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United States  
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Economic  
Research  
Service

# Canned Fruit and Vegetable Consumption in the United States

Report to Congress

September 2008



This report was prepared by Jean C. Buzby,  
Biing-Hwan Lin, Hodan Farah Wells,  
Gary Lucier, and Agnes Perez.

# **Canned Fruit and Vegetable Consumption in the United States: A Report to the United States Congress**

## **Abstract**

Senate Report 110-134 requested that the Economic Research Service prepare and publish a report regarding consumer perceptions and consumption of canned fruits and vegetables.

Economic Research Service researchers used USDA's food consumption survey data, Bureau of Labor Statistics' Consumer Expenditure Survey data, and the ERS Food Availability Data System to study U.S. consumption of selected fruits and vegetables with available data, including select canned fruits and vegetables. If current trends prevail, total fruit and vegetable availability will continue to increase but canned fruits and vegetables will account for a declining share of that total. However, there are several divergent and offsetting forces that make it difficult to predict the future demand for canned produce.

**Keywords:** Canned, consumption, fruit, food availability, food intake, food loss, vegetable

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## Summary

Economic Research Service researchers used USDA's food consumption survey data, Bureau of Labor Statistics' Consumer Expenditure Survey data, and the ERS Food Availability Data System to study U.S. consumption of selected fruits and vegetables with available data, including select canned fruits and vegetables. If current trends prevail, total fruit and vegetable availability will continue to increase, but canned fruits and vegetables will account for a declining share of that total. However, there are several divergent and offsetting forces that make it difficult to predict the future demand for canned produce.

### What Is the Issue?

The Senate Report 110-134 accompanying S. 1859, the 2008 Agriculture Appropriations Bill, requested that the Economic Research Service prepare and publish a report regarding consumer perceptions and consumption of canned fruits and vegetables.

### What Did the Study Find?

**American consumers are consuming more produce, and they prefer it non-canned.** Using food availability data as a proxy for consumption, the amount of fruit available for consumption rose 13 percent between 1970 and 2005, and the amount of vegetables available for consumption increased 23 percent. Most of these increases were for fresh fruits and vegetables. Although the per capita quantity of canned vegetables increased slightly, canned vegetables' share of total vegetables fell from 30 percent to 25 percent. Per capita availability of canned fruit decreased by 37 percent, and canned fruits' share of total fruit decreased from 11 percent to 6 percent.

### **Consumer spending for canned produce varies across economic and demographic groups.**

Analysis of household spending on both fresh and canned fruits and vegetables shows considerable variation in spending on canned produce and that spending was affected by social and demographic factors. Higher income households tend to spend more per capita on canned fruits and vegetables than do lower income households. The same holds true for households headed by older persons, compared with their younger counterparts. Households with children tend to spend relatively less on canned fruits and vegetables. Hispanic households have lower

expenditures on canned fruits than other ethnic groups. Asians spend the least on canned vegetables, while African Americans spend the most.

**Looking ahead, market trends suggest that the share of canned produce in total**

**consumption will continue to decline.** However, several divergent forces may affect that outcome. The U.S. population is expected to become wealthier, older, better educated, and more ethnically diverse in the long run. Many economic, social, and demographic changes will occur simultaneously, and some will have offsetting effects on the demand for canned fruits and vegetables. For example, a wealthier and older population is likely to spend more on canned fruits and vegetables. However, growth in the Hispanic population, who tend to spend less on canned produce than the rest of the population, may head demand for canned produce in the opposite direction. Consequently, it is difficult to predict the future demand for canned fruits and vegetables. However, if the trends shown in the food availability data prevail in the future, total per capita consumption of fruits and vegetables will continue to increase and the canned share of fruits and vegetables will continue to decline.

**How Was the Study Conducted?**

The report is based on data from:

1. ERS Food Availability Data System (see [www.ers.usda.gov/Data/FoodConsumption/](http://www.ers.usda.gov/Data/FoodConsumption/)), the only source of time-series data on the food available for human consumption in the United States. The data system provides proxies for actual consumption. The data for fruits and vegetables are presented in various product forms, including fresh and canned. In this report, ERS analyzes the amounts and shares of fruits and vegetables available for consumption, by product form, as well as the type of canned fruits and vegetables for 1970-2005. (See Appendix A1 for further information on the Food Availability Data System.)
2. U.S. Department of Labor Bureau of Labor Statistics' Consumer Expenditure Survey (CEX) conducted in 2004 ([www.bls.gov/cex](http://www.bls.gov/cex)). The CEX's Diary Survey contains data on food expenditure for two consecutive weeks. In addition to reporting expenditure,

respondents also report data on income, social, and demographic characteristics. The CEX data were used to estimate per-capita spending on various food and non-food items by income, social, and demographic characteristics of the U.S. population. (See Appendix A2 for more information.)

3. USDA Continuing Survey of Food Intakes by Individuals (CSFII) (see [www.ars.usda.gov/Services/docs.htm?docid=15044](http://www.ars.usda.gov/Services/docs.htm?docid=15044)) conducted in 1994-96 and 1998. ERS used these data to describe who eats selected fruits and vegetables, the amount eaten, and where fruits and vegetables are eaten. These studies were reviewed and relevant findings on the consumption of canned fruits and vegetables are summarized here. The CSFII data are dated. But more recent data cannot, at this time, be used to estimate the amount of produce consumed because the programming and data are not available to translate food consumption information back into commodity ingredients. A food and commodity translation database is under development to fill this research need. (See Appendix A3 for a further discussion.)



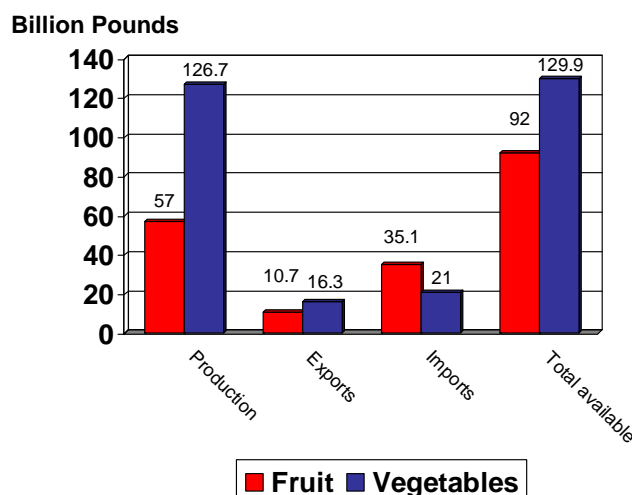


## General Background

The Senate Report 110-134 accompanying S. 1859, the 2008 Agriculture Appropriations Bill, requested that the Economic Research Service prepare and publish a report regarding consumer perceptions and consumption of canned fruits and vegetables. Here, “canned” refers to traditional airtight shelf-stable metal cans and containers as well as other newer and increasingly popular types of airtight containers, such as single-serving plastic cups. Although ERS has not directly studied consumer perceptions of canned fruits and vegetables, consumer perceptions are reflected by market behavior as indicated by consumption trends over time and across demographic groups. In this report, ERS presents results on canned fruit and vegetable consumption from three data sources.

The United States is among the world’s top producers of fruits and vegetables. In 2006, the United States produced 57 billion pounds of fruit and 126.7 billion pounds of vegetables. Most domestically produced fruits and vegetables are consumed in the United States but the share that is exported is growing. Increased promotion of U.S. fruits and vegetables directed at overseas markets, through efforts such as the USDA’s Market Access Program (<http://www.fas.usda.gov/mos/programs/map.asp>), has likely helped boost foreign sales, particularly to Canada, the largest foreign buyer of U.S. fruits and vegetables. While growth in U.S. fruit exports has been strong, the United States remains a net fruit importer. In 2006, 92 billion pounds of fruit and 129.9 billion pounds of vegetables were available for consumption in the United States when accounting for domestic production, exports, imports, feed and seed use, shrinkage in storage, and beginning and ending stocks (fig. 1).

Figure 1. Domestic Production, Exports, Imports, and Availability of Fruits and Vegetables for Consumption in 2006<sup>1</sup>



<sup>1</sup> Total availability equals production plus imports minus exports, and where appropriate, adjustment for beginning and ending stocks. Source: ERS, 2007. Fresh-weight equivalent. Total availability also accounts for changes in stocks, feed use, shrinkage in storage, and seed use.

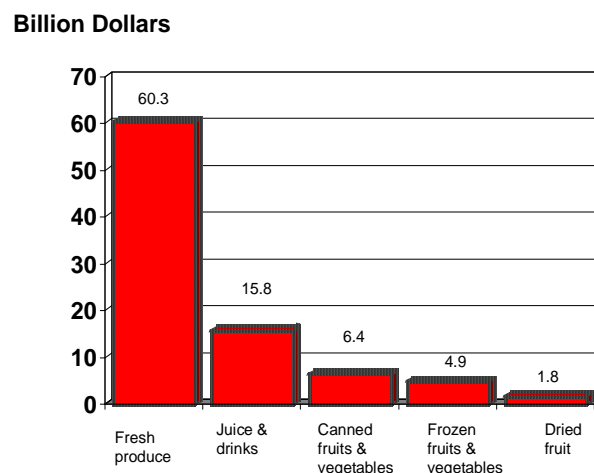
U.S. fruit and vegetable imports grew during the last two decades and through the 2000s, due in part to the growing population in the United States and the increased demand for new products, such as fruit in single-serving plastic cups. Not only have imports expanded for commodities already produced domestically, creating competition for U.S. producers, but imports have also increased for new items, such as the less traditional types of tropical fruit. In 2006, the United States was the world's largest importer of canned fruit mixtures, accounting for 38 percent of such imports (USITC, 2007). In some cases, U.S. produce is exported in institutional-size metal cans, repackaged into plastic cups or jars in another country, and then imported back to the United States in the form of ready-to-eat products. An example is U.S. canned peach exports to Thailand (USITC, 2007).

Fresh and processed fruits and vegetables are distributed through both retail (e.g., mainly grocery chains) and institutional channels (e.g., hospitals, hotels, prisons, schools, and other foodservice outlets). A large portion of canned peaches, pears, and fruit mixtures is sold to institutional buyers, typically in large containers that are lower priced per pound (USITC, 2007). At retail, canned fruits and vegetables are typically sold in smaller containers, such as 4-ounce plastic cups

or 8-ounce metal cans. Fruits and vegetables, both fresh and processed, are also purchased by the government, such as for USDA's school nutrition programs.

Data on sales of fruits and vegetables to restaurants and other foodservice outlets are not available but data does exist for retail sales. The 2006 Consumer Expenditures Study estimated total retail sales in supermarkets and mass supercenters for food categories with annual sales over \$10 million (Progressive Grocer, 2007).<sup>1</sup> Sales at these outlets were estimated at \$60.3 billion for fresh produce, \$15.8 billion for refrigerated and shelf-stable juice/drinks, \$6.4 billion for canned fruits and vegetables, \$4.9 billion for frozen fruit juice and vegetables, and \$1.8 billion for dried fruit (fig. 2).<sup>2</sup> Data are unavailable on the value of fruits and vegetables used in mixed, prepared foods like frozen entrées.

Figure 2. Estimated Retail Sales at Supermarkets and Mass Supercenters in 2006



Source: Calculated by authors using data from the Consumer Expenditures Study reported by the Progressive Grocer, 2007.

<sup>1</sup> “The Consumer Expenditures Study is based on data collected by The Nielsen Company for UPC-coded products, as well as sales estimates made by Progressive Grocer's research department for non-tracked categories in perishables and general merchandise” (Progressive Grocer, 2008).

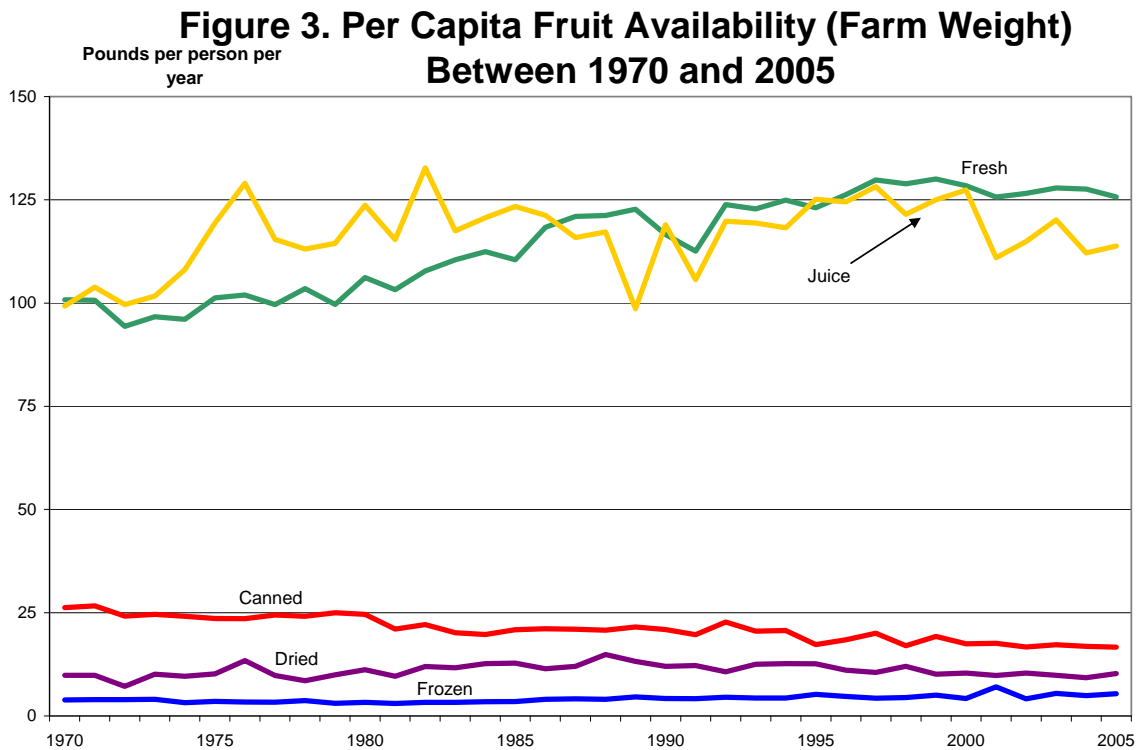
<sup>2</sup> Juice/drinks were mostly fruit products but included a relatively small amount of vegetable juice, nonalcoholic wine, and clam juice. The data were aggregated so that ERS could not exclude these products.

## Consumption Trends for Fruits and Vegetables

The authors used the estimated amounts of canned fruits and vegetables available for consumption in the United States as proxies for actual consumption (see Appendix A1 for further explanation of the data used from the ERS Food Availability Data System).

### Canned Fruit Makes Up a Declining Share of Total Fruit

Although the total amount of fruit available for consumption rose 13 percent between 1970 and 2005, the share of canned fruit out of total fruit fell from 11 percent to 6 percent.<sup>3</sup> Fresh fruit and juice consistently tallied higher shares than canned fruit though canned fruit maintained a higher share than dried and frozen fruit.



Source: USDA/ERS Food Availability (Per Capita) Data System.

<sup>3</sup> Meanwhile, the shares for fruit in fresh, frozen, and juice forms increased between 1970 and 2005. The share of fresh fruit increased the most from 42 to 46 percent. The juice and frozen fruit shares increased by less than 1 percent over this time period and the dried fruit share fell by less than 1 percent. When only looking at total processed fruit, the canned share of total fruit fell from 19 percent in 1970 to 11 percent in 2005 (not shown).

## **Estimated Consumption of Most Types of Canned Fruits Declined**

We use a different data series in the system, the Loss-Adjusted Food Availability Data, when analyzing among the different varieties of canned fruit and vegetables. This series accounts for the amount of food lost at the market and consumer levels (e.g., plate waste and spoilage) in order to obtain a closer approximation of what Americans, on average, consume over time on an annual and daily basis. The estimated amount of canned fruit consumed, per capita, decreased 35 percent between 1970 and 2005. All canned fruit covered in the data decreased during this time period, except for canned olives, which increased by almost fifty percent. Most of the growth in olives is from the increased demand for olives in foodservice channels, such as pizza and fast food chains, restaurants, and hotels, particularly since the 1990s.<sup>4</sup> One reason for declines in the other canned fruit is that some consumers switched to fresh fruit or other types of processed fruit (e.g., juice).<sup>5</sup>

Canned apples and applesauce were the most popular canned fruit in 2005, followed by peaches and pineapples. Although these three fruits decreased since 1970, they each maintained over a 20 percent share of total canned fruit.

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<sup>4</sup> The sharp growth in per capita canned olive consumption in the U.S. between 1970 and 2005 may be attributed to the large increase in both domestic production and imports. Domestic production averaged 71.5 million pounds (1970/71-1972/73) and imports averaged 95.8 million pounds. For the period 2003/04-2005/06 domestic production averaged 224.9 million pounds and imports averaged 194.3. Spain is our largest supplier of imported canned olives.

<sup>5</sup> For example, between 1970 and 2005, fresh pear availability rose from 1.1 pounds per capita to 1.8 pounds and fresh pineapples rose from .2 pounds to 1.3 pounds while the amounts of canned pears and pineapples fell.

**Table 1. Estimated Per Capita Availability of Canned Fruit, Adjusted for Loss**

<b>Fruit</b>	<b>1970</b>	<b>2005</b>	<b>1970-05 Change</b>	<b>Share of 2005 Total</b>
	<i>Pounds Per Capita</i>		<i>Percent</i>	<i>Percent</i>
Apples and applesauce	3.8	2.9	-24	27
Peaches	4.7	2.4	-50	22
Pineapples	3.5	2.3	-33	21
Pears	2.8	1.9	-31	17
Olives	0.8	1.1	48	10
Cherries	0.3	0.2	-57	1
Apricots	0.7	0.1	-87	---- <sup>2</sup>
Plums	0.3	---- <sup>2</sup>	-89	---- <sup>2</sup>
<b>Total</b>	<b>16.8</b>	<b>10.9</b>	<b>-35</b>	<b>100</b>

<sup>1</sup> Less than 0.1 pounds.

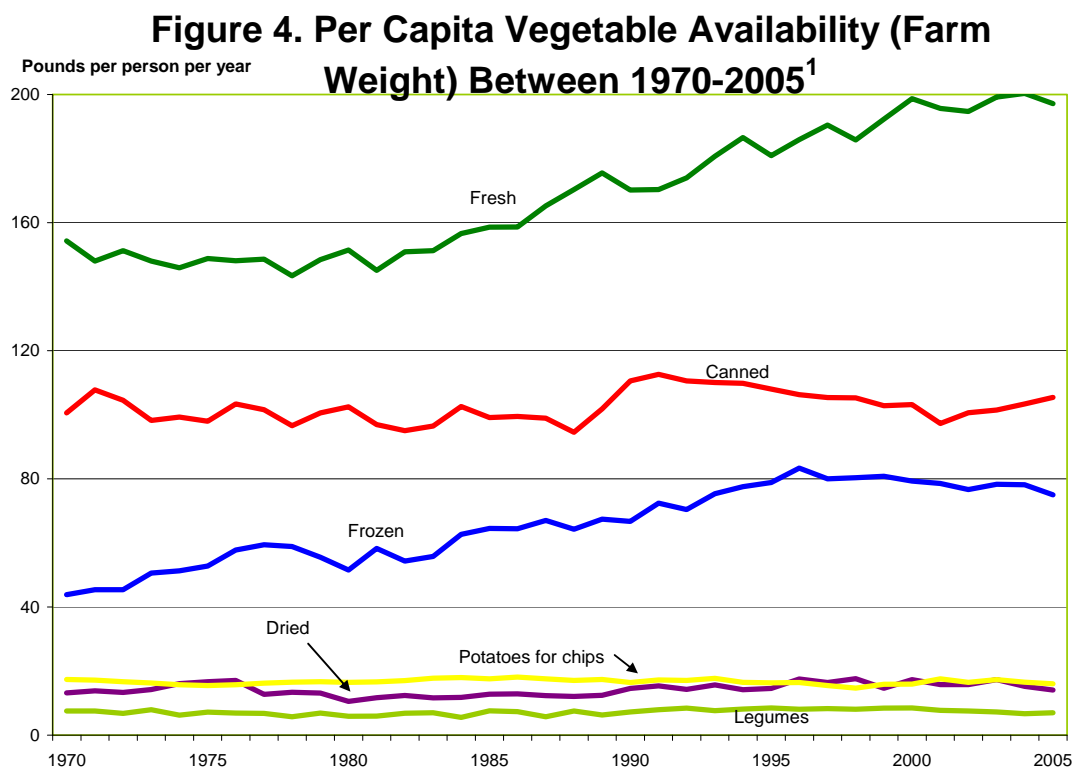
<sup>2</sup> Less than 1 percent.

Source: USDA/ERS Loss-Adjusted Food Availability Data, 1970-2005.

## Canned Vegetables Make Up a Declining Share of Total Vegetables

Between 1970 and 2005, the total availability of vegetables increased by 23 percent and the availability of canned vegetables rose 5 percent. Canned vegetables appear to have been both partially replaced by and supplemented with an increasing amount of fresh and frozen vegetables. As a result, the share of canned vegetables out of total vegetables fell from 30 percent to 25 percent.<sup>6</sup>

During this time period, there was little change in the relative ranking of fresh and processed forms of vegetables. Fresh vegetables consistently made up the highest share of total vegetables. For fruit, juicemaking is the most important type of processing in terms of pounds per year. For vegetables, canning is the most important type of processing, followed by freezing.



<sup>1</sup>The data do not break down legumes into the different product forms. Potatoes have an additional category for chips.  
Source: USDA/ERS Food Availability (Per Capita) Data System.

<sup>6</sup> Between 1970 and 2005, the share of frozen vegetables rose from 13 percent to 18 percent while the shares of the other three categories remained relatively constant. Fresh vegetables rose 2 percentage points from 46 percent to 48 percent. The canned share of vegetables out of total processed vegetables fell from 55 percent in 1970 to 49 percent in 2005 (not shown).



## The Lion's Share of Canned Vegetables are Canned Tomatoes

Once again we used the Loss-Adjusted Food Availability data when estimating consumption among the different varieties of canned vegetables. Estimated consumption of canned vegetables increased by 3 percent between 1970 and 2005, unlike canned fruit, which declined in that time period. Most types of canned vegetables covered in the database decreased between 1970 and 2005 except for canned tomatoes, canned mushrooms, and “other canned” vegetables.

The rise in canned tomatoes added to that vegetable's already dominant share of total canned vegetables. In 2005, the amount of canned tomatoes available for consumption was almost five times higher than the second-ranked canned vegetable, sweet corn. Canned tomatoes include a wide range of products, such as tomato paste, diced tomatoes, and pasta sauce.

**Table 2. Estimated Per Capita Availability of Canned Vegetables, Adjusted for Loss**

Vegetable	1970	2005	1970-05 Change	Share of 2005 Total
	<i>Pounds Per Capita</i>		<i>Percent</i>	<i>Percent</i>
Tomatoes	21.5	25.5	18	59
Sweet Corn	8.8	5.3	-40	12
Chile Peppers <sup>1</sup>	NA	3.7	NA	9
Snap Beans	2.4	2.0	-14	5
Other Canned Vegetables <sup>2</sup>	1.3	1.9	49	4
Cucumbers (Pickles)	1.9	1.3	-32	3
Carrots	1.4	1.1	-20	3
Mushrooms	0.5	0.7	33	2
Green Peas	1.8	0.6	-67	1
Potatoes	1.2	0.6	-53	1
Cabbage (Sauerkraut)	0.9	0.5	-47	1
Asparagus	0.4	0.1	-68	---- <sup>3</sup>
Total	42.1	43.3	3	100

<sup>1</sup>Data on chile peppers is not available for 1970. In 1980, the estimate was 1.88 pounds per capita per year. Includes fresh, frozen, and dried chiles. Canning is the major use in this estimate.

<sup>2</sup>Other canned vegetables include beets, pulses, pimentos, water chestnuts, bamboo shoots, juices, and other miscellaneous vegetables.

<sup>3</sup> Less than 1 percent.

Source: USDA/ERS Loss-Adjusted Food Availability Data, farm weight, 1970-2005.

## Economic Factors Determining Consumer Demand

Americans can now choose among a wider selection of fruits and vegetables year-round than in the past. In 1998, the typical U.S. grocery store carried 345 produce items, compared with 173 in 1987 (Calvin et al., 2001). International trade has helped overcome supply gaps due to seasonality.<sup>7</sup> Imports also provide U.S. consumers with a larger variety of horticultural products, particularly tropical fruits that cannot be profitably grown in the States. Some of the newer items available to consumers include imported tomato varieties and exotic imports like passion fruit. Demand for convenience, such as for single-serving containers of fruit, has also resulted in a wider array of products available for sale, many of which are from foreign suppliers. In general, increased fruit and vegetable availability could potentially increase the demand for canned produce (see Box 1, “Major Trends and Factors Potentially Affecting the Demand for Canned Fruits and Vegetables”). Processed fruits and vegetables spoil less and tend to have lower handling and transportation costs than fresh versions, thus expanding the reach of geographical markets (Huang, 2004).

### Box 1. Major Trends and Factors Potentially Affecting the Demand for Canned Fruits and Vegetables

<u>Trend/factor</u>	<u>Potential direction for demand</u>
↑ Availability of fruits and vegetables (variety, quality)	↑
↓ Price of fruits and vegetables	↑
↑ Increased awareness of nutritional benefits of fruits and vegetables	↑
↑ Eating away from home	↓ (except for some types like canned refried beans)
↑↓ Demographic determinants	↑↓

Source: ERS, March 24, 2008.

<sup>7</sup> The United States harvests many kinds of fruits and vegetables for domestic consumption and export during the late summer and early fall. The United States then imports these products from other countries during the remaining months when they are not domestically produced. However, imports can compete with storable U.S. commodities, such as fresh apples and pears, and canned fruit and vegetables.

International trade has generally lowered prices for many fruits and vegetables and this may increase the demand for these products, including canned versions. International trade has also helped smooth price fluctuations, such as through year-round marketing agreements between wholesalers and retailers. New produce varieties that handle different climates, locations, and pest conditions as well as advances in production, transportation, and handling methods have also played a role in increasing produce availability, maintaining quality, and lowering prices.

Undoubtedly, relative prices of processed fruits and vegetables play a role in which foods consumers purchase. The increase in imported canned fruits and vegetables, new forms of these products, and private-label supplies of traditional canned products has changed the price relationships between products and brands, often diminishing the competitiveness of U.S. canners in the domestic market (USITC, 2007). However, the recent changes in exchange rates have increased the cost of imported produce and made U.S. produce exports more competitive, particularly for more heavily traded types of produce. Exports of canned fruits and vegetables may also increase due to the weakened U.S. dollar.

Encouraging Americans to eat more fruits and vegetables has been a central theme of Federal dietary guidance for the past two decades, in part due to the growing evidence of the health benefits associated with fruit and vegetable consumption. A higher level of education together with an increase in dietary-information campaigns has equipped U.S. consumers with better dietary knowledge and, hence, promoted increased consumption of fruits and vegetables (Lin et al., 2003). One might expect that consumption of all forms of fruits and vegetables, including canned, would increase with greater awareness of the importance of those products in healthy diets.<sup>8</sup>

One of the major dietary trends in the United States is the growing appetite for eating out. In 1970, 26 percent of all food expenditures was spent on food away from home; by 2005, that share rose to 41 percent. A number of factors have contributed to the trend of increased dining out, including a larger share of women employed outside the home, more two-earner households,

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<sup>8</sup> There appears to be no published study on the effect of dietary knowledge on the consumption of canned fruits and vegetables. However, substantiated health claims appear to have helped increase consumption of some fruit and vegetable products, as well as other foods.

higher incomes, more affordable and convenient fast-food outlets, increased advertising and promotion by large foodservice chains, and the smaller size of American households. Continuation of these economic and demographic trends is expected to keep boosting Americans' preference for eating out. It is not expected that this trend will result in any notable increases in demand for all canned fruits and vegetables, though there may be a few exceptions, such as for canned refried beans, which are already mostly consumed away from home.

Changing economic, social, and demographic characteristics also play a role in shaping consumer preferences for fruits and vegetables, including canned versions. The next section looks at a sample of these characteristics (income, race and ethnicity, region, and age) and consumption of canned fruits and vegetables.

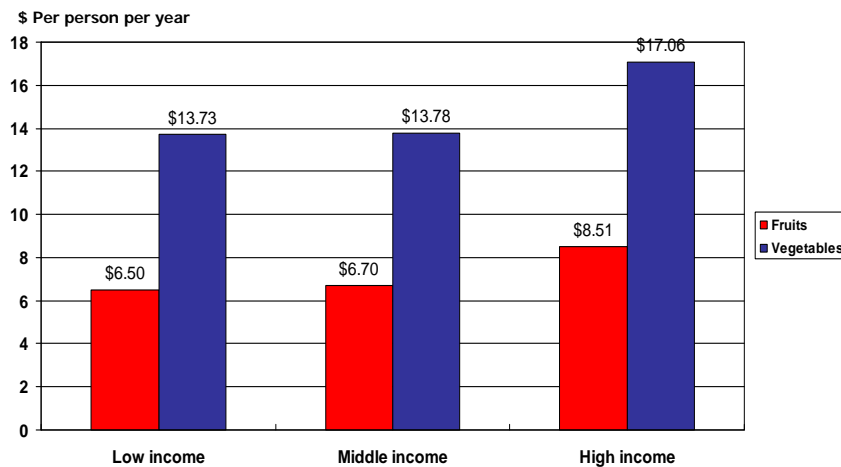
## Spending on Fruits and Vegetables

In this report, per-capita spending on canned fruits and vegetables was estimated by using data from the Bureau of Labor Statistics' (BLS) 2004 Consumer Expenditure Survey (see Appendix A2 for a discussion about the survey). This section summarizes the differences in per capita spending by selected social and demographic factors.

### *High-income households spend more on canned fruits and vegetables*

Households are classified into three income groups using the Federal poverty guidelines.<sup>9</sup> High-income households tend to spend more on canned fruits and vegetables. Spending on canned fruits and vegetables is similar between low- and middle-income groups—the differences are not statistically significant.

**Figure 5. Per Capita Spending on Canned Fruits and Vegetables: Income Class**



Source: BLS Consumer Expenditure Survey 2004.

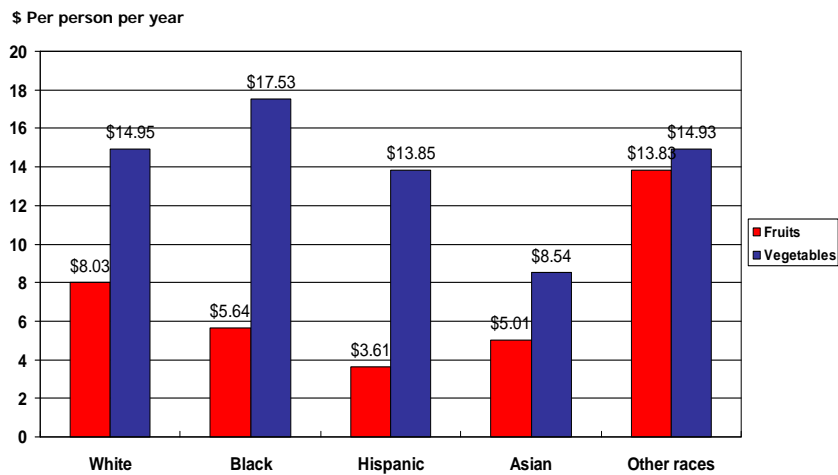
<sup>9</sup> The low-income group has income not exceeding 185 percent of the poverty level, the high-income group has income exceeding 300 percent of the poverty level, and the middle-income group has income falling between 185 and 300 percent of the poverty level.

*Hispanics spend the least on canned fruits; Blacks spend the most on canned vegetables*

Per capita spending on canned fruits and canned vegetables varies greatly by race and ethnicity.

In 2004, Hispanics spent the least on canned fruits, and individuals of “other races” spent the most. Asians spent the least on canned vegetables and Blacks spent the most.

**Figure 6. Per Capita Spending on Canned Fruits and Vegetables: Race and Ethnicity**

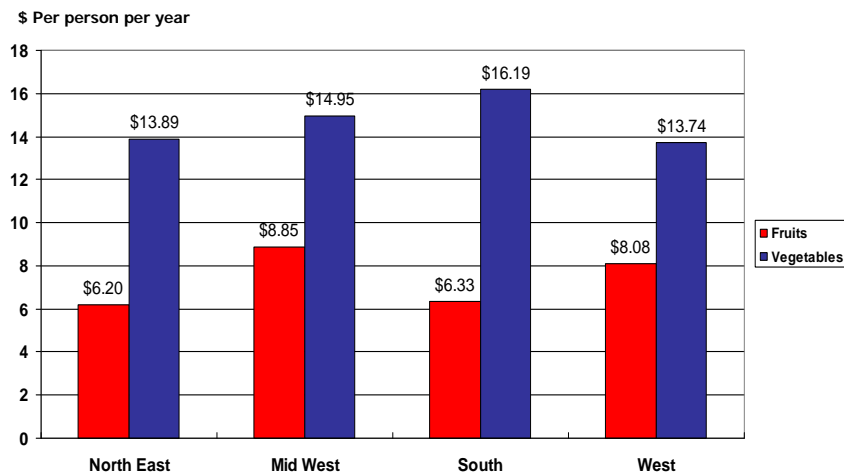


Source: BLS Consumer Expenditure Survey, 2004.

***Individuals living in the South tend to spend more on canned vegetables***

There were regional differences in per capita spending on canned fruits and canned vegetables in 2004. Individuals living in the Northeast spent the least on canned fruits while individuals in the Midwest spent the most. Individuals living in the West spent the least on canned vegetables while individuals in the South spent the most.

**Figure 7. Per Capita Spending on Canned Fruits and Vegetables: Region**

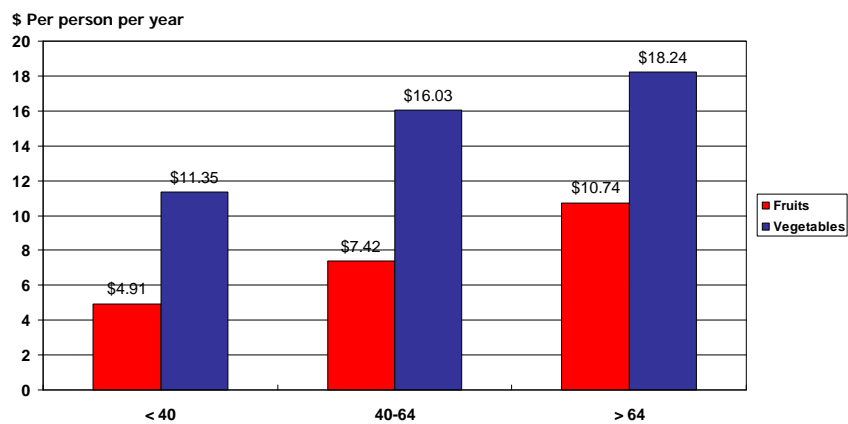


Source: BLS Consumer Expenditure Survey, 2004.

*Spending on canned fruits and vegetables rises with the age of household head*

Total fruit and vegetable consumption has risen with age in the United States. Young households (head is younger than 40) spent the least on canned fruits, compared with households headed by those aged 40-64 and the oldest households (head is 65 or older). Young households also spent the least on canned vegetables.

**Figure 8. Per Capita Spending on Canned Fruits and Vegetables: Age of Household Head**



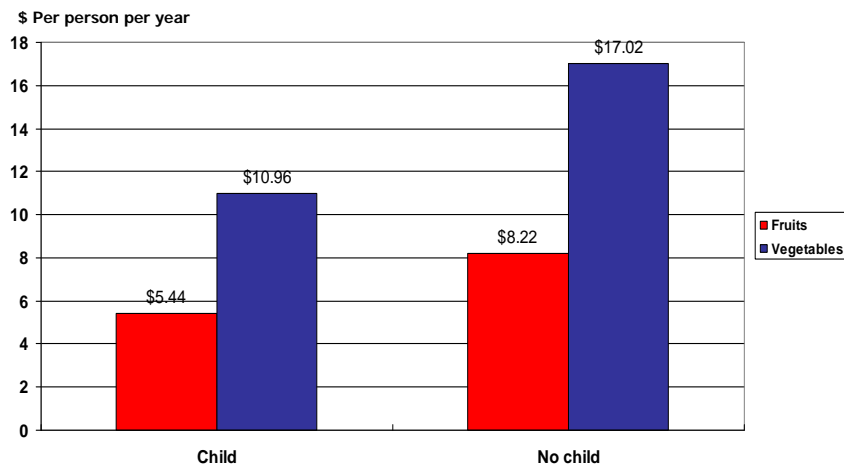
Source: BLS Consumer Expenditure Survey, 2004.



***Presence of children lowers spending on canned produce***

Consistent with the results on age of household head, households with children (age 18 or younger) tend to spend less on canned produce. In 2004, households with children spent less on canned fruits and vegetables than households without children. These findings could also reflect the fact that per capita food spending for children is less than for adults.

**Figure 9. Per Capita Spending on Canned Fruits and Vegetables: Presence of Children**

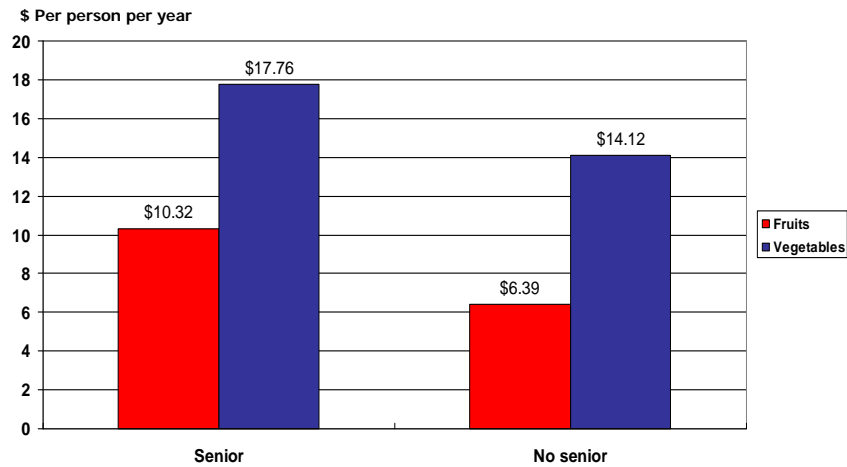


Source: BLS Consumer Expenditure Survey, 2004.

***Presence of senior increases spending on canned produce***

In 2004, households with one or more adults aged 65 or over (i.e., “a senior”) spent more on canned fruits and vegetables than households without a senior.

**Figure 10. Per Capita Spending on Canned Fruits and Vegetables: Presence of Senior<sup>1</sup>**



<sup>1</sup>A “senior” indicates that the household had one or more adults aged 65 or over  
Source: BLS Consumer Expenditure Survey, 2004.

## Demographic Characteristics: Who Eats What, When, and Where

The Bureau of Labor Statistics (BLS) data tell us the spending patterns on canned produce by economic, social, and demographic characteristics. Prices of canned produce vary greatly by the type of produce as well as by product attributes, such as packaging. Therefore, spending more on canned produce may not necessarily mean that a greater quantity of canned produce was purchased.

Data from USDA's food consumption surveys can be used to estimate the amount of canned produce consumed by Americans in different social and demographic groups. Since 2000, ERS researchers have conducted a series of studies combining survey data with availability data to describe who eats produce, how much is eaten, and where it is eaten. These studies were based on 1994-96 and 1998 data. Even though more recent food consumption data have been collected, the recent data cannot be used to estimate the amount of produce consumed (see Appendix A-3 for an explanation and description of the data).

This section highlights findings from 20 ERS published studies pertaining to specific canned fruits and vegetables. Although these findings do not give us a comprehensive story about all types of produce, they provide anecdotal evidence about individual types of fruits and vegetables. These findings show the choices made in the market place and this information reveals consumer preferences, which vary by the type of produce and by product form. That is, purchase decisions for individual commodities are based on income, age, and other demographic factors. However, purchase decisions can also be based on relative prices, availability, and convenience of the different forms (e.g., baby carrots versus canned carrots). Detailed tables and publications are available upon request from Biing-Hwan Lin ([blin@ers.usda.gov](mailto:blin@ers.usda.gov)).

### *Apples*

- Children under the age of 5 eat more applesauce than older children and adults.
- By a substantial margin, Whites consume more applesauce than other individuals.
- Applesauce consumption rose with income.

### *Tomatoes*

- Most processed tomatoes are consumed at home, except ketchup.
- Fast food restaurants account for 34 percent of ketchup use and restaurants with waiter service account for 15 percent.
- Individuals living in the western region eat more tomato sauce and less tomato paste than individuals living in other parts of the United States. The western region accounts for 22 percent of the U.S. population and consumes 25.6 percent of tomato sauce and 20.9 percent of tomato paste.
- Relative to other Americans, Blacks have a preference for ketchup but do not favor tomato juice. Blacks account for 12.6 percent of the U.S. population and consume 14.6 percent of ketchup and 5.8 percent of tomato juice.<sup>10</sup>

### *Sweet corn*

- Sweet corn consumption, on a fresh-equivalent basis, was evenly divided among fresh, frozen, and canned.
- Foodservice uses a larger percentage of frozen and canned sweet corn than fresh sweet corn. The use of prepared frozen and canned corn products is heavily favored in the food service industry to reduce labor costs.

### *Snap beans*

- Consumption of canned snap beans (i.e., green or long beans) is greatest among older Americans (age 60 and above) and weakest among teenagers.

### *Cucumbers*

- The preference for fresh and pickled cucumbers varies by age.
- Men aged 20 to 59 are the largest consumers of pickles, accounting for 27 percent of the U.S. population but consuming 39 percent of pickled cucumbers.
- Seniors consume below the average amount of pickles, likely reflecting their desire to reduce sodium intake.

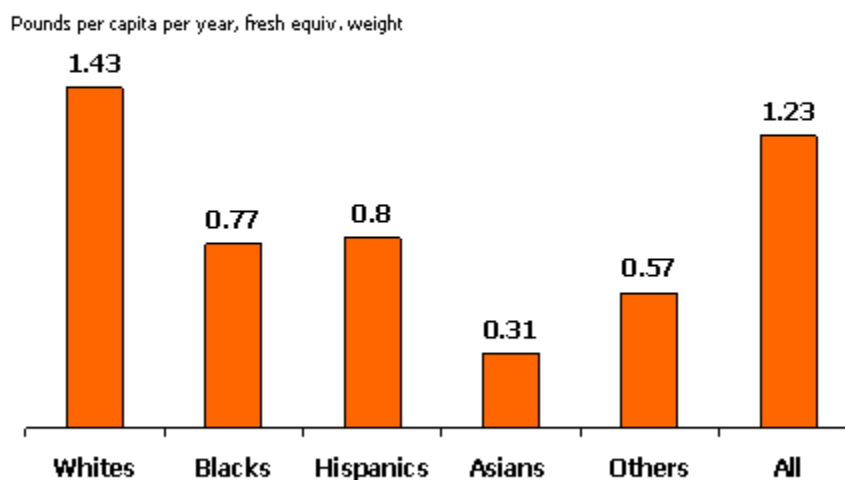
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<sup>10</sup> The population estimate for Blacks in the 1994-96 survey is from the 1990 Census.

## Carrots

- Most processed carrots are consumed at home rather than away from home.
- An estimated 1.55 pounds of fresh-equivalent canned carrots are consumed per capita in 2006, and 86 percent of this amount is consumed at home.
- Restaurants with waiter service account for 7 percent of canned carrot use, followed by 3 percent at school cafeterias.
- At home, individuals living in the southern region consume more canned carrots per capita than individuals in other regions.
- Per capita consumption of canned carrots declines with income and education.
- In 2005, Whites ate more canned carrots at home by a substantial margin than Hispanics, Blacks, and Asians (fig. 11).

**Figure 11. Annual Per Capita Consumption of Canned Carrots by Race**



Source: Consumption patterns depicted in 1994-96 and 1998 are used with 2005 food availability data to show 2005 consumption by race.

## Potatoes

- Canned potatoes make up a very small share of total potato use (about 2 pounds fresh weight, compared to 63 pounds for frozen potatoes in 1999).
- Canned potato consumption rises with income and is higher among individuals living in rural areas rather than among individuals living in nonrural areas.

### Onions

- At-home consumption accounts for 80 percent of canned onion use.
- Restaurants with waiter service lead the away-from-home market with 12 percent of total canned onion use.

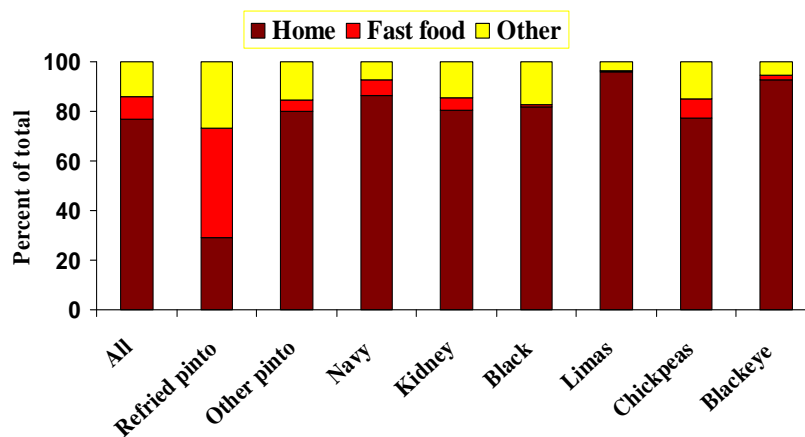
### Spinach

- At-home consumption accounts for 90 percent of canned spinach use.
- Canned spinach is favored by older people, those living in the South and West, and those living in rural areas.

### Dry beans

- Canned refried pinto beans are distinctly different from other dry beans in terms of where they are consumed. About 77 percent of all dry beans are consumed at home, whereas 71 percent of canned refried pinto beans are consumed away from home, mostly at fast food outlets (fig. 12).
- Refried pinto bean consumption rises with age and then drops sharply among seniors, reflecting the fact that older Americans are less likely to eat out.
- Canned refried pinto beans are favored by Hispanics, especially Mexican Americans.

Figure 12. Share of Select Dried Beans Consumed at Home and Away from Home



Source: USDA's Continuing Survey of Food Intakes by Individuals, 1994-96.

## Future Trends

### How Demographic Shifts May Influence Future Food Choices

The U.S. population is expected to continue to increase, with changes occurring in the number of people in different economic, social, and demographic groups. The U.S. population is expected to become wealthier, older, better educated, and more ethnically diverse in the long run. In particular, the racial and ethnic landscape of the U.S. population is undergoing dramatic changes.<sup>11</sup> Two growing groups, Hispanics and Asians, spent the least on canned produce in 2004, whereas Whites spent relatively more on canned produce. If these spending patterns continue into the future, the changing demographic landscape suggests a declining spending on canned produce, on a per capita basis. However, with a larger population, the total spending on canned produce in the United States can still increase despite decreased per capita spending. An in-depth analysis is needed to gauge the effects of changing race and ethnic makeup on the future consumption of canned produce.

Americans are getting older, and that aging trend is expected to boost spending on canned produce. Americans are also getting wealthier in the long run, and it has been well-documented that as household income rises, food spending will rise as well.<sup>12</sup> BLS data indicate that spending on both canned fruits and canned vegetables rises with income. Therefore, we would expect per capita consumption of canned fruits and vegetables to increase with rising income and the graying of the U.S. population in the long run.

The American appetite for eating out is also expected to continue growing. Consequently, we expect these changes to affect per capita consumption of fruits and vegetables, by type and processed form. For example, the current demand for canned refried pinto beans, ketchup, and canned sweet corn in the foodservice industry may increase if this trend prevails.

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<sup>11</sup> According to the population projections by the U.S. Census Bureau, the White population will decline to 72 percent by 2050, Blacks will increase to 14.6 percent, Asians will more than double to 8 percent, and “all other races will be 5.3 percent. Hispanics (of any race) will almost double to 24.4 percent.

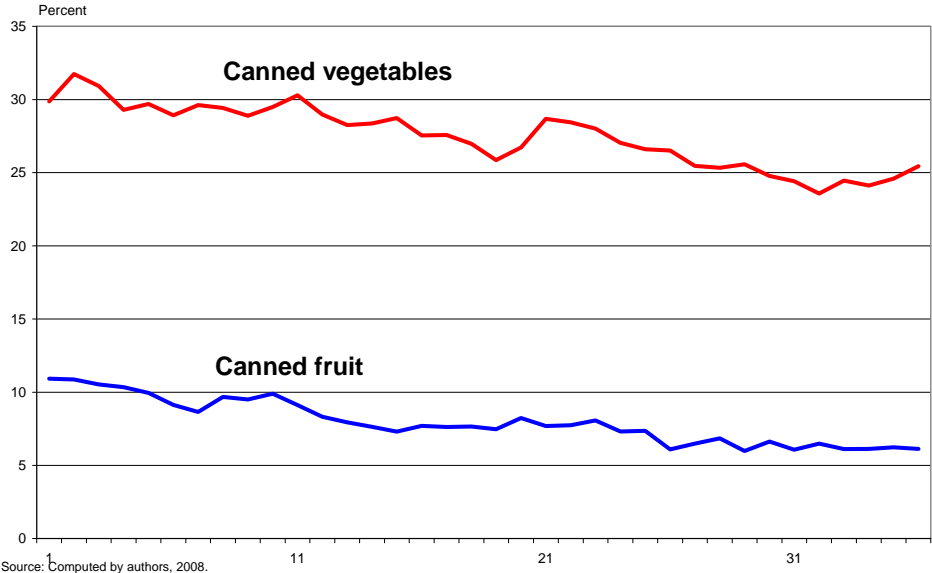
<sup>12</sup> Given current events, such as declining housing prices and rising energy costs, households may not be considered as becoming wealthier in the short term. Our analysis takes the long run approach whereby households have become wealthier in general over time.

ERS studies of canned produce consumption have not used the more recent survey data because a technical database and programming to convert the amount of foods to their equivalent commodity components have not yet been developed. ERS is currently working with USDA's Agricultural Research Service (ARS) to fill this data void in order to continue estimating the type and amount of food commodities Americans eat and where they are eaten.

**Where Will Markets Head in the Future?**

Many economic, social, and demographic changes will occur simultaneously. Some will have offsetting effects on the demand for canned fruits and vegetables, making it difficult to predict the future demand for these products. However, if the trends shown in the food availability data prevail in the future, total per capita consumption of fruits and vegetables would continue to increase and the canned share of fruits and vegetables would continue to decline (fig. 13). Most of this expected increase in total fruits and vegetables will likely be due to increases in non-canned fruits and vegetables.

**Figure 13. Shares of Canned Fruit and Vegetables, 1970-2005**





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## Appendix A: Sources of Data

### A1. The Food Availability Data System

The Food Availability data represent the food supply, or the disappearance of food into the food marketing system. In the Food Availability Data System, food available for domestic consumption is calculated as a residual. That is, for a given year, the total supply is the sum of production, imports, and beginning inventories; from this amount, exports, farm and industrial uses, and ending stocks are subtracted, leaving domestic consumption as a residual. USDA collects these data directly from producers, distributors, and government (e.g., for international trade data) using techniques that vary by commodity. These data are not collected from individual consumers, and thus provide an alternative to using consumer surveys to examine food consumption trends.<sup>13</sup> Per capita estimates are calculated by dividing the total annual availability for a commodity by the U.S. population for that year. The data measure the food supply of over two-hundred food commodities, such as beef, fresh apples, and eggs.

ERS manages and disseminates the Food Availability data within the Food Availability Data System posted on the ERS website. ERS is the only official source of time series data on the food available for human consumption in the country. Accordingly, the data play a key role in monitoring the potential of the food supply to meet the nutritional needs of Americans and to examine historical consumption trends. Although the Food Availability data series does not directly measure actual quantities ingested, it provides an indication of whether Americans, on average, are consuming more or less of various foods over time. In this report, we use this data series to compare the amount and share of fruits and vegetables that are available fresh or in the different forms of processing (e.g., canned, frozen, juice, and dried) and how these estimates have changed between 1970 and 2005.<sup>14</sup>

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<sup>13</sup> Because of the way the data are constructed, the data are available at the national level only and not at the State, county, or regional level. Additionally, the data cannot be broken up by other demographic categories.

<sup>14</sup> Here, canned fruits and vegetables include those fruits and vegetables sold in metal cans, glass containers, or other such packaging that permits the product to be maintained without refrigeration (i.e., shelf-stable). It does not include boxed juice, dried fruits or vegetables (e.g., dried lentils), or potato chips.

In terms of pounds, the total availability of fruit (farm weight) rose 13 percent from 240.7 pounds per capita in 1970 to 272.4 pounds in 2005 (table A1).<sup>15</sup> Of this amount, the total availability of fruit for canning fell from 26.3 pounds per capita in 1970 to 16.7 pounds in 2005 (a 37 percent decrease).

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<sup>15</sup> These estimates are in terms of *farm weight*, which is the weight of a commodity as measured on the farm before further conditioning and processing. The farm weight is essentially the same as the *fresh-weight equivalent*, which is the weight of processed fruits and vegetables converted to an equivalent weight of the fresh produce.

**Table A1. Fruit by Type of Processing (Farm Weight): Per Capita Availability, 1970-2005**

Year	Fresh <sup>1</sup>	Processing					Total fruit <sup>6</sup>
		Canning <sup>2</sup>	Freezing <sup>3</sup>	Dried <sup>4</sup>	Juice <sup>5</sup>	Total processed fruit <sup>6</sup>	
<i>Pounds</i>							
1970	100.8	26.3	3.9	9.8	99.3	139.9	240.7
1971	100.7	26.7	4.0	9.8	103.9	145.0	245.7
1972	94.4	24.2	4.0	7.2	99.6	135.6	229.9
1973	96.7	24.6	4.1	10.1	101.7	141.1	237.8
1974	96.1	24.1	3.3	9.6	108.1	146.0	242.1
1975	101.3	23.6	3.6	10.2	119.4	157.2	258.4
1976	102.0	23.5	3.4	13.4	129.0	169.7	271.6
1977	99.6	24.5	3.3	9.8	115.4	153.6	253.2
1978	103.5	24.1	3.7	8.5	113.1	150.3	253.8
1979	99.7	25.0	3.1	10.0	114.5	153.1	252.8
1980	106.2	24.6	3.3	11.2	123.7	163.5	269.7
1981	103.2	21.0	3.0	9.6	115.4	149.4	252.6
1982	107.8	22.1	3.3	12.0	132.7	170.5	278.3
1983	110.5	20.1	3.3	11.7	117.5	153.0	263.4
1984	112.4	19.7	3.4	12.7	120.7	156.9	269.4
1985	110.5	20.9	3.5	12.8	123.3	160.8	271.3
1986	118.4	21.1	4.1	11.5	121.3	158.3	276.6
1987	121.0	21.0	4.1	12.0	115.8	153.3	274.3
1988	121.2	20.8	4.0	14.9	117.2	157.2	278.5
1989	122.7	21.5	4.6	13.2	98.6	138.2	260.9
1990	116.6	21.0	4.3	12.1	119.0	156.5	273.1
1991	112.6	19.7	4.2	12.2	105.7	142.2	254.7
1992	123.8	22.8	4.6	10.7	119.8	158.5	282.3
1993	122.8	20.5	4.4	12.5	119.4	157.1	280.0
1994	124.9	20.7	4.4	12.7	118.2	156.5	281.4
1995	123.1	17.3	5.2	12.6	125.1	160.6	283.7
1996	126.2	18.5	4.7	11.1	124.5	159.0	285.3
1997	129.8	20.1	4.3	10.6	128.2	163.8	293.6
1998	128.9	17.0	4.5	12.1	121.4	155.4	284.2
1999	130.0	19.2	5.0	10.1	125.0	159.9	289.9
2000	128.4	17.5	4.2	10.4	127.4	159.9	288.3
2001	125.7	17.6	7.1	9.8	110.9	145.7	271.3
2002	126.6	16.7	4.1	10.4	114.9	146.3	272.9
2003	127.9	17.2	5.5	9.9	120.1	153.0	280.9
2004	127.6	16.9	4.9	9.3	112.1	143.6	271.2
2005	125.7	16.7	5.4	10.3	113.8	146.7	272.4

<sup>1</sup>Includes apples, apricots, avocados, bananas, cherries, cantaloupe, cranberries, grapes, grapefruit, honeydew, kiwifruit, lemons, limes, mangoes, nectarines, oranges, papayas, peaches, pears, pineapples, plums, prunes, strawberries, tangelos, tangerines, temples, and watermelon. <sup>2</sup>Includes apples, applesauce, apricots, cherries, olives, peaches, pears, pineapples, plums, and prunes. <sup>3</sup>Includes apples, apricots, blackberries, blueberries, boysenberries, cherries, loganberries, peaches, plums, loganberries, peaches, plums, prunes, raspberries, strawberries, and other miscellaneous fruit and berries. <sup>4</sup>Includes apples, apricots, dates, figs, peaches, pears, prunes, and raisins. <sup>5</sup>Includes apple, cranberry, grape, grapefruit, lemon, lime, orange, pineapple, and prune juice.

<sup>6</sup>Computed from unrounded data.

Source: USDA/ERS Food Availability Data, last updated Feb. 15, 2007.

In terms of pounds, the annual per capita availability of vegetables increased 23 percent from 336.8 pounds per capita in 1970 to 414.6 pounds in 2005 (table A2). A small part of this increase was due to the 5 percent increase in the availability of vegetables for canning (farm weight), which rose from 100.6 pounds per capita in 1970 to 105.5 pounds in 2005. Increases in fresh and frozen vegetables accounted for more than 90 percent of the increase in total vegetables.



**Table A2. Vegetables by Type of Processing (Farm Weight): Per Capita Availability, 1970-2005**

Year	Fresh <sup>1</sup>	Processing						Total processed vegetables <sup>6</sup>
		Canning <sup>2</sup>	Freezing <sup>3</sup>	Dried <sup>4</sup>	Potatoes for chips	Legumes <sup>5</sup>	Total processed vegetables <sup>6</sup>	
<i>Pounds</i>								
1970	154.3	100.6	43.8	13.2	17.4	7.5	182.5	336.8
1971	148.0	107.8	45.4	13.8	17.2	7.5	191.6	339.6
1972	151.3	104.5	45.4	13.3	16.7	6.7	186.7	337.9
1973	148.0	98.2	50.6	14.3	16.3	7.9	187.3	335.3
1974	145.9	99.3	51.3	16.1	15.7	6.2	188.5	334.4
1975	148.8	98.0	52.8	16.7	15.5	7.2	190.1	338.9
1976	148.1	103.4	57.8	17.1	15.8	6.9	201.0	349.1
1977	148.6	101.6	59.4	12.7	16.2	6.8	196.8	345.3
1978	143.4	96.6	58.9	13.4	16.5	5.7	191.1	334.5
1979	148.5	100.6	55.5	13.1	16.7	6.9	192.8	341.2
1980	151.4	102.5	51.5	10.5	16.5	5.9	187.0	338.4
1981	145.1	96.9	58.2	11.7	16.6	5.9	189.4	334.4
1982	150.9	95.1	54.4	12.4	17.0	6.8	185.7	336.6
1983	151.3	96.4	55.8	11.6	17.8	6.9	188.6	339.9
1984	156.6	102.6	62.7	11.8	18.0	5.5	200.6	357.1
1985	158.6	99.2	64.5	12.8	17.6	7.6	201.7	360.2
1986	158.6	99.5	64.4	12.8	18.1	7.3	202.2	360.8
1987	165.2	98.9	67.0	12.3	17.6	5.7	201.5	366.7
1988	170.3	94.6	64.2	12.1	17.1	7.5	195.5	365.9
1989	175.6	101.8	67.4	12.4	17.4	6.3	205.3	380.9
1990	170.2	110.6	66.8	14.6	16.4	7.2	215.5	385.7
1991	170.3	112.6	72.4	15.4	17.3	7.9	225.6	395.9
1992	173.9	110.6	70.5	14.3	17.1	8.4	220.8	394.8
1993	180.7	110.1	75.3	15.7	17.7	7.6	226.4	407.1
1994	186.5	109.8	77.5	14.2	16.5	8.2	226.2	412.7
1995	180.9	108.0	78.8	14.5	16.4	8.4	226.2	407.2
1996	185.9	106.3	83.3	17.5	16.4	8.1	231.6	417.5
1997	190.4	105.4	80.0	16.4	15.5	8.3	225.5	416.0
1998	185.7	105.3	80.3	17.6	14.7	8.1	226.0	411.8
1999	192.3	102.8	80.8	14.7	15.9	8.4	222.6	414.9
2000	198.7	103.2	79.3	17.3	15.9	8.5	224.1	422.8
2001	195.6	97.3	78.6	15.8	17.6	7.7	217.0	412.6
2002	194.7	100.7	76.7	15.8	16.5	7.5	217.1	411.8
2003	199.2	101.5	78.3	17.3	17.3	7.3	221.6	420.8
2004	200.3	103.4	78.2	15.3	16.5	6.7	220.0	420.3
2005	197.1	105.5	75.0	14.1	16.0	6.9	217.4	414.6

<sup>1</sup>Includes artichokes, asparagus, snap beans, broccoli, cabbage, carrots, cauliflower, celery, sweet corn, cucumbers, eggplant, endive, escarole, garlic, head, romaine, and leaf lettuce, mushrooms, onions, bell peppers, potatoes, radishes, spinach, sweet potatoes, and tomatoes. <sup>2</sup>Includes asparagus, lima beans, snap beans, beets, cabbage, carrots, sweet corn, cucumbers, mushrooms, green peas, chile peppers, potatoes, spinach, tomatoes, and other miscellaneous vegetables. <sup>3</sup>Includes asparagus, lima beans, snap beans, broccoli, carrots, cauliflower, sweet corn, green peas, potatoes, spinach and other miscellaneous vegetables. <sup>4</sup>Includes potatoes and onions. <sup>5</sup>At this time dry field peas and lentils are not available and therefore not included in the total legumes. <sup>6</sup>Computed from unrounded data.

Source: USDA/Economic Research Service. Data last updated Feb. 15, 2007.

The Food Availability data overstates the amount of food actually ingested by capturing substantial quantities of food lost to human use through waste and spoilage beyond the farm gate in the marketing system and the home. In order to obtain a closer approximation of what Americans, on average, consume over time on an annual and daily basis, a second data series, the Loss-Adjusted Food Availability Data, adjusts the Food Availability data for:

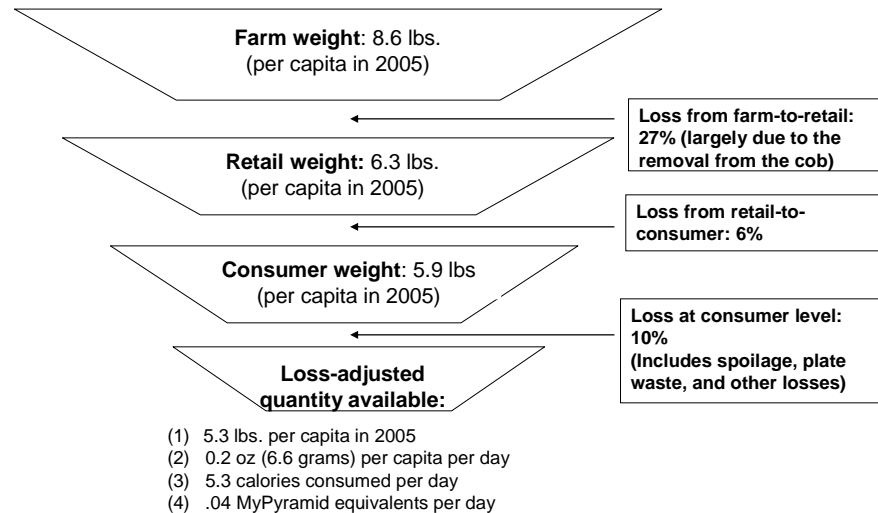
1. Loss from primary (i.e., farm) to retail weight
2. Loss from retail/institutional level to the consumer level (e.g., in supermarkets, megastores like Walmart, and other retail outlets)
3. Loss at the consumer level. This includes losses for food consumed at home and away from home (e.g., restaurants, fastfood outlets etc.) and has two components:
  - (a) “Nonedible share” of a food (e.g., asparagus stalk, apple core). Data on the nonedible share is from the National Nutrient Database for Standard Reference compiled by USDA’s Agricultural Research Service.
  - (b) “Cooking loss and uneaten food such as plate waste” from the edible share.

The goal of accounting for these three general types of losses is that the Loss-Adjusted Food Availability data will more closely approximate actual food intake. In addition to estimates of per capita consumption, the data are presented in two forms:

1. the number of calories available per capita per day, and
2. the number of MyPyramid equivalents available per capita per day which can be used to compare with dietary recommendations for the U.S. population (e.g., Buzby et al., 2007).

Figure A1 illustrates the multistage process that takes the per capita annual estimates for canned sweet corn from the farm to the table.

**Figure A1. Loss-Adjusted Food Availability Data for Canned Sweet Corn, Per Capita, in 2005**



Source: ERS, 2008

Each commodity in the Loss-Adjusted Food Availability data has a spreadsheet posted on the ERS website that provides the loss assumptions currently used by ERS (see <http://www.ers.usda.gov/Data/FoodConsumption/FoodGuideIndex.htm>). Additionally, each fruit and vegetable has a separate spreadsheet for each product form. For example, apples have spreadsheets for fresh, frozen, dehydrated/dried, and canned apples as well as a spreadsheet for apples processed into juice. Vegetables do not have tables for juice but have tables for legumes and potatoes processed into chips. The Loss-Adjusted Food Availability data for canned fruits and vegetables are provided in tables 1 and 2 of this report.

It is important to note that like the core Food Availability data, this data series is based on the food that is available for consumption and does not represent data from consumer surveys.<sup>16</sup> Traditionally, ERS uses the Loss-Adjusted Food Availability Data series to track the dietary status of Americans as compared with Federal dietary recommendations. In this report, however, ERS uses the data to estimate how much of the different kinds of canned fruits and vegetables Americans are consuming over time.

<sup>16</sup> Most consumer surveys of dietary intake cover one or a few years of consumption and most are not nationally representative of the U.S. population. Moreover, time series data on actual consumption by Americans are lacking.

## **A2. Consumer Expenditure Survey**

The Bureau of Labor Statistics conducts the Consumer Expenditure Survey (CEX) and a major objective of the survey is to collect information necessary to construct the Consumer Price Indices. The CEX features two components, each with its own questionnaire and sample:

1. a quarterly interview panel survey in which each of approximately 11,000 households is surveyed every 3 months over a 1-year period
2. a weekly diary survey of approximately 7,800 households that keep an expenditure record for two consecutive 1-week periods. The diary data from 2004 are analyzed in this report.

The diary survey obtains data on small, frequently purchased items that are normally difficult to recall, including food and beverages, tobacco, housekeeping supplies, nonprescription drugs, personal care products and services, fuels, and utilities. The survey excludes expenditures incurred while respondents are away from home for one night or longer. In addition to reporting expenditure, respondents also report data on income, social, and demographic characteristics. Therefore, CEX data are useful to estimate per capita spending on various food and nonfood items by income, social, and demographic characteristics of the U.S. population.

### **A3. The Food Intake Data**

Since 2000, ERS researchers have developed a methodology to analyze food intake survey data to examine the influences of income and demographic factors on the consumption of produce and animal products. Over 20 analyses have been conducted to study the consumption of specific fruits and vegetables (e.g., apples, carrots, and potatoes).<sup>17</sup> These studies were mostly based on food intake data collected by USDA. USDA has conducted periodic surveys of household and individual food consumption in the United States since the 1930s. During 1994-96 and 1998, the Continuing Survey of Food Intakes by Individuals (CSFII, 1994-96 and 1998) was the last food consumption survey conducted by ARS to collect data on the type and the amount of foods eaten by Americans. In addition to food intake data, ARS also developed the Food Commodity Intake Database (FCID), which provides data on the edible amount of agricultural food commodities contained in each food reported eaten in CSFII.

Besides food intake, CSFII also collects demographic information, such as household size, income, race, age, and gender, and information on where a food was purchased, how it was prepared, and where it was eaten. The data are particularly valuable for measuring the effect of social, economic, and demographic characteristics on food consumption.

The 1994-96 and 1998 CSFII was the last food consumption survey conducted exclusively by USDA. The data have become dated. Currently, USDA is working with the Centers for Disease Control and Prevention to collect food consumption data as part of the National Health and Nutrition Examination Survey (NHANES) conducted by U.S. Department of Health and Human Services (CDC is part of DHHS). Work is underway to develop a Food Commodity Economic Database (a modified FCID database) to continue studying food and commodity consumption using survey data being collected since 1999.

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<sup>17</sup> Whether or not canned products were included in these studies depended on the type of produce. The depth of each analysis depended on the type of publication ERS researchers used to disseminate findings. For example, Commodity Spotlight articles in *Agricultural Outlook* (this publication was later replaced by *Amber Waves*) were short and hence only highlighted selected findings. There were also a number of studies published as ERS Outlook Report articles, which provided more detailed description of produce consumption. These ERS publications are listed in the references of this report and are available on the ERS website—under “Who eats what and where” in <http://www.ers.usda.gov/Briefing/DietQuality/who eats.htm>. In addition, some of the research findings were published in journals. Interested readers should contact Biing-Hwan Lin ([blin@ers.usda.gov](mailto:blin@ers.usda.gov)) for more information.