Age	17
Organic Share at 3 Percent	18
Conclusion	19
References	20

Approved by USDA's
World Agricultural
Outlook Board

Introduction

The versatile carrot has long been a favorite American vegetable, popularly used in soups, stews, snacks, and desserts. But today's U.S. carrot industry is quite different from that of just 20 years ago, having been transformed by the introduction of fresh-cut technology. In 1986, a prominent California carrot grower invented the baby carrot (included in the term fresh-cut used henceforth in this article) to save some of the broken and misshaped carrots culled from the fresh carrot packing line. Although more expensive than the traditional cellophane-wrapped (cello) carrot pack, fresh-cut carrots eventually gained wide appeal by the early 1990s. Time-pressed consumers quickly recognized the convenience factor embodied in these new products, which broadened the carrot market by making them more portable, convenient, and tasty. As a result of these exciting new products, domestic disappearance of carrots (fresh and processing expressed on a fresh-weight basis) was explosive during the 1990s, reaching a record 5 billion pounds in 1997 (table 1).¹

Despite the popularity and convenience of fresh-cut products, disappearance of carrots declined during the first 6 years of the new millennium. While this drop may have partly reflected reduced demand for whole carrots, it is more likely that the maturation of the fresh-cut industry fostered increased production and processing efficiency, thus reducing waste and allowing lower raw carrot production. During 2000-05, average disappearance of carrots for the fresh market (down 15 percent) and for processing (down 20 percent) have each declined from the 1990-99 average. Despite this drop, per capita use of all carrots this decade remains 20 percent above the average of the 1980s (Lucier, 4).

Carrots are very high in beta carotene (the precursor to Vitamin A), and also contain Vitamin C, Vitamin K, potassium, other vitamins and minerals, and dietary fiber (USDA, 15). In this century, carrots have largely been used as a popular cooking vegetable, salad item, snack food, and raw vegetable.

Interest in how the consumption of vegetables like carrots is distributed among various demographic components remains strong. Although much is known about the supply side of U.S. fresh and processing carrot markets, much less 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 movement in per capita carrot consumption, including immigration trends, changing family sizes and lifestyles, rising disposable incomes, and shifts in America's tastes and preferences. However, due to limited consumer research, the demographics of carrot consumption have not been quantified in detail. Some basic questions include: What proportion of fresh and processed carrots are purchased at retail for use at home and purchased away from home at places such as restaurants? Who consumes carrots? Have the increasing Asian and Hispanic populations in the United States influenced carrot demand?

The purpose of this article is to provide basic economic information about the market distribution of carrots, largely using data from the 1998-2003

¹A proxy for consumption, disappearance is the net supply available for consumption.

Table 1

U.S. carrots, fresh and processing: Supply, utilization, and price, farm weight, 1980-2006

Year	Supply				Disappearance				Trade share of:	
	Production ¹	Imports ²	Beginning stocks ³	Total	Exports ²	Ending stocks ³	Total	Per capita use ⁴	Disappearance imported	Supply exported
	<i>Million pounds, fresh-weight equivalent</i>							<i>Lbs/person</i>	<i>Percent</i>	
1980	2,112	119	626	2,857	135	530	2,191	9.63	5.4	4.7
1981	2,195	99	530	2,824	178	447	2,199	9.56	4.5	6.3
1982	2,408	115	447	2,970	164	592	2,216	9.54	5.2	5.5
1983	2,311	139	592	3,042	142	665	2,235	9.54	6.2	4.7
1984	2,361	175	665	3,200	158	521	2,521	10.66	6.9	4.9
1985	2,277	164	521	2,962	144	514	2,304	9.66	7.1	4.9
1986	2,354	134	514	3,002	172	552	2,278	9.47	5.9	5.7
1987	2,872	118	553	3,543	189	577	2,777	11.44	4.3	5.3
1988	2,485	132	577	3,193	198	434	2,561	10.45	5.1	6.2
1989	2,956	145	434	3,535	165	533	2,837	11.47	5.1	4.7
1990	2,994	143	380	3,517	166	409	2,942	11.76	4.9	4.7
1991	2,857	152	409	3,419	188	371	2,860	11.28	5.3	5.5
1992	3,279	157	371	3,807	179	462	3,163	12.32	5.0	4.7
1993	3,884	143	462	4,489	194	475	3,821	14.68	3.7	4.3
1994	4,471	181	475	5,127	180	494	4,453	16.91	4.1	3.5
1995	4,140	236	494	4,869	204	560	4,106	15.40	5.7	4.2
1996	4,505	235	560	5,299	222	513	4,564	16.92	5.1	4.2
1997	4,998	246	513	5,757	253	548	4,957	18.16	5.0	4.4
1998	3,805	199	548	4,551	292	467	3,793	13.74	5.2	6.4
1999	3,813	204	467	4,484	274	559	3,651	13.07	5.6	6.1
2000	3,746	197	559	4,503	296	538	3,669	12.99	5.4	6.6
2001	3,688	231	538	4,457	321	503	3,634	12.74	6.4	7.2
2002	3,389	223	503	4,115	355	442	3,318	11.52	6.7	8.6
2003	3,611	219	442	4,271	334	460	3,477	11.95	6.3	7.8
2004	3,528	261	460	4,248	290	470	3,488	11.87	7.5	6.8
2005 p	3,610	240	470	4,320	289	507	3,524	11.62	6.8	6.7
2006 f	3,491	286	507	4,284	257	501	3,526	11.80	8.1	6.0

p = preliminary. f = ERS forecast.

Note: Components may not sum due to rounding.

¹Source: USDA, National Agricultural Statistics Service. Production was adjusted by ERS for 1980-81 to account for States excluded in NASS surveys.

² Source: U.S. Dept. of Commerce, U.S. Census Bureau. From 1980-89, fresh exports were adjusted using Canadian import data. All frozen data converted to a fresh-weight basis using a factor of 1.82. Canned converted using a factor of 1.33.

³ Source: USDA, National Agricultural Statistics Service.

⁴ Per capita use is total supply divided by total U.S. population on July 1.

Source: USDA, Economic Research Service.

ACNielsen Homescan and a USDA individual food consumption survey. Following a short discussion of the history and supply factors for carrots, the article briefly describes the economics of the fresh and processing carrot markets and U.S. carrot consumption by food source. The focus then shifts to various demographics of the food-at-home portion of the carrot market, including market share and per capita use by region of the country, ethnic background, and income class.

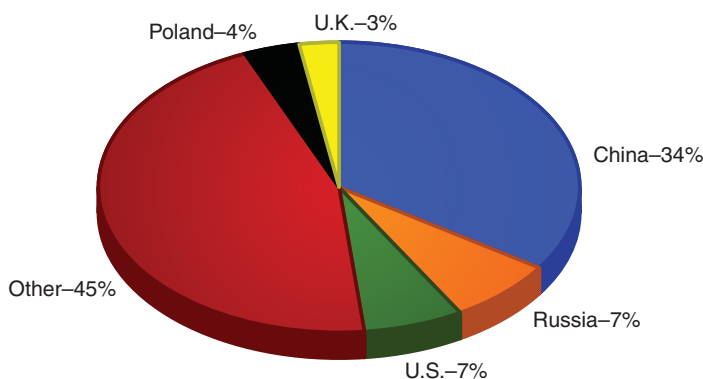
The United States Is a Leading Carrot Producer

Thought to be native to central or western Asia (likely Afghanistan), cultivated carrots first arrived in North America with the early Virginia colonists (Yamaguchi). Carrots (*Daucus carota L.*) are an important member of the parsley (*Umbelliferae*) family, which also includes celery, anise, and dill. Like many vegetables, the early history of carrots centered on various medicinal attributes thought suitable for curing a wide range of conditions and maladies. This, together with later varietal improvements, helped carrot culture to spread throughout the world. Despite this widespread acceptance and growth, according to the United Nations' Food and Agriculture Organization (FAO), three countries produced nearly half of the world's carrots during 2003-05. The United States was the third-leading producer of all carrots, just behind Russia, with each producing about 7 percent of world output (fig. 1). Both distantly followed the Peoples Republic of China, which produced 34 percent of the world's carrots (United Nations). FAO data indicate that worldwide carrot production averaged 24 million metric tons during 2003-05—up 51 percent from 1993-95. Much of the world increase over the past decade was due to a nearly three-fold increase in China's output.

According to the 2002 Census of Agriculture, carrots were grown on 1,792 U.S. farms—down 16 percent from 2,138 farms in 1997, but about the same as in 1982 (USDA, 13). California (65 percent), Washington (8 percent), and Michigan (6 percent) were the top producing States during 2003-05. California accounted for 76 percent of fresh-market output, while Washington produced 34 percent of the carrots destined for processing. Over 2003-05, U.S. growers produced an annual average of 3.5 billion pounds of carrots for all uses, with three-fourths sold into the fresh market (the fresh market also includes fresh-cut carrots) (USDA, 11). Among processing (largely frozen and canned) uses, ERS estimates indicate that output destined for frozen products accounted for about 52 percent of processing production during 2003-05. An additional unknown (but likely substantial)

Figure 1

World carrots: Share of production, average 2003-05



Source: Prepared by ERS from FAOStat, Food and Agriculture Organization, United Nations.

volume enters a growing juice market, with a portion of the juice squeezed from odd sized or shaped carrots culled by fresh-cut processors. Several firms are also known to manufacture dried and dehydrated products (e.g., carrot flakes, powder, and fiber), but there are no specific data on the volume of carrots used for these products.

The farm value of U.S. carrots (fresh and for processing) averaged \$573 million per year during 2003-05, with fresh-market carrots accounting for 94 percent (USDA, 11). Average grower cash receipts for all carrots during 2003-05 exceeded those for such crops as bell peppers (\$492 million), romaine lettuce (\$509 million), and cantaloup (\$332 million). Led by an 80-percent share of the value of fresh-market carrots, California accounted for more than three-fourths of the value of all carrots produced in the Nation. The average farm value of the fresh-market carrot crop has risen 27 percent since 1993-95 as stronger demand during the 1990s boosted production, while inflation-adjusted prices held constant. Over the same period, the farm value of carrots for processing has declined 23 percent. This largely reflects an apparent reduction in demand for frozen carrots. Per capita use of carrots used for frozen products, which peaked in the 1990s, has declined by about one-third this decade.

According to the 1998-2003 ACNielsen Homescan panel data used in this report, the majority of fresh-market carrots consumed at home consisted of baby/fresh-cut carrots. The average retail price for all fresh-market carrots during this time was \$0.95/lb. Baby/fresh-cut carrots sold at a premium to whole carrots (cello and bunched), with the average retail price at \$0.99/lb, compared with \$0.66/lb for fresh whole carrots.

Although most all the carrots marketed in the United States today are orange, other colors such as red, yellow, or purple can occasionally be found in various fresh, frozen, and juice products (Snider). In fact, until the Dutch bred orange carrots in the 17th or 18th century, carrots were largely purple, yellow, or white. While color is not necessarily an indicator of variety (of which there are hundreds), carrots are generally grouped according to size, shape, and intended use. There are four basic types of carrots in the U.S. market: Emperor (the most common fresh-market type), Nantes, Danvers, and Chantenay (largely used for processing). Fresh-cut “baby” carrots are not true baby carrots but are usually Emperor types that have been planted closer together to force them to grow long and thin. After harvest, these carrots are brought to a processing plant where they are washed, sorted, mechanically cut, trimmed, grated, polished, and shaped into the small uniform sizes found in supermarket packages.

Fresh-Cut Drives Carrots

The development and rapid consumer acceptance of packaged fresh-cut carrot products during the 1990s has helped the carrot industry evolve from supplier of low-value bulk products to marketer of relatively upscale value-added products. This product metamorphosis has required structural changes in the U.S. carrot industry largely because fresh-cut/baby carrot products must be manufactured in elaborate, capital-intensive processing facilities. With the majority of carrots now sold as fresh-cut products, the industry has

Data and Methodology

Using a combination of ACNielsen Homescan panel data, USDA's Continuing Survey of Food Intakes by Individuals, and ERS food supply and disappearance data (also known as disappearance data), this article examines the consumption distribution of fresh-market and processed carrots in the United States. The primary data set used was a sample of food purchases for 1998-2003 drawn from ACNielsen's existing 52,000-household consumer panel. This data set contains a nationally representative panel of U.S. households covering food purchase data for at-home consumption. Each week, a panel household scanned either the Uniform Product Code (UPC) or a designated code (for random-weight items) for all of their purchases at all retail outlets. The data include detailed product characteristics, quantity, expenditures, and promotion information as well as detailed household income and demographic data. The more than 8,000 representative households included in the data set used in this article are those who reported their purchases of **both** UPC-coded and random-weight foods. The larger Nielsen panel data set includes consumers who reported only the purchase of UPC-coded items. Further, this article only used data records for households that participated in the panel data collection for at least 10 months during the year.

The second source of food consumption information for this article comes from a periodic USDA Agricultural Research Service (ARS) survey of U.S. household and individual food consumption. Conducted since the 1930s, the most recent survey available that allows complete at-home and away-from-home commodity market analysis is the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals (CSFII) (USDA, 12). Each year of the data set 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, and was focused strictly on children. Use of this survey was limited in this article and largely focused on determining an approximate share of carrots consumed at home versus away from home.¹

The third data set used in this article is the disappearance data. These data, compiled by ERS, measure the flow of raw and semi-processed food commodities through the U.S. marketing system. The data are neither a direct measure of actual consumption, nor of

the quantity of food actually ingested. The total amount available for domestic consumption is estimated as the residual after exports, industrial uses, seed/feed use, and ending inventories are subtracted from the sum of production, beginning inventories, and imports. This remainder is also known as net domestic supply. 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).

Dating back to 1909 for most commodities, the food disappearance data are useful as a proxy for actual consumption and serve 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 permit statistical analyses of effects of prices and income on food consumption. Because they include spoilage and waste accumulated through the marketing system and in the home, the data 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 as actually eaten. For example, the food disappearance data provide an estimate of the annual per capita consumption of processing carrots (on a fresh-weight basis), but provide little information on consumption by product form—frozen, canned, dehydrated; where the carrots or carrot products were marketed—supermarket, school, restaurant, or food manufacturer; how they were consumed—in frozen meals, in casseroles, or in a stew; how they were prepared—cooked from scratch or reheated from a canned or frozen product; or the socioeconomic characteristics of the consumer that ultimately ate the carrots.

¹For more information on this survey, see the text box "USDA Food Consumption Data" in *Factors Affecting Spinach Consumption in the United States* (Lucier, 7).

consolidated and become concentrated in California where carrot marketing is dominated by two large firms.

Largely driven by the marketing efforts of these two firms, packaged baby and fresh-cut carrot products have been the fastest growing segment of the carrot industry since the early 1990s. Within the \$1.3-billion fresh-cut vegetable category (excludes pre-packaged salads), carrots account for the largest share (about half) of supermarket sales, followed distantly by potatoes, celery, and others (Cook). Within canned and frozen carrot markets (in this retail sales discussion, carrot-containing products such as soups, stews, and juice are excluded), retail sales volume has generally been sluggish over the past 5 years. Although sales volume was down 10 percent between 1999 and 2005, the value of retail sales of canned carrots totaled \$35 million in 2005—up 4 percent from 1999 as average retail prices increased 17 percent (American Institute of Food Distribution). For frozen carrots, retail sales volume has generally declined, with volume in 2005 down 26 percent from 1999. The average retail price for frozen carrots increased 6 percent, but this was not enough to offset the drop in volume. As a result, the value of frozen carrot retail sales fell sharply in 2005 to \$23 million, after reaching a recent high of \$38 million in 2003. Carrots also appear in a wide variety of processed food products, such as canned soups and stews and frozen dinner entrees, all of which were not included in the retail sales data discussed above.

During the first 6 years of this decade (2000-05), domestic disappearance of all carrots declined 2 percent from 1990-95 to 3.5 billion pounds (fresh-equivalent basis) (table 1). However, after accounting for population growth, use of all carrots declined 12 percent to 12.1 pounds per person (table 2). Fresh-market carrots (including fresh-cut) account for nearly three-fourths of all carrots consumed in the United States. Per capita use of fresh-market carrots averaged 8.9 pounds during 2000-05—down 10 percent from 1990-95 but 38 percent higher than 1980-85 (Lucier, 4). Fresh use peaked in the mid-1990s as the industry responded to strong widespread demand for the still relatively novel fresh-cut products (fig. 2). By the late 1990s, demand had settled into a more stable pattern where it remains today. Largely because of a declining pack (production) of frozen carrots over the past several years, per capita disappearance of processing carrots averaged 3.2 pounds during 2000-05—17 percent less than 1990-95, but just 4 percent below the average use during 1980-85.

Market Share By Location²

The delineation of the terms “at home” and “away from home” are based on where a food such as carrots was obtained or prepared, not where it was consumed. Food at home is generally obtained at a retail store such as a supermarket, grocery store, or convenience store. Food away from home is generally purchased from foodservice establishments but can also be obtained from such places as school cafeterias or child/adult care centers. Both at-home and away-from-home food can be consumed 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 delivered and consumed at home is classified as away-from-home food.

²This section of the report relies on the CSFII survey to provide a breakdown of the share of market accounted for by carrots purchased at retail for at-home use. Most consumer product data rely on scanned Universal Product Codes (UPC) or standard Price Lookup (PLU) codes for produce purchased at supermarkets. These data sets typically do not cover the foodservice side of the market, which is increasing in importance for many vegetables. Because the latest (2002) USDA food consumption survey fails to adequately cover food away from home, this report relies on a combination of the 1994-96, 1998 CSFII survey and the 1998-2003 A.C. Nielsen Homescan panel data. The CSFII is not used exclusively to analyze carrot demand because the structure of the retail carrot market was undergoing rapid change when this survey was in the field. Thus, use of CSFII data are limited to defining the scope of the carrot market (since no other available data can adequately do this), providing an estimate of at-home versus away-from-home market shares. With the importance of the at-home market established, the Homescan panel data are then used to delve more deeply into the at-home market for fresh and processed carrots.

Table 2

U.S. per capita carrot disappearance¹

Year	Fresh market	Processing ²			Total
		All	Canning	Freezing	
<i>Pounds per person per year, fresh-equivalent</i>					
1960	7.22	1.47	.80	.67	8.69
1965	6.89	1.74	.80	.94	8.63
1970	5.97	3.54	2.14	1.40	9.51
1975	6.44	3.51	1.91	1.60	9.95
1980	6.15	3.48	1.79	1.69	9.63
1985	6.49	3.17	1.40	1.77	9.66
1990	8.29	3.47	1.19	2.28	11.76
1994	12.68	4.23	1.44	2.79	16.91
1995	11.19	4.21	1.63	2.58	15.40
1996	12.37	4.55	1.72	2.83	16.92
1997	14.11	4.05	1.48	2.57	18.16
1998	9.53	4.21	1.45	2.76	13.74
1999	9.25	3.82	1.38	2.44	13.07
2000	9.20	3.79	1.06	2.73	12.99
2001	9.38	3.36	1.90	1.46	12.74
2002	8.42	3.10	1.18	1.92	11.52
2003	8.82	3.13	1.60	1.53	11.95
2004	8.83	3.04	1.76	1.28	11.87
2005 p	8.79	2.83	1.46	1.37	11.62
2006 f	8.74	3.06	1.55	1.51	11.80
Decade averages:					
1960s	6.76	1.72	.81	.91	8.48
1970s	6.16	3.64	2.00	1.64	9.80
1980s	6.85	3.23	1.27	1.96	10.08
1990s	10.92	4.00	1.42	2.58	14.92
2000s	8.91	3.21	1.49	1.72	12.12

p = preliminary. f = ERS forecast.

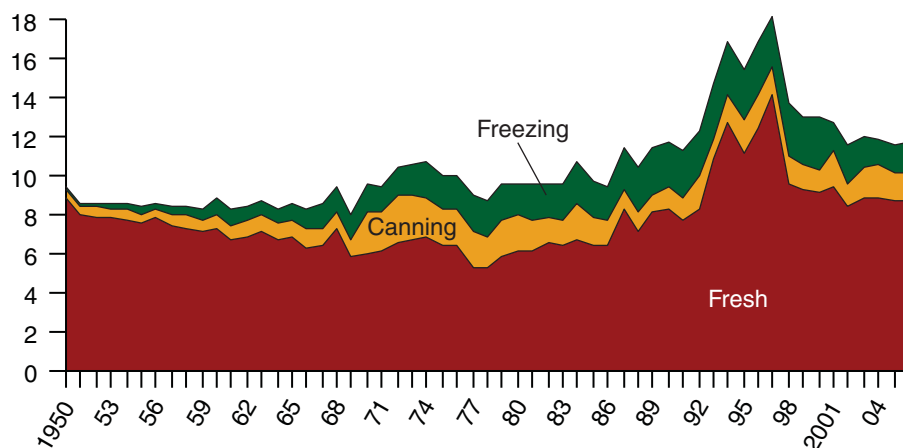
¹ Disappearance is net domestic supply, used as a proxy for consumption.² Fresh-weight basis.

Source: Calculated by the USDA, Economic Research Service.

Figure 2

U.S. carrots: Per capita disappearance, 1950-2006

Lbs/person



Source: Computed by USDA, Economic Research Service.

According to the CSFII, nearly 82 percent of all carrots were purchased at retail stores and considered at-home foods (table 3). The advent of convenient, fresh pre-packaged carrot products in retail stores over the last decade has greatly simplified the inclusion of carrots as snacks and lunchbox items. According to analysis of the Nielsen Homescan data, fresh-cut carrots now account for more than three-fourths of all fresh-market carrot retail sales volume. In addition to a strong retail presence, fresh-market carrots also featured a significant away-from-home share, with 20 percent of carrots being sourced from within the foodservice sector. In comparison, 30 percent of fresh-market tomatoes and 33 percent of fresh-market onions were found to be consumed in the away-from-home market (Lucier, 5 and 6). Restaurants with table service accounted for 11 percent of fresh-carrot consumption likely due to salad bars, entrée salads, side dishes, combination entrees such as Yankee pot roast, and *hors d'oeuvres* such as carrot sticks. While just 3 percent of fresh carrots were sourced from fast-food establishments (also known as quick-service restaurants (QSR)), this share may be on the rise, with QSR chains continuing to carry combination salad and vegetable options on their menus.

Steady industrial food demand (frozen dinner entrees, stews, soups, etc.), and relatively weak foodservice demand, has resulted in most processed carrot products being used in foods purchased at retail for home use. A versatile vegetable, carrots can be eaten raw or prepared in any number of ways. About 86 percent of all processed carrots are bought at retail and used for home meal preparation (table 3). About 60 percent of processed carrot consumption consists of frozen products (such as TV dinners, dinner entrees, or frozen carrots in polybags), with canned products (such as vegetable soups, various stews, and canned sliced carrots) accounting for most of the remainder. About 87 percent of frozen carrots were purchased at retail due in part to the popularity of microwaveable frozen vegetable entrees—many of which contain carrots. About 16 percent of canned carrots are purchased away from home, with few sourced from QSR establishments (under 1 percent). However, 3 percent of all canned carrots were reported to be consumed in the school lunch program—the single largest share among all forms of carrots. Carrots also appear in juices (e.g., as a component of V-8) and dried and dehydrated products such as soups, flavoring agents, and food coloring, with most of these products consumed at home.

Table 3
U.S. carrot consumption by fresh and processed product¹

Item	Population ²	All carrots	Fresh-market	Processed ³	Canned	Frozen	Dehydrated	Juice
<i>Percent</i>								
Food sources:								
Home	97.6	81.6	79.8	86.2	84.0	86.5	86.3	93.9
Away from home	56.2	18.5	20.2	13.8	16.0	13.5	13.7	6.1
Fast food	26.6	2.5	3.2	.8	.6	1.1	2.7	.0
Other restaurant	17.3	9.7	11.0	6.3	7.3	5.6	9.2	3.7
School	6.8	2.0	1.9	2.1	3.0	1.7	.5	.1
Others	21.4	4.3	4.1	4.7	5.1	5.1	1.4	2.3

¹Components may not sum vertically due to rounding.

²Percent of population consuming at least one food at the specific location.

³Processed consists largely of canned and frozen but also includes dehydrated and juice.

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.

As is frequent among vegetables, fresh and processed markets vary widely in where foods are obtained (table 4). Using the 1994-96 CSFII data as distributors, ERS per capita disappearance data were broken down by the various food sources (see box, “Calculating Per Capita Shares”). This estimation procedure assumes that market shares today are similar to those discovered by the survey during 1994-96/98. In 2005, an estimated 9.5 pounds per person of all carrots were purchased at retail for home use. The fresh-weight equivalent of about 2.2 pounds per person was obtained from away-from-home sources through various foodservice outlets.

Among many other factors over the past 20 years, having a presence in the expanding foodservice sector has been key in promoting market growth for vegetables such as potatoes, tomatoes, and onions. Until recently, growth in carrot use within the foodservice sector has largely been in salad bars and various salad products. Given increased consumer interest in carrots, the larger share of food being sourced away from home, and the general increase in the diversity and ethnicity of foods, foodservice establishments have been increasing the number of menu items featuring fresh produce like carrots over the past decade. For example, a leading sandwich chain now routinely offers shredded carrots as a condiment. As a result, the share of carrots being consumed away from home may have risen from that documented by the 1994-96/98 CSFII, although the data currently available are not able to adequately document the trend.

At-Home Carrot Consumption Strongest in the East

The Nielsen Homescan data are broken down by four scantrack regions, which contain the same standard State groupings defined by the Bureau of the Census (fig. 3). The regional data show that during 1998-2003, the East, Central, and West each consumed proportionately more carrots at home than their share of the national population (table 5). The South was the only region to consume fewer carrots than its share of the population. (The same conclusion held with 1994-96/98 carrot data.)

Table 4

Per capita carrot use by food source, 2005

Category	Total ¹	Fresh	Processed
	<i>Pounds per person</i>		
At home	9.45	7.01	2.44
Away from home	2.18	1.78	0.39
Fast food	0.30	0.28	0.02
Other restaurant	1.15	0.97	0.18
School	0.23	0.17	0.06
All others	0.50	0.36	0.13
All sources	11.63	8.79	2.83

¹Components may not sum due to rounding. See box, “Calculating Per Capita Shares” for an explanation of methodology.

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

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 at-home per capita use data presented in the tables for 2005 were calculated by distributing the 2005 ERS food disappearance data for carrots using both the CSFII survey data and the 1998-2003 ACNielsen Homescan panel data as distribution factors and then dividing by the 2005 population. For example, to calculate the per capita use of fresh-market carrots at home in the Northeast in 2005.

$$NEHomePcap = ((ERSFresh * HomeShare) * NEastShare) / (USPop * NEPopShare)$$

Where;

NEHomePcap = Per capita fresh-market carrot use at home in the Northeast

ERSFresh = U.S. fresh-market carrot disappearance (in pounds) in calendar 2005

HomeShare = Percent of fresh carrots consumed at home as per the 1994-96/98 CSFII survey

NEastShare = Percent of fresh carrots purchased in the Northeast per the Nielsen Homescan data set

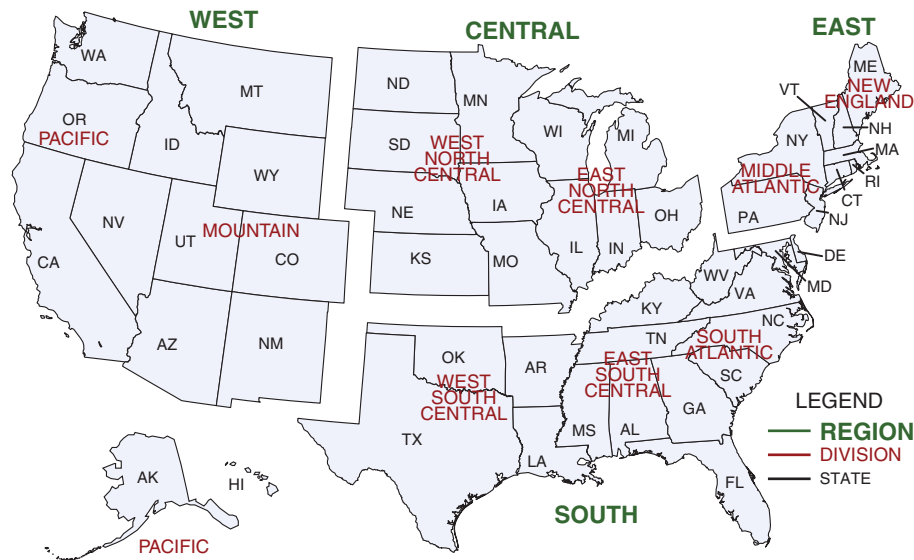
USPop = Total U.S. population on July 1, 2005, per U.S. Census Bureau

NEPopShare = Percent of U.S. population in the Northeast as reported in the Nielsen Homescan dataset.

This presents the share of consumption described in the survey in terms of carrot disappearance (on a fresh-weight equivalent basis) per person. While this presents the results in an easy-to-grasp concept (pounds per person), a potential shortcoming is the difference in time periods represented by each data set. While the disappearance data are for the 2005 season (the latest available), the distribution factors applied to these data (also the latest available at the time of the analysis) are from CSFII survey data collected during 1994-96 and 1998 and the 1998-2003 Homescan panel data. It is conceivable that there have been changes in market distribution factors, especially since the time the CSFII data were collected. Although the various levels of consumption may or may not be the same as if a newer USDA food consumption survey or the 2005 Homescan data were available and used, the shares illustrated by the distributed disappearance data in the tables are a fair representation of the shares found in the available data sets.

Figure 3

Census regions and divisions of the United States



Source: U.S. Department of Commerce, U.S. Census Bureau.

To illustrate differences in regional carrot consumption, the 1998-2003 HomeScan data were used as share distributors for 2005 ERS carrot disappearance data (see box, “Calculating Per Capita Shares” for an explanation of the methodology). Carrots appear to be most popular in the East, followed closely by the Central States (table 6). While the population in the West consumed just under the national average of 9.5 pounds, those in the South consumed about one-tenth less than the national average. In the fresh market, at-home carrot consumption is very similar in three regions (West, Central, and East) at 7.6 to 7.9 pounds per person, while consumers in the South ate about 2 pounds less. Consumption of fresh-cut carrots dominates the at-home fresh market, accounting for 6.1 of the 7.0 pounds used per person in 2005. Consumers in the Central States were the top consumers of fresh-cut carrots, while the West was the only region to consume more than the national average for fresh-market whole carrots (cello-packs and fresh-bunched).

Because of scarce data, the analysis of processed products in this article excluded juice and dried/dehydrated products, focusing on canned and frozen products. At-home consumption for these two processed product groupings was fairly even at a fresh equivalent of about 1.2 pounds per person. Reflecting the popularity of frozen products containing carrots (such as prepared dinner entrees), consumers in the East were the top consumers of processing carrots at 3.1 pounds per person. Consumers in the West were on the other end of the spectrum, reporting the lowest consumption of processing carrots at 1.4 pounds per person. Western consumers largely shun canned and frozen carrots, focusing instead on fresh-cut and whole carrots. In fact, the West was the only region to consume less than 1 pound per person of both canned and frozen carrots, with the other regions recording at least 1.1 pounds per capita for each. Canned carrots, which tend to cost less, were most popular in the South, partly reflecting the popularity of carrot-laden prepared foods such as soups and stews.

Table 5

U.S. at-home carrot consumption: Share of category volume by selected demographic characteristic¹

Category	Population share ²	All carrots	Fresh-market			Processing		
			Whole	Baby/cut	Total	Freezing	Canning	Total
<i>Percent</i>								
All regions (U.S.)								
East	19.1	21.0	18.8	21.0	20.7	29.2	20.1	22.9
Central	22.6	24.9	12.5	27.0	25.1	21.2	24.2	23.3
South	36.3	30.9	27.6	29.6	29.3	33.8	45.4	41.8
West	22.0	23.3	41.1	22.5	24.9	15.7	10.3	12.0
Race/ethnicity, all								
White	71.2	80.1	75.5	80.4	79.8	80.9	82.9	82.3
Black	11.7	5.8	7.8	5.1	5.4	9.4	7.4	8.0
Hispanic	12.7	9.5	9.0	9.8	9.7	6.1	8.2	7.6
Asian	2.3	2.7	5.6	2.5	2.9	1.8	0.6	1.0
Other	2.0	2.0	2.1	2.1	2.1	1.8	0.9	1.2
Age, household head								
Under 40 years	28.2	19.9	13.2	20.2	19.3	19.2	26.5	24.2
40 to 64 years	56.8	58.9	52.0	60.4	59.3	60.9	53.4	55.7
Over 64 years	15.0	21.2	34.8	19.3	21.4	19.9	20.2	20.1
Income as a share of poverty level ³								
Under 185 percent	28.4	22.9	25.0	21.6	22.0	23.6	31.1	28.8
185 to 350 percent	37.8	36.6	37.4	35.9	36.1	36.8	42.0	40.4
Over 350 percent	33.9	40.5	37.6	42.5	41.9	39.6	26.9	30.9
Education of head								
Less than high school	2.9	2.0	3.8	1.4	1.7	2.0	5.4	4.3
High school	27.9	25.9	29.4	24.2	24.9	29.0	35.6	33.5
Some college	36.6	35.5	35.7	35.6	35.6	34.0	35.0	34.7
B.S. and more	32.6	36.5	31.2	38.8	37.8	35.0	24.0	27.4

¹ Average share of retail volume 1998-2003 within each socioeconomic category for all carrots, organic and conventionally grown. Components within categories may not sum to exactly 100 percent due to rounding.

² The percentage share of the U.S. population that is represented by each sector of the particular category listed.

³ Household income as a percentage of the average national poverty threshold level, which in 2003, for example, was set at \$18,810 for a 4-person household.

Source: Derived by USDA, ERS from *ACNielsen Homescan panel data, 1998-2003*, ACNielsen Market Research.

Table 6

At-home (retail) per capita carrot use by region, 2005¹

Region	Total	Fresh-market			Processing		
		Whole	Baby/cut	Total	Freezing	Canning	Total
<i>Pounds per person, fresh weight</i>							
East	10.71	0.91	6.67	7.58	1.84	1.29	3.13
Central	10.24	0.51	7.28	7.79	1.13	1.32	2.45
South	8.33	0.70	4.96	5.66	1.12	1.54	2.66
West	9.36	1.72	6.20	7.93	0.86	0.58	1.44
U.S.	9.45	0.92	6.08	7.01	1.21	1.23	2.44

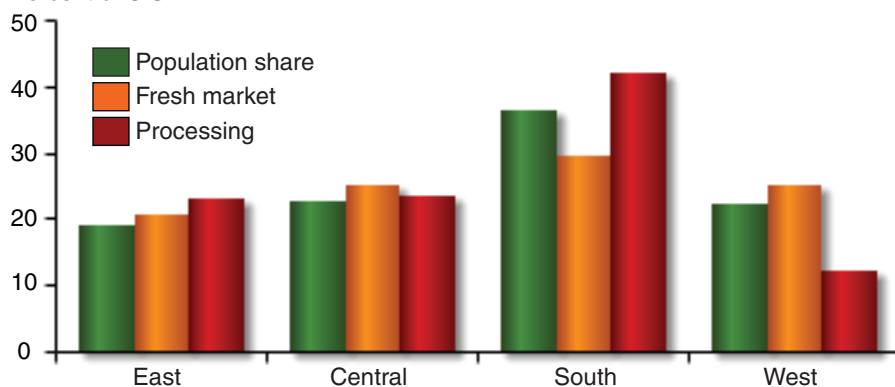
¹ See box, "Calculating Per Capita Shares" for an explanation of methodology.

Source: Derived by USDA, ERS using data from the *1994-96 and 1998 Continuing Survey of Food Intakes by Individuals*, U.S. Dept. of Agriculture, Agricultural Research Service and the *ACNielsen Homescan panel data, 1998-2003*, ACNielsen Market Research.

Figure 4

Market share of at-home carrot consumption, average 1998-2003¹

Percent of U.S.



¹See map in figure 3 for region definitions.

Source: Prepared by ERS from ACNielsen Homescan panel data, Nielsen Market Research.

According to the CSFII, carrot consumption was strongest in suburban areas, followed by metropolitan and rural sections of the country (CSFII was used because the Homescan data did not readily offer metro breakouts). For fresh-market carrots, suburbanites reported consuming more per capita than those in rural areas. On the processing side of the market, consumers in metropolitan areas reported eating the greatest amount of processing carrots—nearly three quarters more than those in rural areas.

Non-Hispanic Whites and Asians Are Dominant Carrot Consumers

According to the ACNielsen panel data for 1998-2003, non-Hispanic White consumers represent 71 percent of the population but consume 80 percent of all at-home carrots (table 5). Extrapolating the 1998-2003 Homescan panel data to 2005 disappearance statistics indicates that non-Hispanic White consumers used the fresh-weight equivalent of 10.7 pounds per person of carrots in foods consumed at home. Asians (a category that includes Pacific Islanders), the most rapidly growing racial class in the Nation, followed closely with 10.3 pounds per person. Asians represent just 2 percent of the U.S. population, but consume 3 percent of all at-home carrots.

The other racial/ethnic categories (non-Hispanic Black and Hispanic) consumed fewer carrots than the national average. Hispanics, a rapidly growing component of the population, are not currently heavy carrot consumers, and may represent a promotional challenge for the industry. 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. Asian consumers used 9.1 pounds of fresh-market carrots—the most among all identified racial/ethnic groups (table 7). Popular in Chinese stir-fry dishes, carrots are also found in a host of recipes. In addition to traditional fresh green salads and cooked carrots, carrots routinely appear in such fare as soups, stews, casseroles, salad entrees, meat entrees, dips, desserts, and a wide variety of vegetable side dishes.

Table 7

At-home (retail) per capita carrot use by race/ethnicity, 2005¹

Race/ethnicity	Fresh-market			Processing			
	Total	Whole	Baby/cut	Total	Freezing	Canning	Total
<i>Pounds per person, fresh weight</i>							
White	10.65	0.98	6.87	7.85	1.37	1.43	2.80
Black	4.97	0.61	2.63	3.24	0.96	0.77	1.74
Hispanic	6.73	0.65	4.70	5.35	0.58	0.80	1.38
Asian	10.31	2.29	6.76	9.05	0.94	0.31	1.26
Others	9.00	0.95	6.44	7.38	1.04	0.57	1.62
Average ²	9.45	0.92	6.08	7.01	1.21	1.23	2.44

¹See box, "Calculating Per Capita Shares" for an explanation of methodology.

²Weighted average across the U.S. population.

Source: Derived by USDA, ERS using data from the *1994-96 and 1998 Continuing Survey of Food Intakes by Individuals*, U.S. Dept. of Agriculture, Agricultural Research Service and the *ACNielsen Homescan panel data, 1998-2003*, ACNielsen Market Research.

Future use of carrots by non-Hispanic Whites will likely depend on increasing per capita use, rather than 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 of the country's population and, by association, a declining share of the carrot market. During 2003, people of Hispanic descent accounted for nearly 13 percent of the population, yet reported consuming about 10 percent of all carrots (table 5). The at-home per capita carrot consumption of Hispanic consumers was 29 percent below the National average, but was one-third greater than that of Black consumers. Hispanic at-home carrot use consisted of an estimated 5.4 pounds of fresh carrots and 1.4 pounds of processing carrots. About 70 percent of at-home carrot consumption of Hispanics consisted of fresh-cut carrots—the largest fresh-cut share among racial/ethnic groups and above the national average of 64 percent (table 7). This is an important market segment for the carrot industry since Hispanics have now surpassed Blacks as the second-largest racial/ethnic group and are growing quickly.

The Nielsen Homescan data indicate that carrots, especially fresh-market products, play a limited role in the diets of many Black consumers. Non-Hispanic Blacks represented nearly 12 percent of the U.S. population but accounted for just 6 percent of all carrots purchased at retail and consumed at home (table 5). At 5.0 pounds, per capita carrot consumption by Black consumers in 2005 was the lowest of any racial/ethnic group studied. Mirroring distributions provided by the CSFII a decade earlier, Blacks consumed just 3.2 pounds of fresh-market carrots at home, but were the second largest consumers of processed carrots at 1.7 pounds (fresh-weight basis).

Part of this lower fresh-market consumption may be rooted in dietary traditions, while smaller incomes (due to a younger or less educated population) may also play a role. About one-third of all carrots consumed at home by Blacks were processed—the highest among the racial/ethnic groups. Black consumers largely avoid fresh-cut carrots, with 2005 per capita use estimated at 2.6 pounds—less than half the national average.

Fresh and Frozen Use Rises With Income³

According to both the CSFII and Homescan data sets, income appears to be an important determinant of carrot 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 Federal food programs, such as the Food Stamp Program, have used 130 percent of the poverty level to determine eligibility. The Women, Infant, and Children (WIC) program uses 185 percent. Whole (excluding baby) carrots are currently the lone WIC-eligible fresh vegetable, with canned and frozen carrots also allowed. Thus, in this article, we use 185 percent of the poverty level as the top end of the low-income category. About 28 percent of all households fell into this category in the 1998-2003 Homescan data set and were designated as the low-income group (table 5). About 34 percent of households had incomes exceeding 350 percent of the poverty level (designated as high-income households); and 38 percent of households had incomes falling between 185 and 350 percent of the poverty level (middle-income group).

The data suggest a pronounced positive correlation between income and both fresh and frozen carrot consumption, while there was a somewhat discernible negative relationship between income and canned carrot use. For all carrots, consumers in the survey's top income bracket reported the highest per capita disappearance for carrots consumed at home, while those in the lowest bracket reported the lowest consumption (table 8). At-home consumption by "middle-income" consumers was 9.2 pounds per person. Although their per capita total fresh carrot consumption was 23 percent greater than the lowest income group, the "middle-income" responders reported eating proportionately fewer fresh-whole carrots than their respective population share. This was also the case with the lower income group.

Consumption of fresh carrots, mainly fresh-cut carrots, also increases with income. Consumers with higher income are more willing to pay for foods with improved quality and convenience, in this case bagged and pre-cut

³It is likely that there are several cross-effects at work in determining carrot consumption. Factors such as ethnicity, income, region, and gender are intertwined and overlapping so that a regression model could be constructed to dissect the effects by considering all important factors in an analysis. However, the purpose of the article is to describe carrot consumption by each factor independently.

Table 8

At-home (retail) per capita carrot use by income class, 2005¹

Percent of poverty level ²	Fresh-market			Processing			
	Total	Whole	Baby/cut	Total	Freezing	Canning	Total
<i>Pounds per person, fresh weight</i>							
Under 185 percent	7.80	0.81	4.63	5.45	1.00	1.35	2.35
185 to 350 percent	9.24	0.91	5.78	6.70	1.17	1.37	2.54
Over 350 percent	11.05	1.02	7.64	8.66	1.41	0.98	2.39
All households ³	9.45	0.92	6.08	7.01	1.21	1.23	2.44

¹See box, "Calculating Per Capita Shares" for an explanation of methodology.

²Household income as a share of the average national poverty threshold level (in 2003 was set at \$18,810 for a 4-person household).

³Weighted average across the U.S. population.

Source: Derived by USDA, ERS using data from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, U.S. Dept. of Agriculture, Agricultural Research Service and the ACNielsen Homescan panel data, 1998-2003, ACNielsen Market Research.

carrot products as compared to whole carrots. Since they also take a greater percentage of their meals away from home, their exposure to carrots may be greater than the other two income classes, given that full-service restaurants accounted for about a tenth of fresh carrot sales. Within the total processed category, consumption was fairly constant over the income ranges. However, frozen carrot consumption rose with income, while canned carrot consumption was much less within the highest income group.

According to the Homescan data, the more educated the head of a household, the greater the consumption of carrots at home. (This is partly a reflection of household income since consumers with more education generally enjoy higher incomes.) As education level increases, per capita use of fresh carrots increases. However, this was only true for fresh-cut carrots, with the opposite result seen for fresh whole carrots. The increase in whole-carrot use by those with less education may also reflect the impact of the WIC program, which tends to serve young, low-income consumers who may not be finished with their formal education. Like fresh whole carrots, consumption of carrots in canned products declined as education levels increased.

Carrot Consumption Increases With Age

According to Homescan panel data, carrot consumption increases with the age of the household head, and this was apparent across both fresh and processed products (table 9). Total per capita carrot consumption was highest in households where the age of the household head was 65 or more. At 13.3 pounds per person, use in these households exceeded the national average by 40 percent. Meanwhile, consumers in younger households (headed by someone under age 40) ate 28 percent less than the national average. For fresh-cut carrots, use was 28 percent below the national average of 6.1 pounds per person for these younger households. Adoption of fresh-cut was not a problem for long-time carrot consumers, as households headed by someone over age 65 exceeded national average fresh-cut consumption by 29 percent. For fresh whole carrots, consumption by these mature households was more than twice the national average.

Table 9

At-home (retail) per capita carrot use by age of household head, 2005¹

Age range	Total	Fresh-market			Processing		
		Whole	Baby/cut	Total	Freezing	Canning	Total
<i>Pounds per person, fresh weight</i>							
Under 40 years old	6.77	0.43	4.37	4.80	0.82	1.15	1.98
40 to 64 years	9.76	0.84	6.47	7.32	1.29	1.16	2.45
65 years and over	13.26	2.14	7.86	10.00	1.60	1.66	3.26
All consumers 2/	9.45	0.92	6.08	7.01	1.21	1.23	2.44

¹See box, "Calculating Per Capita Shares" for an explanation of methodology.

²Weighted average across the U.S. population.

Source: Derived by USDA, ERS using data from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals, U.S. Dept. of Agriculture, Agricultural Research Service and the A.C. Nielsen Homescan panel data, 1998-2003, A.C. Nielsen Market Research.

Organic Share at 3 Percent

Organic carrots are continuing to make inroads into U.S. carrot markets. According to the 2003 Homescan panel data, organic carrots accounted for about 3 percent of the total at-home carrot market. Shares range from about 4 percent of the carrot market in the West to less than 2 percent in the South. About 12 percent of the carrots consumed at home by Asians were organic in 2003, including 21 percent of whole carrots and 10 percent of fresh-cut carrots purchased at retail. In contrast, for non-Hispanic Whites and Hispanics, organic market share for at-home carrots was about 2 percent.

Conclusion

Carrots are one of the most popular vegetables in the United States, with annual per capita disappearance for all uses estimated at 11.6 pounds in 2005. Although much is known about the supply side of the U.S. carrot market, the demand side of the market is not well documented. Using data from USDA's 1994-1996/98 CSFII survey and the Nielsen Homescan panel database for 2003, we show where and how much fresh and processed carrots are consumed and link this consumption to various economic, social, and demographic characteristics of consumers. Findings include:

- Most carrots were purchased at retail stores and considered at-home foods. The standard full-service restaurant was strongest among the away-from-home markets.
- Per capita consumption of carrots was greatest in the East and Central States, around the national average in the West, and weakest in the South.
- Non-Hispanic Whites and Asians were the strongest consumers of carrots. Compared with other consumers, fresh-market carrots are less important in the diets of Hispanic consumers and sparsely used by non-Hispanic Blacks.
- Per capita carrot consumption is positively correlated with income. Consumption of fresh-market and frozen carrots increases with income, while use of canned carrots is greatest for low- and middle-income consumers and lowest at upper income levels.
- Per capita consumption of all carrots rises with education. Although fresh-cut per capita use was positively correlated with education level, fresh whole carrot use was negatively correlated with education attained by the household head.
- Carrot consumption increased with the average age of the household head. This was apparent across both fresh and processed products.
- Organic carrots accounted for about 3 percent of the total at-home carrot market in 2003. The shares range from about 4 percent of the carrot market in the West to less than 2 percent in the South, with Asians consuming the largest share of their at-home carrots as organic.

References

- American Institute of Food Distribution. *Market Info Centers*. Food Institute web site. Accessed July 2006. <http://www.foodinstitute.com/infocenter.cfm>
- Cook, Roberta. “Trends in the Marketing of Fresh Produce and Fresh-Cut Products”. Web presentation. University of California, Davis. September 2004. <http://ucce.ucdavis.edu/files/datastore/234-680.pdf>
- Lucier, Gary. “What’s Up Doc? Carrots”. U.S. Department of Agriculture, Economic Research Service. *Agricultural Outlook*. AO-246. November 1997. pp.11-13. <http://www.ers.usda.gov/publications/AgOutlook/nov1997/ao246c.pdf>
- Lucier, Gary (coord). U.S. Department of Agriculture, Economic Research Service. *Vegetables and Melons Situation and Outlook Yearbook*, VGS-2006. July 2006. <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1212>
- Lucier, Gary, Biing-Hwan Lin, and Jane Allshouse. “Factors Affecting Tomato Consumption in the United States.” U.S. Department of Agriculture, Economic Research Service. *Vegetables and Specialties Situation and Outlook Report*, VGS-282. November, 2000, 7pp. <http://www.ers.usda.gov/Briefing/tomatoes/tomatopdf/TomatoConsumption.pdf>
- Lucier, Gary, Biing-Hwan Lin, and Jane Allshouse. “Factors Affecting Onion Consumption in the United States.” U.S. Department of Agriculture, Economic Research Service. *Vegetables and Specialties Situation and Outlook Report*, VGS-283. April, 2001, 8pp. <http://www.ers.usda.gov/Briefing/Vegetables/vegpdf/OnionConsump.pdf>
- Lucier, Gary, Jane Allshouse, and Biing-Hwan Lin. “Factors Affecting Spinach Consumption in the United States”. U.S. Department of Agriculture, Economic Research Service. *E-Outlook*, VGS-300-01, January 2004, 15pp. <http://www.ers.usda.gov/publications/VGS/jan04/vgs30001/vgs30001.pdf>
- Reed, Jane. “How Much Do Americans Pay for Fruits and Vegetables?” Appendix data set for ERS Agriculture Information Bulletin No. (AIB790). July 2004. <http://www.ers.usda.gov/Data/fruitvegetablecosts/>
- Snider, Carrie. “Colored Carrots Showing Up in Retail Products”. *Carrot Country*. Columbia Publishing. Spring 2005.
- Toland, Brenda, and Gary Lucier. “U.S. Carrot Statistics.” U.S. Department of Agriculture, Economic Research Service. ERS data product, 49 Excel tables. December 2004. <http://www.ers.usda.gov/data/sdp/view.asp?f=crops/carrots/>
- U.S. Department of Agriculture, National Agricultural Statistics Service. *Vegetables 2005 Summary*. Vg 1-2 (06). January 2006. Pp. 14 and 68. <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1183>

- U.S. Department of Agriculture, Agricultural Research Service. *1994-96 Continuing Survey of Food Intake by Individuals and 1994-96 Diet and Health Knowledge Survey*. CD-ROM available from National Technical Information Service, Springfield, VA. 1998.
- U.S. Department of Agriculture, National Agricultural Statistics Service. *Census of Agriculture, 2002*. Vol. 1, Table 29. Pp. 459.
http://www.nass.usda.gov/census/census02/volume1/us/st99_2_029_029.pdf
- United Nations, Food and Agriculture Organization. *FAOSTAT-Agriculture*. Online agricultural database. <http://faostat.fao.org/default.aspx>. Accessed May 2006.
- U.S. Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory. *National Nutrient Database*. Accessed March 2005.
http://www.nal.usda.gov/fnic/foodcomp/cgi-bin/list_nut_edit.pl
- Yamaguchi, Mas. *World Vegetables: Principles, Production, and Nutritive Values*. Van Nostrand Reinhold Company, Inc. 1983. pp. 240-246.