



How Much Do Fruits and Vegetables Cost?

Hayden Stewart, Jeffrey Hyman, Jean C. Buzby,
Elizabeth Frazão, and Andrea Carlson



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How Much Do Fruits and Vegetables Cost?

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Abstract

Federal dietary guidance advises Americans to consume more vegetables and fruits because most Americans do not consume the recommended quantities or variety. Food prices, along with taste, convenience, income, and awareness of the link between diet and health, shape food choices. We used 2008 Nielsen Homescan data to estimate the average price at retail stores of a pound and an edible cup equivalent (or, for juices, a pint and an edible cup equivalent) of 153 commonly consumed fresh and processed fruits and vegetables. We found that average prices ranged from less than 20 cents per edible cup equivalent to more than \$2 per edible cup equivalent. We also found that, in 2008, an adult on a 2,000-calorie diet could satisfy recommendations for vegetable and fruit consumption in the *2010 Dietary Guidelines for Americans* (amounts and variety) at an average price of \$2 to \$2.50 per day, or approximately 50 cents per edible cup equivalent.

Keywords: food prices, food budgeting, fruit and vegetable consumption, *2010 Dietary Guidelines for Americans*

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Summary

What Is the Issue?

Federal dietary guidance advises Americans to consume more vegetables and fruits because most Americans do not consume the recommended quantities or variety. Food prices, along with taste, convenience, income, and awareness of the link between diet and health, shape food choices. This research updates previous estimates of vegetable and fruit prices, and estimates the cost of satisfying recommendations for adult vegetable and fruit consumption in the *2010 Dietary Guidelines for Americans*.

What Are the Major Findings?

We estimated the average retail prices of 153 fresh and processed vegetables and fruits, where processed includes frozen, canned, and dried vegetables and fruits as well as 100% fruit juice. We also estimated the average price per edible cup equivalent for each vegetable and fruit. This is the consumption unit used in the *2010 Dietary Guidelines for Americans*, and measures only the edible portion of a food once it has been cooked or otherwise prepared for consumption. In 2008:

- An adult on a 2,000-calorie diet could satisfy recommendations for vegetable and fruit consumption (amounts and variety) in the *2010 Dietary Guidelines for Americans* at an average cost of \$2 to \$2.50 per day, or approximately 50 cents per edible cup equivalent.
- The lowest average price for any of the 59 fresh and processed fruits included in the study was for fresh watermelon, at 17 cents per edible cup equivalent. The highest average price was for fresh raspberries, at \$2.06 per edible cup equivalent.
- The lowest average price for any of the 94 fresh and processed vegetables included in the study was for dry pinto beans, at 13 cents per edible cup equivalent. The highest average price was for frozen asparagus cuts and tips, at \$2.07 per edible cup equivalent.
- Processed fruits and vegetables were not consistently more or less expensive than fresh produce. Canned carrots (34 cents per edible cup equivalent) were more expensive than whole fresh carrots eaten raw (25 cents per edible cup equivalent). However, canned peaches (58 cents per edible cup equivalent) were less expensive than fresh (66 cents per edible cup equivalent).
- Retail prices per pound often varied substantially from prices per edible cup equivalent. Fresh broccoli florets and fresh ears of sweet corn both sold for around \$1.80 per pound at retail stores, on average. After boiling and removing inedible parts, however, the sweet corn cost almost twice as much as the broccoli florets (\$1.17 vs. 63 cents per edible cup equivalent).

Costs in the study are defined as the average prices paid by all American households for a food over a 1-year period, including purchases in different package sizes, under different brand names, and at different types of retail

outlets (including, among others, supercenters such as Wal-Mart, wholesale club stores such as Costco, “traditional” grocers such as Safeway, Kroger, and Albertsons, and convenience stores).

How Was the Study Conducted?

We used 2008 Nielsen Homescan data to calculate the average price of a pound (or, for juices, a pint) of 153 fresh and processed fruits and vegetables at retail stores. In order to estimate price per edible cup equivalent for each food, retail quantities were adjusted for the removal of inedible parts and cooking that occur prior to consumption. For example, 1 pound of store-bought fresh pineapple yields 0.51 pound of edible pineapple. Data from the USDA National Nutrient Database for Standard Reference (Release 21) and USDA’s *Food Yields Summarized by Different Stages of Preparation* were used to estimate edible weights. The MyPyramid Equivalents Database, 2.0 was used to define edible cup equivalents.

Introduction

Federal dietary guidance advises Americans to consume more vegetables and fruits because most Americans do not consume the recommended quantities or variety. Individuals choose foods based on taste, convenience, income, and awareness of the link between diet and health. Food prices also shape food choices.

How much do fruits and vegetables cost? Reed et al. (2004) used 1999 Nielsen Homescan data to estimate average prices at retail stores across the contiguous United States. They found that consumers could purchase enough fruits and vegetables to satisfy Federal dietary recommendations in place between 2000 and 2004 for \$1 a day (three servings of fruits and four servings of vegetables). The USDA Center for Nutrition Policy and Promotion (CNPP) also provides estimates of average prices for fruits and vegetables. As of December 2010, the online CNPP Prices Database reported average prices paid per 100 edible grams in 2003-04. Here, we use 2008 data on prices to update these previous estimates of the cost of vegetables and fruits.

We also use the newly released *2010 Dietary Guidelines for Americans* to estimate the cost of satisfying recommended adult vegetable and fruit consumption. The U.S. Department of Agriculture and U.S. Department of Health and Human Services revise the Dietary Guidelines every 5 years to provide up-to-date authoritative advice for people 2 years old and older about how good dietary habits can promote health and reduce risk for major chronic diseases. The Guidelines also serve as the basis for Federal food and nutrition education programs. In 2005, the Dietary Guidelines increased recommended intakes of vegetables and fruits for most Americans and made more specific recommendations about how to divide vegetable consumption among subgroups (Guenther et al., 2006).

According to the *2010 Dietary Guidelines for Americans*, a person on a 2,000-calorie diet needs 2.5 cup equivalents of vegetables per day or, equivalently, 17.5 cup equivalents per week (table 1). Weekly consumption ought to include dark green vegetables (1.5 cup equivalents), red and orange vegetables (5.5 cup equivalents), beans and peas (1.5 cup equivalents), starchy vegetables (5 cup equivalents), and other vegetables (4 cup equivalents).¹ Fresh, canned, frozen, dried, and 100% juice count equally toward recommended intakes, although the majority of the recommended fruit should come from whole fruit.

¹Each vegetable subgroup is defined in the *2010 Dietary Guidelines for Americans*. For example, beans and peas are the mature form of legumes, which include kidney beans, pinto beans, black beans, garbanzo beans, lima beans, black-eyed peas, split peas, and lentils. Legumes do not include green beans or green peas.

Table 1

**Dietary recommendations tailored to gender, age,
and level of physical activity**

Consumer (gender and age) ¹	Total calories	Fruit cup equivalents	Vegetable cup equivalents
<i>Daily</i>			
Female, 6 years old	1,400	1.5	1.5
Male, 6 years old	1,600	1.5	2
Female, 20 years old	2,200	2	3
Female, 40 years old	2,000	2	2.5
Male, 20 years old	2,800	2.5	3.5
Male, 40 years old	2,600	2	3.5

¹All people are assumed to be moderately active (30-60 minutes of exercise daily).

Source: 2010 Dietary Guidelines for Americans.

How Do We Estimate the Cost of Fruits and Vegetables?

We estimate average retail prices using 2008 Nielsen Homescan data with information on 61,440 households. Households participating in Nielsen's Homescan panel keep a scanner in their home to record their purchases of foods at retail stores. After a shopping occasion, panelists use these scanners to record the items purchased, the quantities bought, the amount of money paid, and the date. Purchases at supercenters (such as Wal-Mart), wholesale club stores (such as Costco), traditional grocery stores, convenience stores, drugstores, and other types of retail facilities are all included. Nielsen further provides sample weights that allow data users to estimate what all households across the contiguous U.S. paid for foods at retail stores and the quantities they bought.²

We define the cost of each food as the average price paid by all American households for that food over a 1-year period, including purchases in a variety of package sizes, under different brand names, and at several types of retail outlets. Costs to buy foods at retail stores are estimated on a per-pound (or, for 100% juices, a per-pint) basis, while the costs to consume foods are estimated on a per-edible-cup-equivalent basis. Further details on how we applied this methodology to specific fruits and vegetables are available on our website, at: <http://www.ers.usda.gov/data/FruitVegetableCosts/index.htm/>.

Selecting the Foods To Price

Many types of fruits and vegetables are available at retail stores across the Nation. For this study, we focused on fruits and vegetables that account for a large share of total consumption. Some less commonly consumed types, such as guava, are excluded, as are lemons, limes, garlic, and other types used as flavorings and condiments but not widely consumed alone as a food.

Selected types of fruits and vegetables are priced in various fresh and processed forms, where processed includes frozen, canned, and dried vegetables and fruits as well as 100% fruit juice. For example, we priced fresh apples, dried apples, and unsweetened applesauce. Apples are also priced in two 100% juice forms—ready-to-drink and frozen concentrate that must be reconstituted at home.

The last step in our selection process was to identify fairly specific products for pricing. Data constraints influenced our selection among fresh fruit and vegetable products at this step. Specifically, we had to exclude fresh produce sold on a “random-weight” basis, such as whole, untrimmed heads of Romaine lettuce. Marketers usually sell untrimmed heads of Romaine lettuce in loose form. Consumers can choose among the heads on display and place their selection in a plastic bag. The weight of the food placed in the bag is not fixed. Thus, in retail terminology, the lettuce is sold on a random-weight basis. Nielsen did not provide data on sales of individual random-weight foods in 2008. Because of this, we could not price heads of Romaine lettuce and other random-weight produce, but we could price products like Romaine hearts, which are generally sold in bags that include a manufacturer's or retailer's brand name along with a Universal Product Code (UPC, a type of bar code).

²It is reasonable to question the credibility of Homescan data because households self-report their purchases. Households may make mistakes when reporting information to Nielsen (e.g., some may fail to report all purchases because the recording process is time-consuming). However, validation studies confirm the suitability of these data for calculating average prices paid. Einav et al. (2008) concluded that errors commonly found in Homescan data should not seriously affect estimates of average prices paid by all households. They also found that errors in the Homescan data are of the same order of magnitude as reporting errors in data sets commonly used to measure earnings and employment, for example.

How do prices compare for produce sold on a random-weight basis and produce marketed in other ways? To investigate, we used 2006 Nielsen Homescan data. When Homescan panelists bought fresh produce on a random-weight basis in 2006, Nielsen identified the specific type of fruit or vegetable bought. Prices for random-weight produce can then be compared with prices for fruits and vegetables marketed in other ways including food products sold in a prepackaged container or on a “count” basis, such as a \$2.50 per melon (table 2).

For some types of fruits and vegetables, such as whole carrots and celery stalks, there is very little difference in price between produce sold on a random-weight basis and the same type of produce sold in a package with a manufacturer’s or retailer’s brand name. For example, using 2006 price data, we estimate that random-weight whole carrots cost about 69 cents per pound while prebagged whole carrots cost 67 cents per pound.

Substantial price differences do exist for other types of produce depending on how the food is marketed. In 2006, apples sold on a random-weight basis (\$1.18 per pound) cost about 30 cents more per pound than apples sold in prepackaged form (85 cents per pound). One possible explanation is that more varieties are sold on a random-weight basis, some of which may be more expensive than the varieties that are available in bagged forms. Another possibility is that retailers prefer to sell the largest and most attractive apples in loose form, leaving smaller and less attractive apples for bagging.

Table 2

Retail prices for random weight and other fresh produce, 2006 prices¹

	Random weight ²	Other fresh produce ³
<i>Dollars per pound</i>		
Apples	1.18	0.85
Broccoli heads	1.07	--
Broccoli florets	--	1.79
Celery stalks	0.85	0.82
Carrots, whole	0.69	0.67
Carrots, baby	--	1.36
Oranges (all varieties)	0.83	0.61
Potatoes	0.67	0.41
Romaine heads	1.19	--
Romaine hearts	--	1.74
Spinach, bunch	1.05	--
Spinach, leaf and baby	--	3.32

¹Average retail prices per pound, not adjusted for the removal of inedible parts and cooking that may be required prior to consumption.

²Random weight produce includes loose items from which consumers can choose the quantity of products they want, generally by placing their desired fruit or vegetable in a plastic bag.

³Includes items sold in a prepackaged container, such as a bag or clamshell, and items sold on a count basis, such as oranges priced per piece of fruit.

-- = not available or insufficient data accessible.

Source: USDA, Economic Research Service analysis of 2006 Nielsen Homescan data.

The largest cost differentials exist for higher value-added fresh fruits and vegetables. Many processors are adding more value to produce by removing inedible parts and/or washing it. They also tend to sell these foods in a bag or clamshell that includes either their name or a retailer's brand name. Bagged broccoli florets are one such product. In 2006, this product cost \$1.79 per pound whereas random-weight heads of broccoli cost \$1.07. However, broccoli florets include no refuse, whereas households may discard much of the stem on a head of broccoli. Because of this, using 1999 data, Reed et al. (2004) found that florets can be cheaper to consume per serving than heads of broccoli.

In general, however, higher value-added produce costs more money to consume than traditional produce even after accounting for food parts that are discarded. For example, a person wanting to consume fresh spinach could purchase a random-weight bunch at a lower price than our estimated price for leaf and baby spinach sold in prepackaged bags or clamshells. In 2006, prepackaged leaf and baby spinach cost \$3.32 per pound while random-weight bunch spinach cost \$1.05 per pound. Even though households may discard the stems and roots on a bunch of spinach, it is likely that they can still economize by purchasing this product over the higher value-added product in a bag or clamshell. For 2008, along with fresh spinach, we could only price fresh broccoli, Romaine lettuce, mustard greens, turnip greens, collard greens, kale, and winter squash in higher value-added forms.

Overall, retail prices for random-weight fruits and vegetables are neither higher nor lower than prices for produce marketed in other ways. For our analysis of 2008 food prices, it follows that households could have saved money by purchasing random-weight produce instead of the food products in our sample, in cases where the random-weight items were available at a lower price. By contrast, in cases where the random-weight produce was more expensive, economizing households could have still bought the foods in our sample.

The processed foods included in our study are somewhat similar to their fresh counterparts. Our intention was to make the fresh and processed foods in our study as comparable as possible to each other in nutritional quality. For that reason, we excluded apple juice blended with other juices and banana chips made with oil. We did include sweetened and flavored foods in some cases because excluding all sweetened or flavored foods would have overly restricted our sample. Thus, we included canned peaches packed in syrup.

In total, we priced 153 food products including fresh, canned, frozen, dried, and juiced items (tables 3 and 4). We further classified each of these food products as either a fruit or vegetable according to how Federal dietary recommendations classify the same food. Avocados, mushrooms, olives, and tomatoes were classified as vegetables because the consumption of these foods counts toward an individual's recommended intake of vegetables.

Table 3

Fruits included in the study

Apples	Figs, dried	Peaches
Fresh	Grapefruit	Fresh
Canned, applesauce	Fresh	Canned
Juice	Canned	Pears
Ready to drink	Juice	Fresh
Frozen	Ready to drink	Canned
Dried	Frozen	Pineapple
Apricots	Grapes	Fresh
Canned	Fresh	Canned
Dried	Juice	Juice
Bananas, fresh	Ready to drink	Ready to drink
Blackberries	Frozen	Frozen
Fresh	Dried, raisins	Dried
Canned	Honeydew, fresh	Plums/prunes
Frozen	Kiwi, fresh	Fresh
Blueberries	Mangoes	Juice, ready to drink
Fresh	Fresh	Dried prunes
Canned	Dried	Raspberries
Frozen	Nectarines, fresh	Fresh
Cantaloupe, fresh	Oranges	Frozen
Cherries	Fresh navel	Strawberries
Fresh	Canned Mandarin	Fresh
Canned	Juice	Canned
Sweet	Ready to drink	Frozen
Tart	Frozen	Tangerines
Cranberries, dried	Papayas, fresh	Fresh
Dates, dried		Juice, ready to drink
		Watermelon, fresh
	Total fruit	
	Fresh	22
	Canned	12
	Frozen	4
	Juiced	12
	Dried	9
	All fruit	59

Source: USDA, Economic Research Service.

Table 4

Vegetables, beans, and peas included in the study

Artichoke	Cauliflower	Lentils, dried	Pumpkin, canned	
Fresh	Fresh	Lima beans	Radishes, fresh	
Canned	Florets	Canned	Red kidney beans	
Frozen	Heads	Frozen	Dried	
Asparagus	Frozen	Dried	Canned	
Fresh spears	Celery, fresh	Mushrooms	Red peppers, bell fresh	
Canned	Hearts	Fresh	Romaine hearts, fresh	
Cut & tips	Stalks	Sliced	Spinach	
Spears	Collard greens	Whole	Fresh	
Frozen	Fresh	Canned	Canned	
Cut & tips	Canned	Frozen	Frozen	
Spears	Frozen	Mustard greens	Squash, summer	
Avocados, fresh	Corn, sweet	Fresh	Fresh	
Beets, canned	Corn on cob, fresh	Canned	Canned	
Black beans	Whole kernel	Frozen	Frozen	
Dried	Canned	Navy beans	Squash, winter	
Canned	Frozen	Dried	Fresh	
Broccoli	Great Northern beans	Canned	Frozen	
Fresh, florets	Dried	Okra	Sweet potatoes	
Frozen	Canned	Fresh	Fresh	
Brussels sprouts	Green beans	Canned	Frozen, french fries	
Fresh	Fresh	Frozen	Tomatoes	
Frozen	Canned	Olives, canned	Fresh	
Cabbage	Cut	Onions, fresh	Cherry & grape	
Fresh	Whole	Peas, green	Roma & plum	
Canned sauerkraut	Frozen	Canned	Round	
Carrots	Cut	Frozen	Canned	
Fresh	Whole	Pinto beans	Turnip greens	
Baby	Green peppers, bell fresh	Dried	Fresh	
Whole	Iceberg lettuce, fresh	Canned	Canned	
Canned	Kale	Potatoes, white	Frozen	
Sliced	Fresh	Fresh		
Whole	Canned	Canned		
Frozen	Frozen	Frozen, french fries		
Total vegetables				
Fresh				35
Canned				24
Frozen				23
Juiced				0
Beans and peas				12
All vegetables, beans, and peas				94

Source: USDA, Economic Research Service.

Estimating the Average Retail Prices of Selected Foods

The average retail price of each food was estimated on a per-pound (or, for juices, a per-pint) basis. To do so, we first used the 2008 Homescan data to estimate total expenditures by U.S. households on each food and the total quantities bought. Average retail prices then were calculated as the ratio of total expenditures to total quantities. We estimated that Americans spent \$247.1 million on frozen concentrated orange juice, which, if reconstituted, could make 480.7 million pints. Thus, the average retail price of frozen concentrated juice was estimated at 51 cents per pint (\$247.1 million/480.7 million pints).

To estimate total expenditures and quantities, we aggregated over purchases made by all households, in all seasons of the year, in all package sizes, and at all retail store formats. We also used Nielsen's sample weights to make our estimates representative of what all households across the contiguous United States paid in 2008.

While calculating aggregate household expenditures on each type of food was straightforward, calculating aggregate quantities of foods purchased by households was more complicated. Fruits and vegetables are sold primarily by the pound or ounce. For example, whole fresh carrots are typically sold in bags weighing 1, 2, or 5 pounds. However, we had to impute a weight for products sold on a count basis, such as melons or oranges priced per piece of fruit. To convert these sales to a weight basis, we used the USDA National Nutrient Database for Standard Reference, Release 21 (SR). The USDA Standard Reference estimates the weight of a medium cantaloupe at about 1,082 grams (roughly 2.4 pounds), including the weight of the rind and inedible cavity contents such as seeds.

Estimating Average Prices per Edible Cup Equivalent

We also estimated the average price of each fruit and vegetable per edible cup equivalent as defined in the *MyPyramid Equivalents Database*, Version 2.0 (MPED). For many fruits and vegetables, a 1-cup equivalent equals the weight of enough edible food after cooking, if necessary, to fill a measuring cup. For example, a cup equivalent of cooked whole kernel corn weighs 164 grams whether from fresh, frozen, or canned product. However, there are exceptions. To make a 1-cup equivalent, it takes 2 edible cups of a raw, leafy vegetable, like spinach, but only one-half cup of edible dried fruit.³ Prior to 2005, USDA provided nutritional advice in servings. A serving of a fruit or vegetable generally equals one-half cup.

Our estimates of the costs to consume fruits and vegetables are based on an approach developed by USDA's Center for Nutrition Policy and Promotion (Carlson et al., 2008). We also rely on USDA's Standard Reference and *Food Yields Summarized by Different Stages of Preparation* (Handbook 102) for data on cooking yields and data on the edible shares of fruits and vegetables. If weight is lost through preparation, we define a food's retail-equivalent weight as:

$$\text{Retail-equivalent weight} = \text{weight of a cup equivalent} / (1 - \text{share lost})$$

³USDA's nutrition education guidance system, known as MyPyramid (MyPyramid.gov), helps nutrition educators, health professionals, and consumers implement the Dietary Guidelines for Americans (DGA) through personalized eating plans and interactive tools to help them plan/ assess the best food choices based on the DGA. The DGA, through MyPyramid, recommends amounts of food groups, including vegetables and fruits, to meet the nutrient needs of Americans ages 2 and older, at various calorie levels, to help reduce the risk of chronic illness and maintain a healthy weight.

where shares are expressed as fractions. For example, the Standard Reference (SR) reports that 10 percent of a fresh apple is inedible, while the MPED lists the weight of a 1-cup equivalent of raw apple with skin at 106 grams. To eat a 1-cup equivalent, households must therefore buy $106/0.9 = 117.78$ grams of whole fresh apple. By contrast, if weight is gained through preparation, we define a food's retail-equivalent weight as:

$$\text{Retail-equivalent weight} = \text{weight of a cup equivalent}/(1 + \text{share gained})$$

where shares are again expressed as fractions. USDA Handbook 102 reports that cooking dry beans increases their weight. The weight of the cooked product is approximately 240 percent of the weight of the dry beans prior to cooking. The MPED further lists the weight of a 1-cup equivalent of cooked pinto beans at 173 grams. Households must therefore buy $173/2.4 = 72.08$ grams of dry pinto beans at a retail store to eat a 1-cup equivalent at home.

Finally, because cup equivalent weights are in grams, we converted our earlier estimates of retail prices from a dollars-per-pound basis to a dollars-per-gram basis (by dividing by 453.59), and calculated the cost to eat a cup equivalent of a food as:

$$\text{Price per cup equivalent} = (\text{average retail price per gram}) \times (\text{retail-equivalent weight in grams}).$$

Having estimated the average costs to buy and to consume selected fruits and vegetables, we report our results in figures 1-9. As noted, our sample of foods does not include all fruit and vegetable products available at retail stores. There are still other products available at both higher and lower prices than the 153 foods we examined.

Average Fruit Prices in 2008

We priced 59 fruit products: 22 fresh, 12 canned, 4 frozen, 12 juiced, and 9 dried (see table 3). Average retail prices for selected fruit in 2008 ranged from 26 cents per pound to over \$7 per pound. After adjusting retail food prices for the inedible parts of fruit products and cooking yields, there was still much variability on a cup equivalent basis. Below, we examine average fruit prices.

Fresh Fruit

How much does fresh fruit cost? Out of the 22 types of fresh fruit we analyzed, retail prices ranged from 26 cents per pound for watermelon to \$7.29 per pound for raspberries (fig. 1a). Two of these fruits (bananas and watermelon) cost less than 50 cents per pound, 6 cost less than \$1 per pound, and 10 cost between \$1 and \$2 per pound.

How much does it cost to eat a cup equivalent of fresh fruit? We assume that all fresh fruits are consumed fresh. Only inedible parts such as the stem and core of an apple or peel and navel of a navel orange are removed prior to consumption and discarded. Under these assumptions, eight fresh fruits cost less than 50 cents per cup equivalent (fig. 1b). Watermelon was the least expensive at 17 cents per cup equivalent followed by bananas (21 cents), apples (28 cents), and navel oranges (34 cents).

Fresh berries, papayas, and cherries were the most expensive types of fresh fruits to eat. Fresh raspberries cost \$2.06 per cup equivalent, on average. Among fresh berries and cherries, we estimate that strawberries were least expensive, at 89 cents per cup equivalent.

Canned Fruit

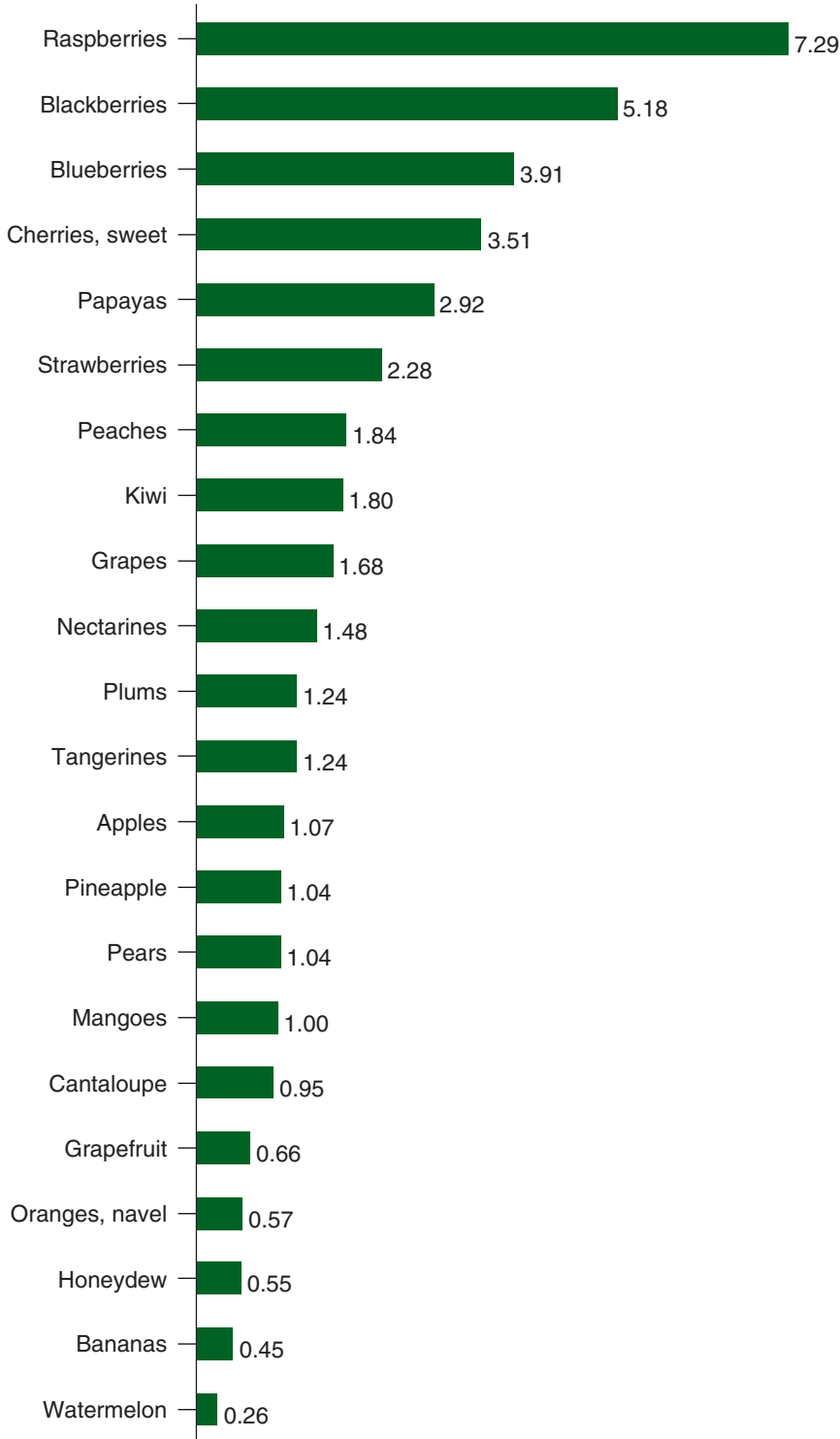
Of the 12 canned fruits in the study, applesauce was the least expensive to buy at \$0.85 per pound (fig. 2a). Canned pineapple, Mandarin oranges, peaches, and pears all sold for between 90 cents and \$1.10 per pound, on average.

Canned fruits may be used as an ingredient in baked or frozen foods or simply eaten without further preparation. For this study, we use the weight for a cup equivalent reported in the MPED for canned fruits that are eaten without further preparation. Using this approach, the cost to eat canned fruits ranged from 46 cents to \$1.60 per cup equivalent (fig. 2b). Applesauce and pineapple cost less than 50 cents per cup equivalent. Mandarin oranges, pears, and peaches cost less than 60 cents per cup equivalent. Canned blueberries and blackberries were the most expensive canned fruits to consume, at more than \$1.50 per cup equivalent.

Figure 1a

Fresh fruit: Average retail prices

Dollars per pound



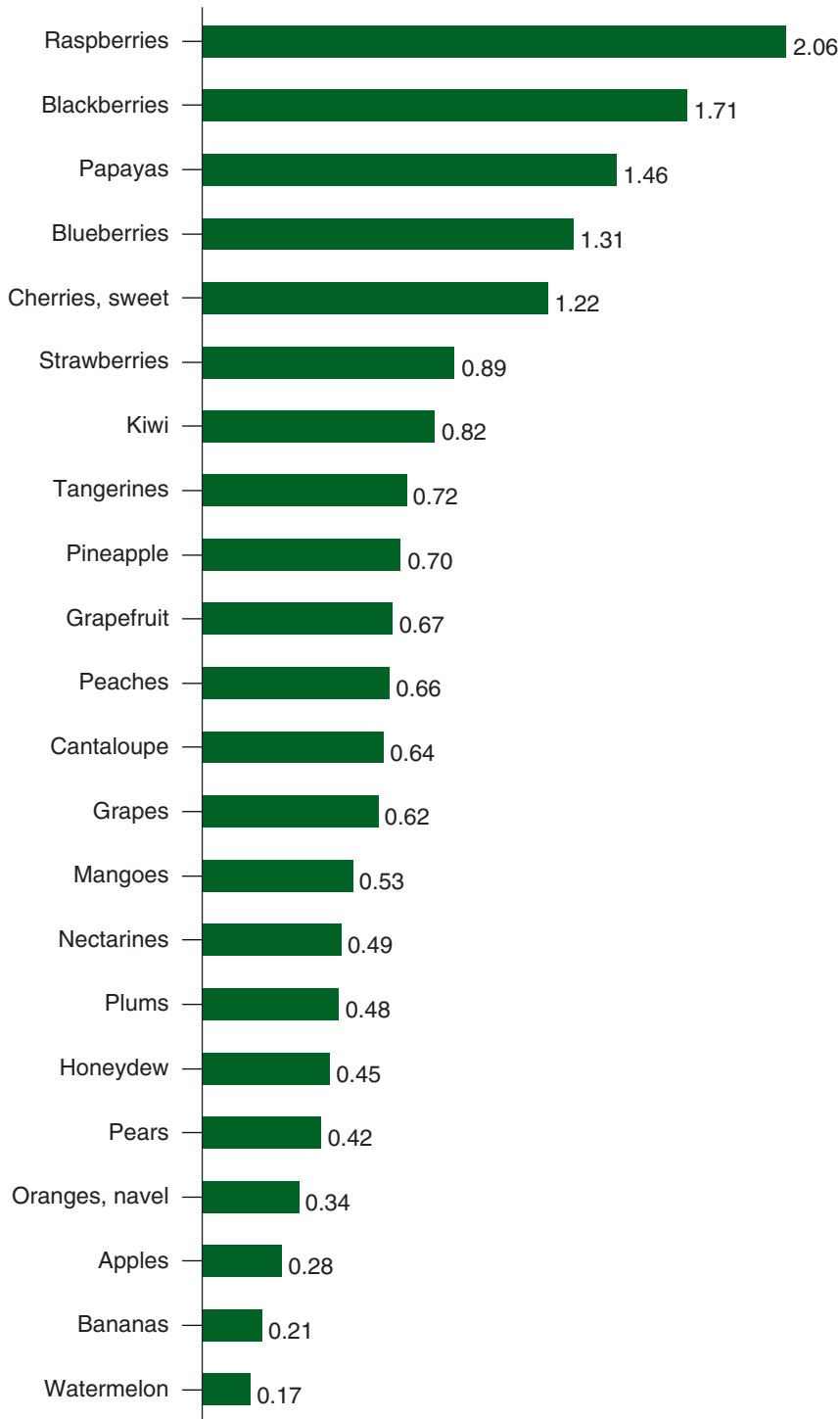
Note: Prices are for fruit sold in a prepackaged container, such as in a bag or clamshell, and fruit sold on a count basis, such as melons and oranges sold per piece of fruit.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 1b

Fresh fruit: Average prices per edible cup equivalent

Dollars per edible cup equivalent

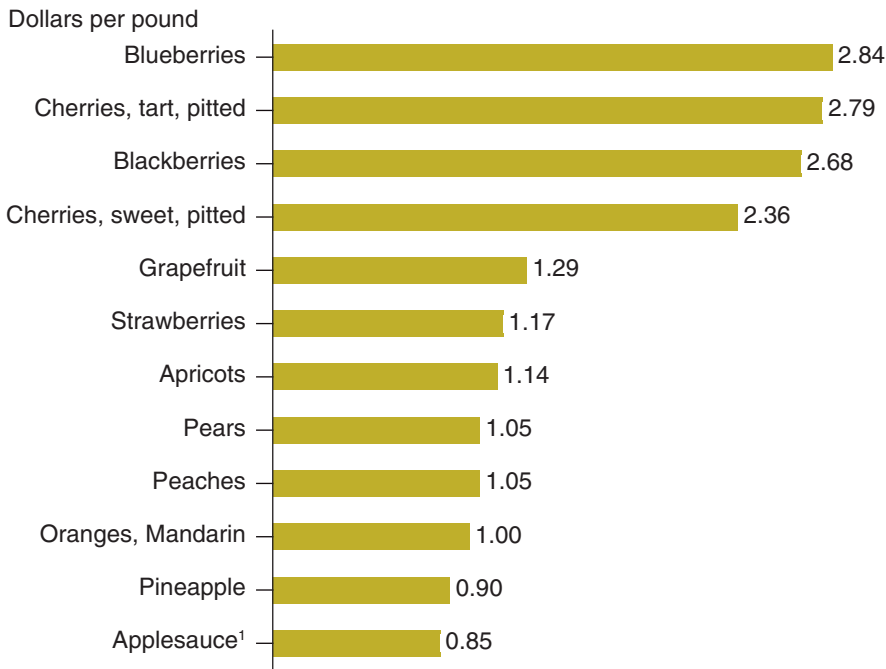


Note: Prices are for fruit sold in a prepackaged container, such as in a bag or clamshell, and fruit sold on a count basis, such as melons and oranges sold per piece of fruit. Edible cup equivalents are units of measurement for fruit/vegetable-consumption recommendations.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 2a

Canned fruit: Average retail prices

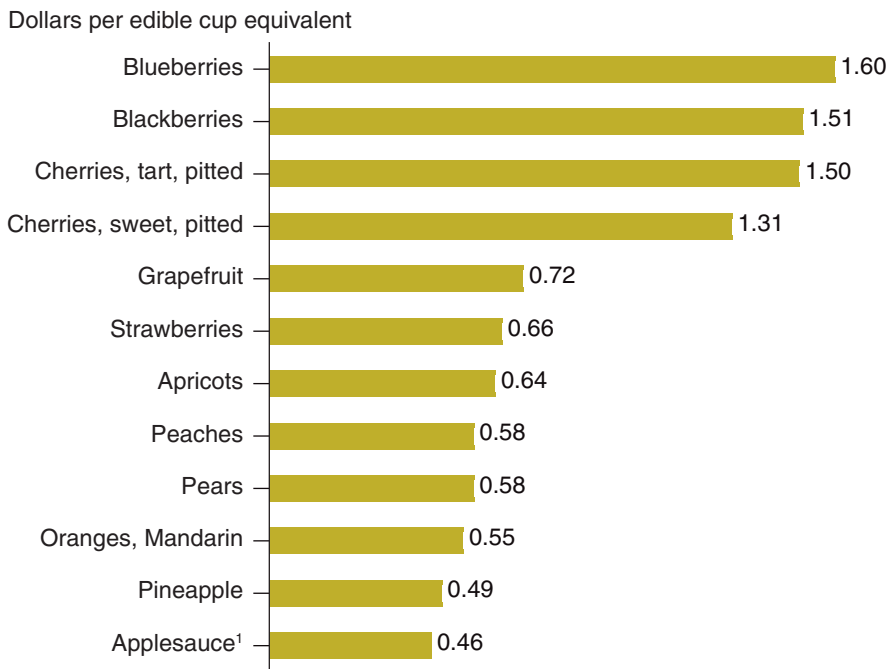


¹Includes unsweetened and “diet” varieties.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 2b

Canned fruit: Average prices per edible cup equivalent



Note: Edible cup equivalents are units of measurement for fruit/vegetable-consumption recommendations.

¹Includes unsweetened and “diet” varieties.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Frozen Fruit

Four popular types of frozen berries, all unsweetened, are included in our food cost analysis. Strawberries were least expensive costing \$2.12 per pound, on average (fig. 3a). Blueberries, blackberries, and raspberries all cost over \$3 per pound.

We assume that frozen berries include only edible fruit. All inedible parts are removed prior to packaging for retail sale. We further assume that frozen raspberries, blueberries, and blackberries are eaten frozen, such as in a fruit smoothie or other dessert. However, because the MPED does not provide a weight for frozen strawberries, we must assume that frozen strawberries are thawed prior to consumption. Under these assumptions, frozen berries cost \$1 to \$2 per cup equivalent, depending on the type of fruit (fig. 3b). However, thawed strawberries (\$1.14 per cup equivalent) were not cheaper to eat than were frozen blackberries (\$1.13 per cup equivalent). Frozen raspberries were the most expensive frozen berry to eat at \$1.86 per cup equivalent, on average.

Figure 3a

Frozen fruit: Average retail prices

Dollars per pound



Note: Includes only unsweetened, frozen fruits.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 3b

Frozen fruit: Average prices per edible cup equivalent

Dollars per edible cup equivalent



Note: Includes only unsweetened, frozen fruits. Edible cup equivalents are units of measurement for fruit/vegetable-consumption recommendations.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

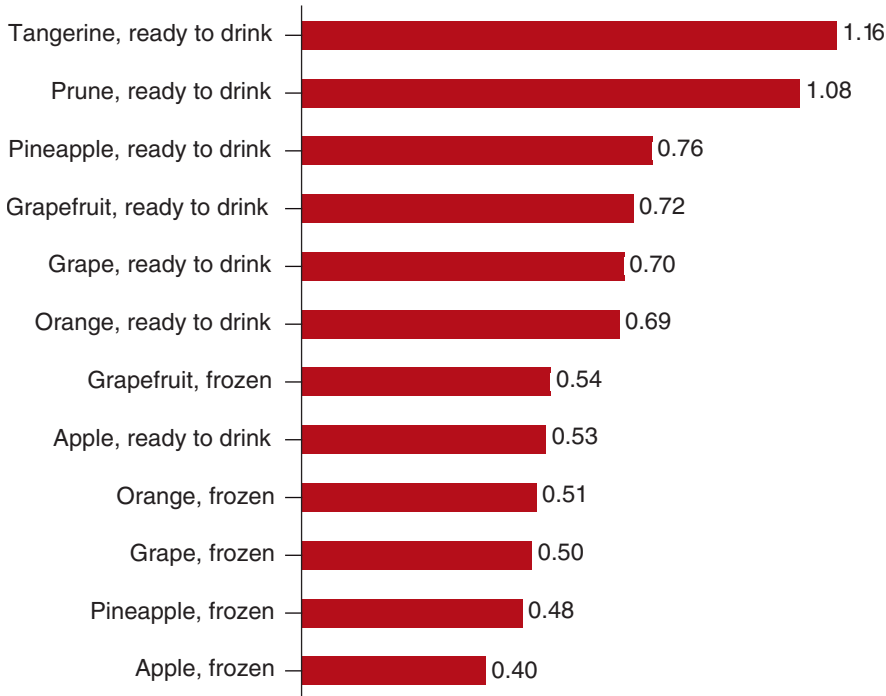
Fruit Juice

We priced 12 100% juice products, including several types of fruit juice in both frozen concentrated and ready-to-drink (shelf stable or refrigerated) forms. Frozen concentrated apple juice was the least expensive product to buy at 40 cents per reconstituted pint and the least expensive to drink at 20 cents per reconstituted cup equivalent (figs. 4a and 4b). Many other varieties of juice were also available for less than 30 cents per cup equivalent including frozen concentrated grape, orange, pineapple, and grapefruit juice. Only ready-to-drink tangerine and prune juice cost more than 50 cents per cup equivalent. Generally speaking, frozen concentrated juices cost less per pint and per cup equivalent than ready-to-drink juices.

Figure 4a

Fruit juice: Average retail prices

Dollars per pint



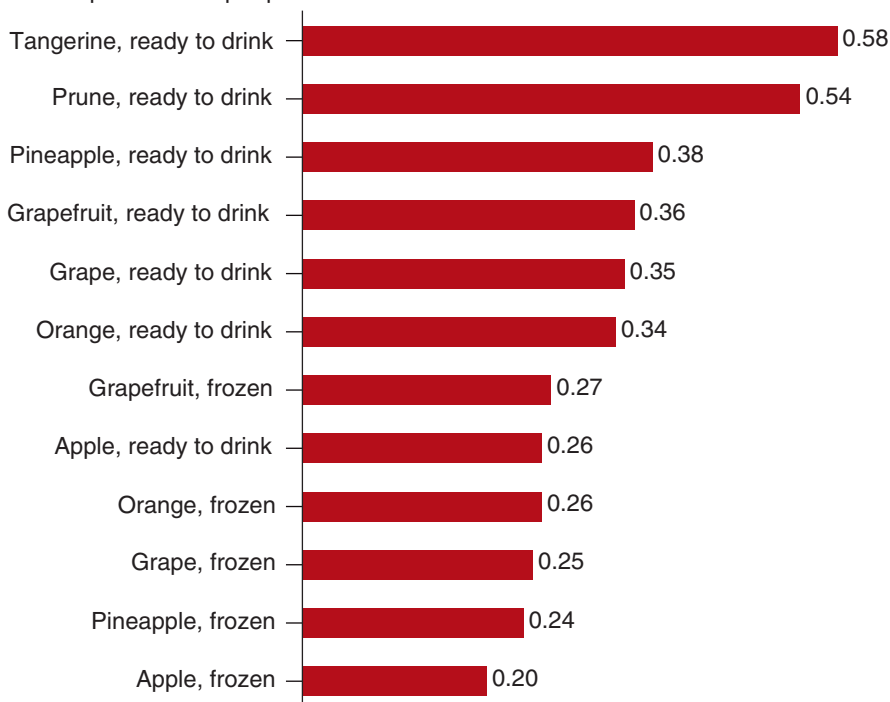
Note: "Ready to drink" refers to the state of the juice at the point of purchase. This includes juice reconstituted by the manufacturer from concentrate, as well as juice not from concentrate. "Frozen" refers to juice sold as frozen concentrate, which consumers can dilute with water at home.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 4b

Fruit juice: Average prices per edible cup equivalent

Dollars per edible cup equivalent



Note: "Ready to drink" refers to the state of the juice at the point of purchase. This includes juice reconstituted by the manufacturer from concentrate, as well as juice not from concentrate. "Frozen" refers to juice sold as frozen concentrate, which consumers can dilute with water at home. Edible cup equivalents are units of measurement for fruit/vegetable-consumption recommendations.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Dried Fruit

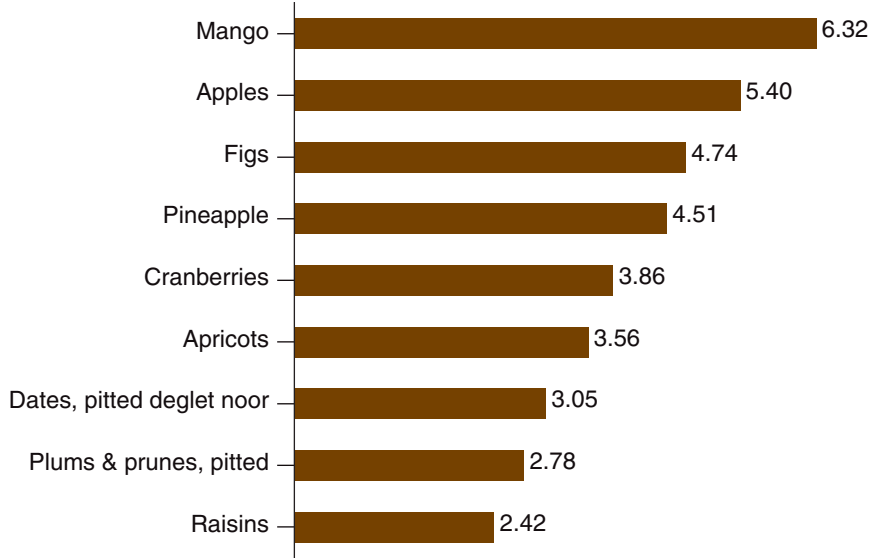
We priced nine types of dried fruit for our food cost analysis. Raisins were the least expensive, costing \$2.42 per pound, on average (fig. 5a). Dried mango, apples, figs, and pineapple all cost over \$4 per pound.

We assume that dried fruit products contain no inedible parts and cooking is not required. The fruits are sold ready-to-eat. Under these assumptions, we found that raisins were the least expensive dried fruit to consume at 39 cents per cup equivalent (fig. 5b). Apricots, cranberries, apples, and prunes cost a few cents more than 50 cents per cup equivalent. Figs (\$1.08/cup equivalent), mango (79 cents/cup equivalent), and pineapple (70 cents/cup equivalent) were the most expensive dried fruit to consume, on average.

Figure 5a

Dried fruit: Average retail prices

Dollars per pound



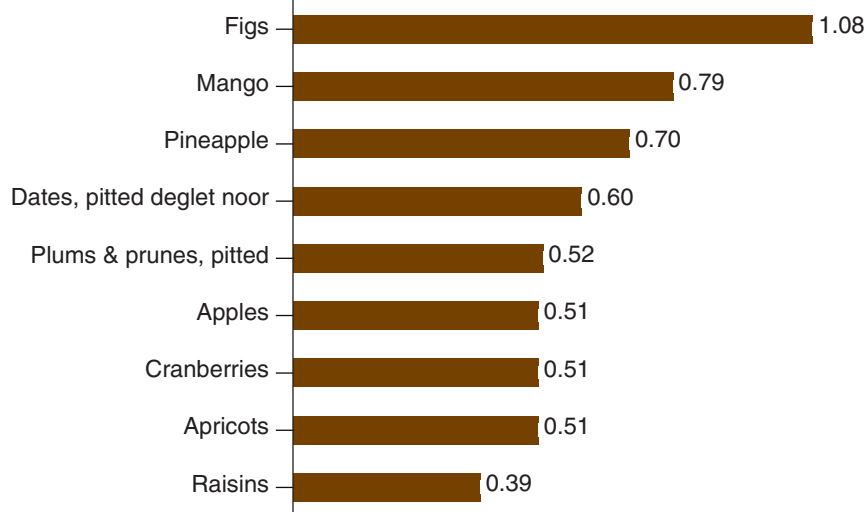
Note: "Pitted deglet noor" is the most popular variety of date.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 5b

Dried fruit: Average prices per edible cup equivalent

Dollars per edible cup equivalent



Note: "Pitted deglet noor" is the most popular variety of date. Edible cup equivalents are the units of measurement for fruit/vegetable-consumption recommendations.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Average Vegetable Prices in 2008

We priced 94 vegetable products: 35 fresh, 24 canned, 23 frozen, and 12 beans and peas (see table 4). Average retail prices for vegetables ranged from less than 50 cents per pound to over \$5 per pound. After adjusting retail food prices for inedible shares and cooking yields, there was still much variability in average prices on a cup equivalent basis. Below, we examine average vegetable prices, including beans and peas.

Fresh Vegetables

How much do fresh vegetables cost at retail? Of the 35 fresh products included in our study, 8 cost less than \$1 per pound. These include potatoes, cabbage, onions, heads of cauliflower, whole carrots, celery stalks, sweet potatoes, and heads of iceberg lettuce (fig. 6a). The most expensive products were sliced mushrooms (\$4.02 per pound) and fresh-cut leaf and baby spinach (\$3.92 per pound).

Many vegetables that are bought fresh also are eaten raw. Other vegetables, such as potatoes, must be boiled, steamed, or otherwise cooked. Still others, such as carrots, are widely eaten both raw and cooked. Thus, we estimated the cost to eat vegetables that were bought fresh in one or both ways—raw (fig. 6b) and/or cooked (fig. 6c).

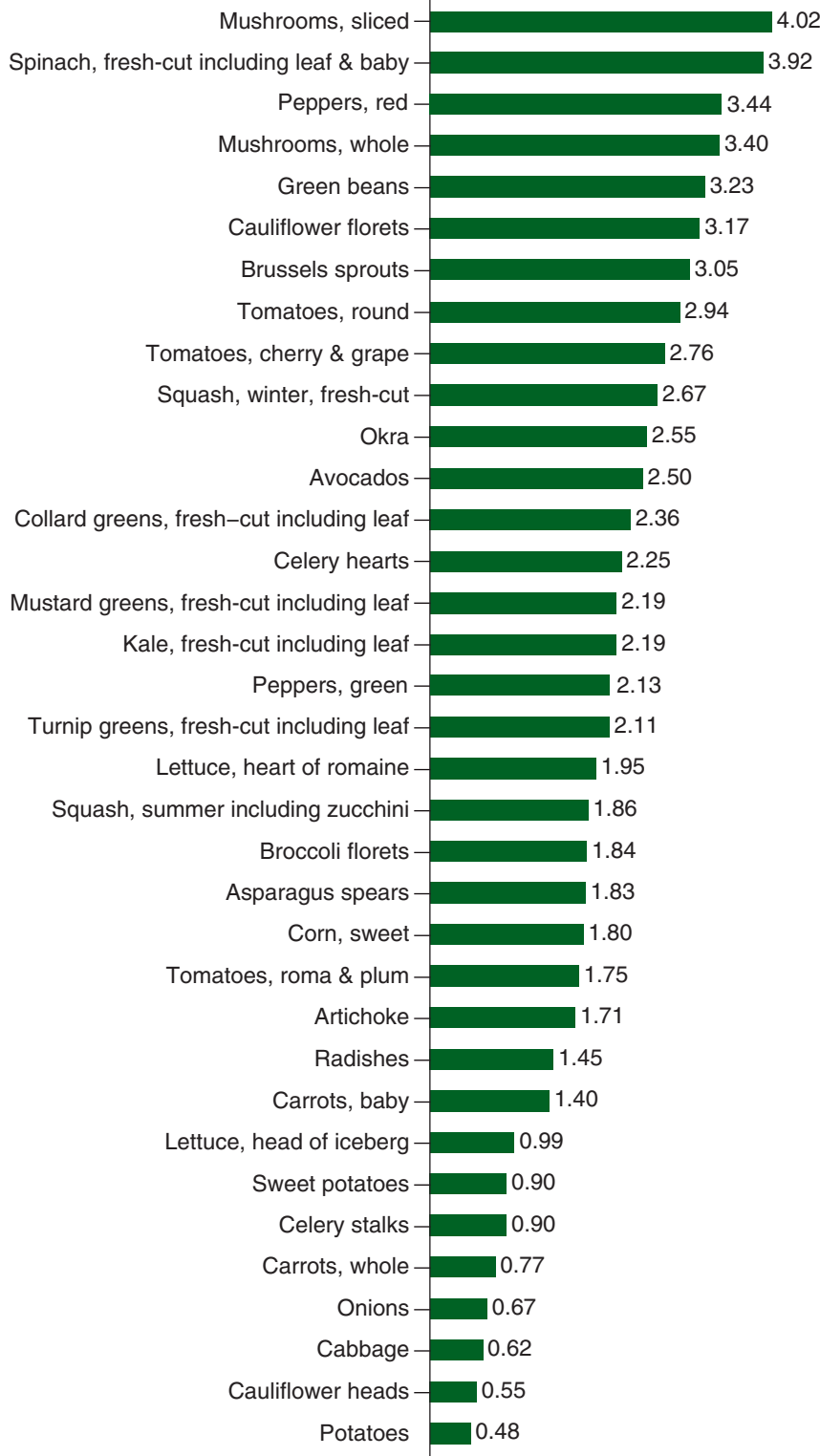
After adjusting for inedible parts and accounting for cooking yields, if applicable, 11 types of fresh vegetable could be consumed (raw and/or cooked) for less than 50 cents per cup equivalent. The least expensive to consume were boiled potatoes (19 cents per cup equivalent), raw whole carrots (25 cents), iceberg lettuce (26 cents), boiled cabbage (27 cents), and raw onions (28 cents). The most expensive was boiled leaf and baby spinach at \$2.02 per cup equivalent.

Households may be able to buy some random-weight vegetables for less money than the higher value-added, fresh-cut produce we priced. For example, bunches of spinach may cost less than the bagged leaf and baby spinach priced for this study. The same may be true for Romaine lettuce, mustard greens, collard greens, turnip greens, kale, and winter squash. As discussed earlier, data limitations prevented us from pricing these foods as sold on a random-weight basis.

Figure 6a

Fresh vegetables: Average retail prices

Dollars per pound



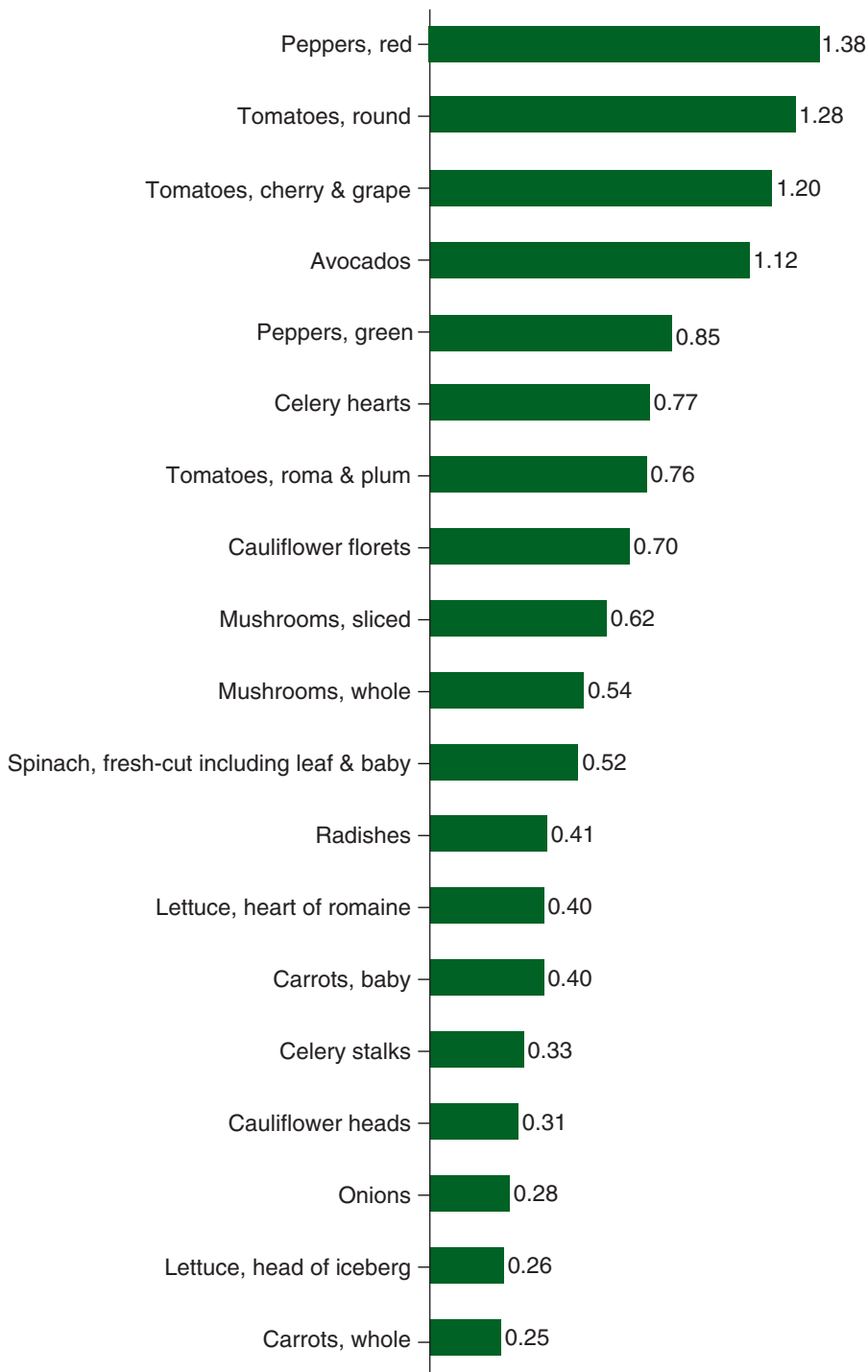
Note: Prices are for vegetables sold in a prepackaged container, such as in a bag or clamshell, and vegetables sold on a count basis, such as iceberg lettuce and cauliflower priced per head.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 6b

**Fresh vegetables: Average prices per edible cup equivalent
(consumed raw)**

Dollars per edible cup equivalent



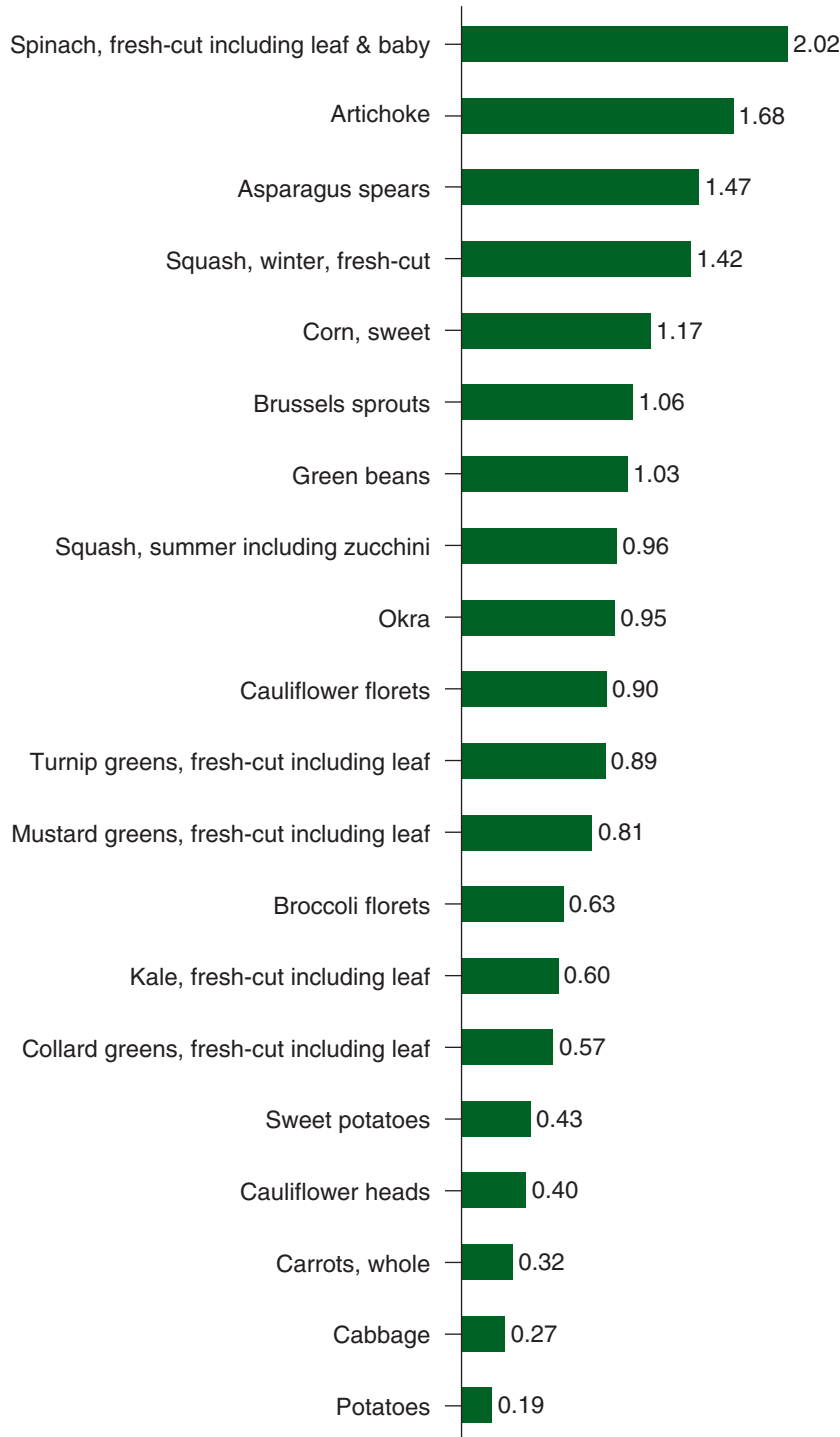
Note: Prices are for vegetables sold in a prepackaged container, such as in a bag or clamshell, and vegetables sold on a count basis, such as iceberg lettuce priced per head. Edible cup equivalents are the units of measurement for fruit/vegetable-consumption recommendations.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 6c

Fresh vegetables: Average prices per edible cup equivalent (cooked)

Dollars per edible cup equivalent



Note: Prices are for vegetables sold in a prepackaged container, such as in a bag or clamshell, and vegetables sold on a count basis, such as cauliflower priced per head. Edible cup equivalents are the units of measurement for fruit/vegetable-consumption recommendations.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Canned Vegetables

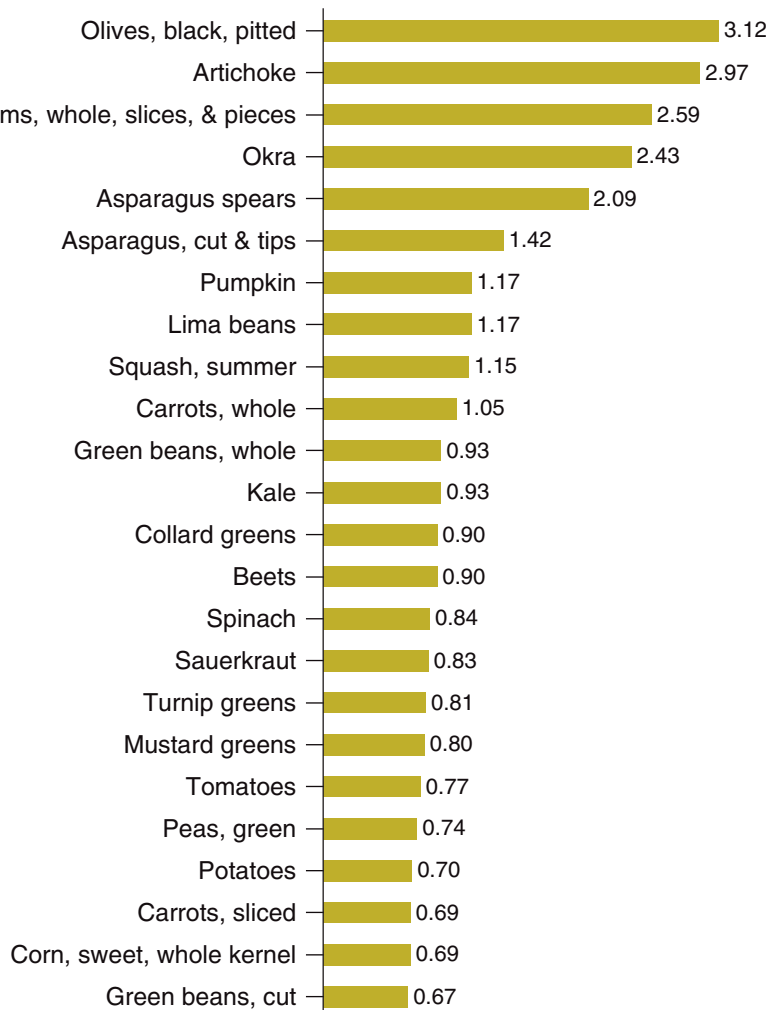
The sample of canned vegetables in our study included 24 products. Prices ranged from 67 cents per pound for cut green beans to \$3.12 per pound for olives (fig. 7a). Some relatively inexpensive canned vegetables included whole kernel corn, sliced carrots, potatoes, and green peas.

Households are assumed to drain and discard the liquid in which canned vegetables are packed. The vegetables may thereafter be cooked or simply eaten without further preparation. For this study, we use the weight for a cup equivalent reported in the MPED for canned vegetables that are eaten without further preparation. After adjusting for drainage and converting to a cup equivalent basis, 10 of the 24 canned vegetable products cost less than 50 cents to eat (fig. 7b). Sauerkraut was the least expensive canned vegetable to eat at 30 cents per cup equivalent, followed by cut green beans (34 cents), sliced carrots (34 cents), and whole kernel, sweet corn (37 cents).

Figure 7a

Canned vegetables: Average retail prices

Dollars per pound

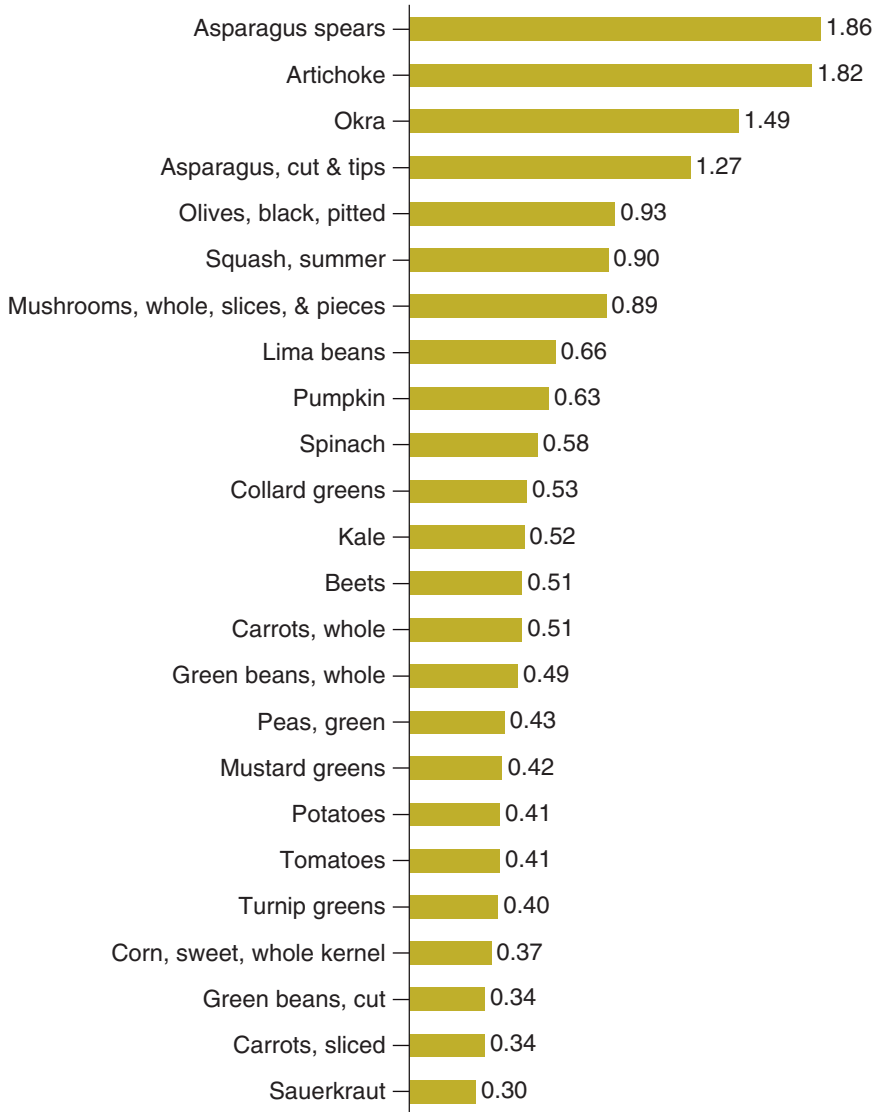


Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 7b

Canned vegetables: Average prices per edible cup equivalent

Dollars per edible cup equivalent



Note: Edible cup equivalents are the units of measurement for fruit/vegetable-consumption recommendations.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Frozen Vegetables

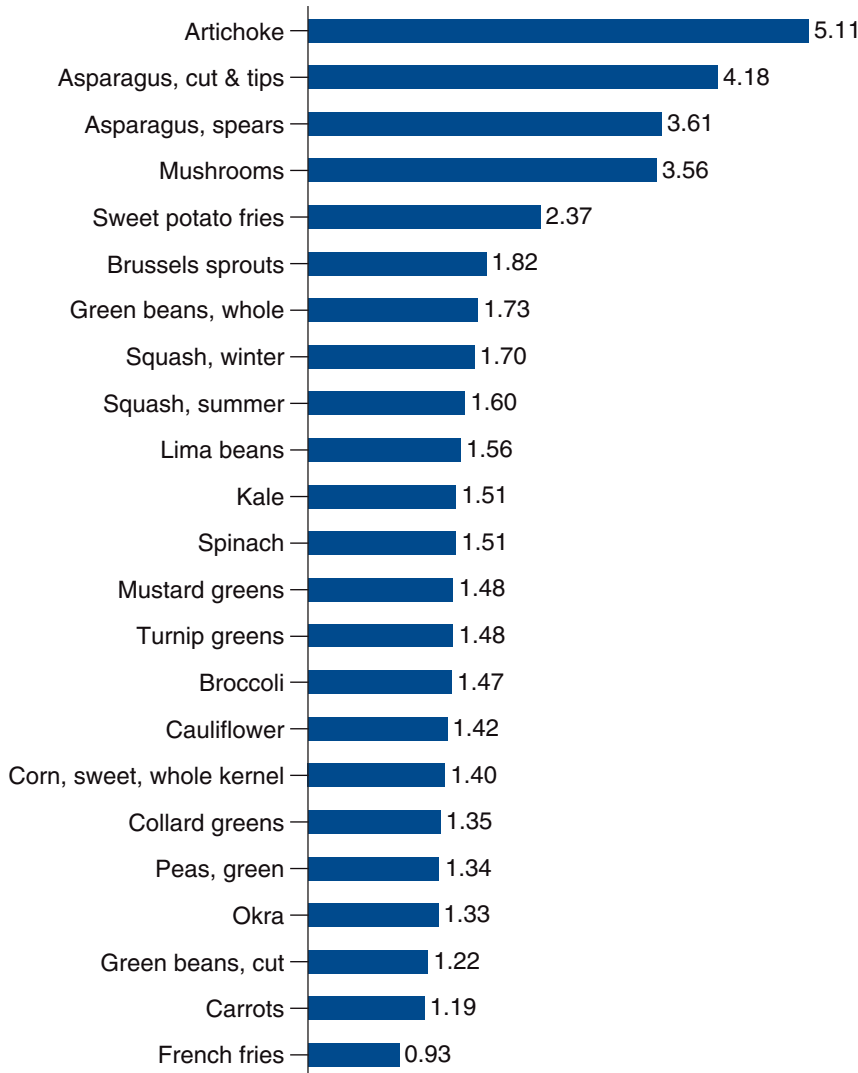
Our study included 23 frozen vegetables which ranged in price from 93 cents per pound for french fries to \$5.11 per pound for artichokes (fig. 8a). Some relatively inexpensive frozen vegetables to buy included carrots, cut green beans, okra, green peas, collard greens, whole kernel corn, and cauliflower.

We assume that most frozen vegetables, such as whole kernel corn, are boiled prior to consumption though some are thawed or baked. French fries, for example, are baked. Under these assumptions, four types of frozen vegetable cost less than 50 cents per cup equivalent. Cut green beans were the least expensive frozen vegetable to consume at 37 cents per cup equivalent, followed by frozen carrots (39 cents), french fries (41 cents), and kale (48 cents) (fig. 8b).

Figure 8a

Frozen vegetables: Average retail prices

Dollars per pound

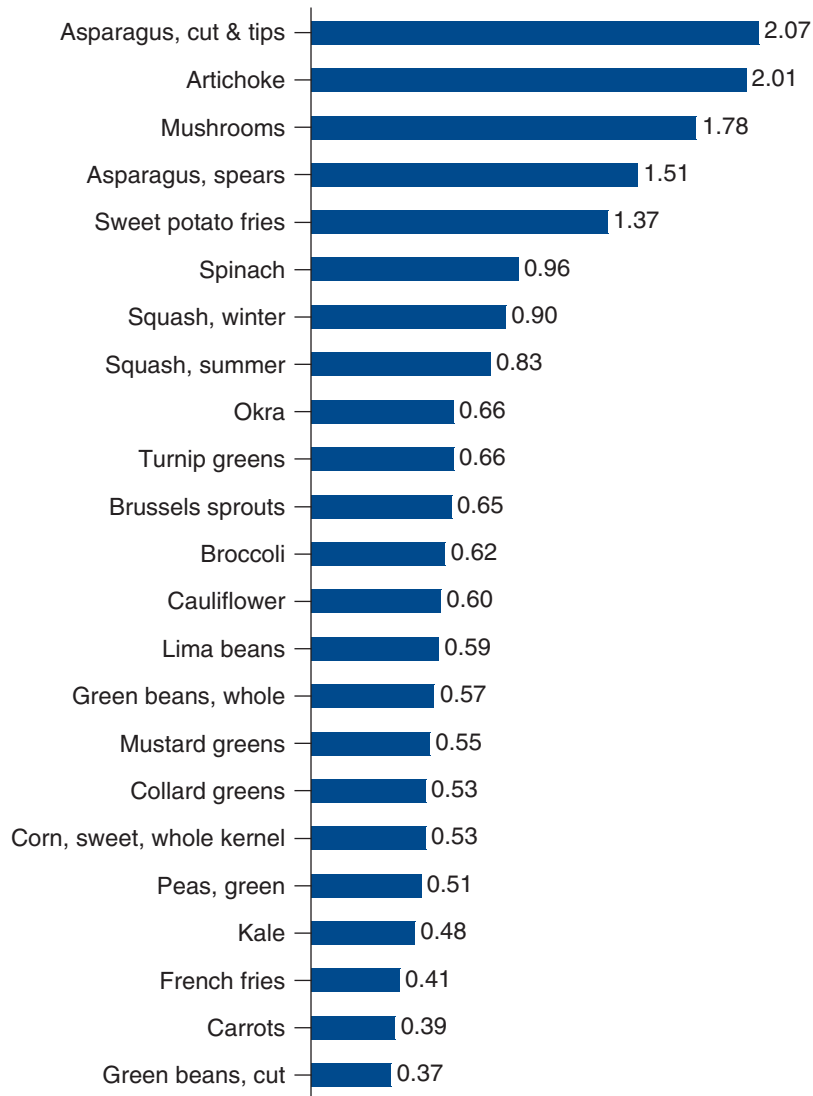


Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 8b

Frozen vegetables: Average prices per edible cup equivalent

Dollars per edible cup equivalent



Note: Edible cup equivalents are the units of measurement for vegetable-consumption recommendations.

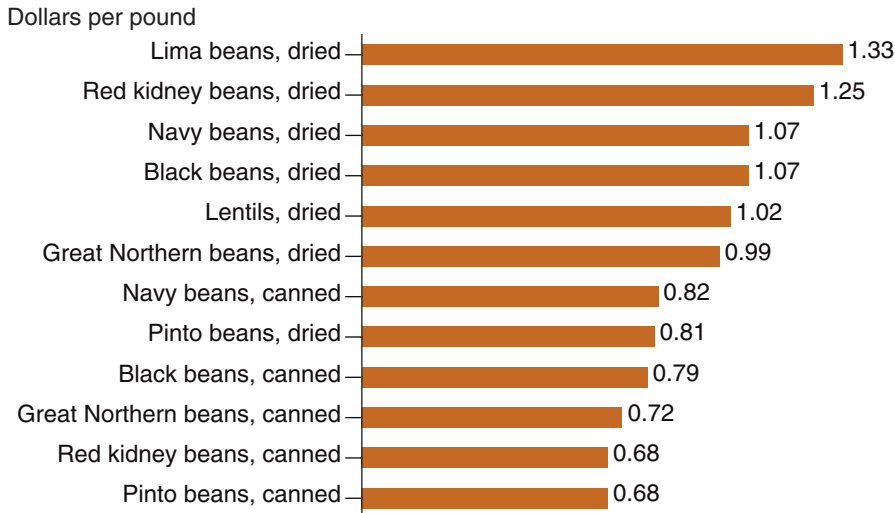
Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Beans and Peas

We priced 12 canned and dried beans as well as dried lentils. Beans and peas tend to cost less per pound to buy, but are relatively more expensive per cup equivalent to eat. However, on an edible basis, all 12 products cost less than 50 cents per cup equivalent to consume. Of the beans and peas we priced, dried pinto beans were the least expensive to eat at 13 cents per cup equivalent followed by lentils at 15 cents per cup equivalent (figs. 9a and 9b).

Figure 9a

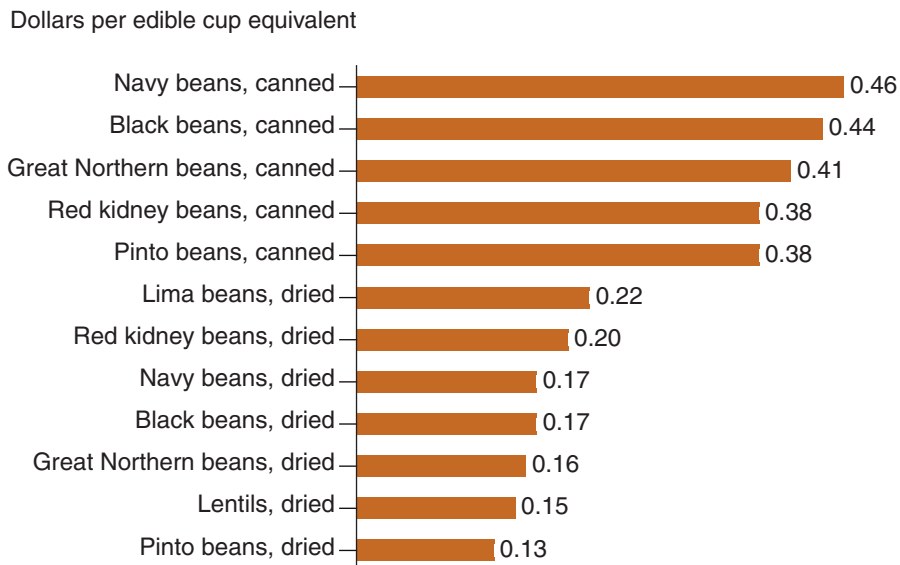
Beans and peas: Average retail prices



Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Figure 9b

Beans and peas: Average prices per edible cup equivalent



Note: Edible cup equivalents are the units of measurement for fruit/vegetable-consumption recommendations.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Discussion

Having estimated average retail prices and prices per edible cup equivalent for 153 fresh and processed fruits and vegetables, we find much variation from the least expensive to most expensive products. As our results in figures 1-9 demonstrate, an edible cup equivalent of fruit can cost 17 cents for fresh watermelon or \$2.06 for fresh raspberries. Similarly, an edible cup equivalent of vegetables can cost 13 cents for dry pinto beans or \$2.07 for frozen asparagus cuts and tips.

We further find that neither fresh nor processed foods are a consistently cheaper way to eat fruits and vegetables. For example, fresh whole carrots eaten raw (25 cents per cup equivalent) are less expensive to consume than either canned carrots (34 cents per cup equivalent) or frozen carrots (39 cents per cup equivalent). By contrast, canned peaches (58 cents per cup equivalent) are more economical than fresh (66 cents per cup equivalent).

Retail prices also appear to be a poor indicator of prices per edible cup equivalent. Fresh broccoli florets and fresh ears of sweet corn both sell for around \$1.80 per pound at retail stores, on average. However, after boiling and removing inedible parts, sweet corn (\$1.17 per cup equivalent) costs almost twice as much as broccoli florets (63 cents per cup equivalent). Similarly, fresh apples and fresh pineapple both sell for slightly more than \$1 per pound at retail stores. However, on a cup-equivalent basis, the apples are much cheaper (28 cents versus 70 cents).

Tables 5 and 6 show some of the less expensive products by subgroup. Many types of fruit juice and a few types of whole fruit cost less than 30 cents per cup equivalent including fresh watermelon, fresh bananas, and fresh apples. Several vegetables in different subgroups were also available in this price range. Whole carrots (25 cents per cup equivalent) were the cheapest red or orange vegetable. Potatoes were the cheapest starchy vegetable (19 cents per cup equivalent). Many types of beans and peas cost less than 20 cents per cup equivalent. Dark green vegetables were slightly more expensive. Fresh Romaine hearts and canned turnip greens were the least expensive dark green vegetables to consume (40 cents per cup equivalent).

To illustrate how much it costs to satisfy overall fruit and vegetable guidelines, we provide a 3-day example for a person on a 2,000-calorie daily diet (table 7). Each daily example includes the recommended 4.5 cup equivalents for this person (2 cup equivalents of fruit and 2.5 cup equivalents of vegetables). We also include popular foods from different fruit and vegetable subgroups. Although total costs for consuming the foods in the examples vary from day to day, in 2008, it was possible to satisfy recommendations in the *2010 Dietary Guidelines for Americans* for about \$2 to \$2.50 per day, or approximately 50 cents per edible cup equivalent.

Table 5

Less expensive fruit, 2008

Fruit type	Average price (cents/edible cup equivalent)
Whole and cut fruit	
Apples—fresh	28
Applesauce—canned	46
Bananas—fresh	21
Grapes—dried (raisins)	39
Honeydew melon—fresh	45
Nectarines—fresh	49
Oranges, navel—fresh	34
Pears—fresh	42
Pineapple—canned	49
Plums—fresh	48
Watermelon—fresh	17
Juice	
Apple	20
Grape	25
Grapefruit	27
Orange	26

Note: All juice prices shown above are for products sold at retail stores in the form of frozen concentrate and then reconstituted by the consumer at home.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Table 6

Less expensive vegetables, 2008

Vegetable type	Average price (cents/edible cup equivalent)
Dark green	
Kale—frozen	48
Mustard greens—canned	42
Mustard greens—frozen	55
Romaine lettuce—fresh	40
Turnip greens—canned	40
Red and orange	
Carrots—whole, fresh	25
Carrots—baby, fresh	40
Carrots—canned, cut	34
Carrots—frozen	39
Sweet potatoes—boiled from fresh	43
Tomatoes—canned, whole and cut	41
Beans and peas	
Pinto beans—boiled	13
Great Northern beans—boiled	16
Navy beans—boiled	17
Black beans—boiled	17
Red kidney beans—boiled	20
Starchy	
Corn—canned, whole kernel	37
Potatoes—boiled from fresh	19
Green peas—canned	43
Other	
Cabbage—boiled from fresh	27
Cauliflower—boiled from fresh	49
Celery stalks—fresh	33
Green beans—canned, cut and sliced	34
Green beans—frozen, not whole	37
Iceberg lettuce—fresh heads	26
Onions—fresh	28
Radish—fresh	41
Sauerkraut—canned	30

Note: All bean prices are for products bought in dried form and then boiled by the consumer at home.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data.

Table 7

Costs for meeting vegetable and fruit recommendations in the 2010 Dietary Guidelines for Americans, daily examples¹

Fruit or vegetable type	Day 1		Day 2		Day 3	
	Cup	Cost (cents)	Cup	Cost (cents)	Cup	Cost (cents)
Fruit and fruit juice						
Orange juice, from frozen concentrate	1	26	1	26	1	26
Strawberries, fresh	1	89				
Cantaloupe, fresh			0.5	32		
Banana, fresh			0.5	11		
Raisins					0.5	20
Apples, fresh					0.5	14
Dark green vegetables						
Romaine lettuce, fresh	0.5	20				
Spinach, cooked from frozen			0.25	24		
Broccoli florets, cooked from fresh					0.5	32
Red and orange vegetables						
Carrots, whole, fresh	0.5	13				
Tomato, Roma, fresh	0.5	38				
Sweet potato, cooked from fresh			0.5	22		
Carrots, cooked from frozen			0.25	10		
Tomato, grape, fresh					0.5	60
Starchy vegetables						
Corn, whole kernel, canned	0.5	19				
Green peas, cooked from frozen			0.5	26		
Potato, cooked from fresh					0.5	10
Other vegetables						
Onions, fresh	0.25	7				
Green beans, whole, cooked from frozen			0.5	29		
Cauliflower florets, fresh					0.5	35
Celery stalk, fresh					0.5	17
Beans and peas						
Pinto beans, canned	0.25	10				
Black beans, canned			0.5	22		
Total	4.5	\$2.22	4.5	\$2.02	4.5	\$2.12

¹For a person on a 2,000-calorie daily diet.

Note: Cups are 1-cup equivalents. Costs are for the number of cup equivalents consumed. Food costs are based on figures 1a-9b. We do not consider how the foods listed here contribute to the intake of micronutrients like potassium, vitamin A, and vitamin C.

Source: USDA, Economic Research Service analysis of 2008 Nielsen Homescan data and Federal dietary recommendations.

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