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Development of the Food-at-Home Monthly Area Prices Data

Megan Sweitzer, Anne T. Byrne, Elina T. Page, Andrea Carlson, Linda Kantor, Mary K. Muth, Shawn Karns, and Chen Zhen

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Abstract

The Food-at-Home Monthly Area Prices (F-MAP) data product provides detailed food price data to support a broad range of food economics research, supplementing existing public food price data. The data product contains monthly mean unit values and 6 price index measures for 90 food-at-home categories across 10 major metropolitan areas and 4 census regions. This report introduces the USDA, Economic Research Service (ERS) Food Purchase Groups (EFPGs) food classification system and describes the methods used to construct the F-MAP data product using weighted retail scanner data from 2016 to 2018. The F-MAP data product is modeled after the Quarterly Food-at-Home Price Database (QFAHPD) previously published by USDA, ERS to report 1999–2010 food-at-home prices.

Keywords: Food-at-Home Monthly Area Prices, F-MAP, food prices, price index, average price, Circana, OmniMarket Core Outlets, IRI InfoScan, scanner data, food at home, ERS Food Purchase Groups, EFPG

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Development of the Food-at-Home Monthly Area Prices Data

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What Is the Issue?

Food prices can impact U.S. consumers' food security, food choices, and diet quality, and price changes can vary across the country and across food types. Reliable granular data about the food price landscape are a necessary tool for economic research on household food choices and access to healthy and affordable food. However, the understanding of these relationships is limited by the sparse granular public data available on food prices.

Publicly available food price data often cover limited products or do not provide sufficient detail to support many food economics research inquiries. Some widely used food price datasets contain data only of specific products, such as fruits and vegetables. Other food price datasets contain aggregate data for broad food categories, across broad regions, or across broad periods of time. National- or annual-level aggregate price data can mask the extent to which price variation affects consumer purchasing decisions. Moreover, foods within the same broad food category may have substantial differences in ingredients or level of processing. This can—in turn—lead to significant variation in the price and healthfulness of foods within a category, which are important distinctions for food and nutrition research.

The Food-at-Home Monthly Area Prices (F-MAP) data provide monthly detailed food prices by granular food categories and geographic areas; additionally, it can be used to model the effects of policies that could influence food consumption, diet quality, and health outcomes. F-MAP data include monthly average unit values and price indexes for 90 food-at-home (FAH) categories across 15 geographic areas of the United States for 2016–18. Geographic areas covered include the total United States, the metropolitan areas of Atlanta, Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, Miami, New York, and Philadelphia and the Northeast, Midwest, South, and West census regions. The F-MAP is an updated version of the Quarterly Food-at-Home Price Database (QFAHPD) that USDA, Economic Research Service (ERS) created for 1999–2010. Its regional- and metropolitan area-level detail provides insight into geographic variation in food prices and its monthly frequency offers data on seasonal variation in prices. The detailed food categories in the F-MAP, the ERS Food Purchase Groups (EFPGs), are based in part on USDA's *Dietary Guidelines for Americans*. Researchers studying food policy issues benefit from access to detailed data for monitoring and understanding variability in food prices across food categories, space, and time.

What Did the Study Find?

The F-MAP contains seven weighted price measures for each food category, geographic area, and month combination: an average unit value and six price index measures. The average unit value is a per quantity price, where quantity is measured by weight in grams. The unit value is a simple average price for all items in the food category during each month and may be influenced by changes in prices for identical products or by changes in the product mix within a food category. During the 2016–18 base period:

- Infant formula had the highest national average price of all food groups at $2.85 per 100 grams. Water had the lowest national average price per 100 grams at $0.05, followed by reduced-fat, low-fat, or skim milk at $0.10; and
- Prices varied considerably within broad categories. National average prices for dairy products ranged from $0.10 per 100 grams for reduced-fat, low-fat, or skim milk to $1.10 per 100 grams for cheese (excluding processed cheese). Similarly, national average prices for protein foods ranged from $0.31 per 100 grams for eggs and egg substitutes to $1.66 per 100 grams for fresh fish and seafood.

F-MAP also provides six price index measures: Laspeyres, Paasche, Törnqvist, Fisher Ideal, GEKS (named for Gini, 1931; Eltetö & Köves, 1964; Szulc 1964), and CCD (named for Caves et al., 1982). Price indexes provide a unitless measure for the cost of a basket of consumption goods or services over time periods, across locations, or over pairs of time periods and locations. The price indexes often track each other closely over shorter periods but may show larger differences over longer periods of time. Based on the Fisher Ideal price index from 2016 to 2018:

- Prices increased for about 53 percent of area-EFPG combinations from 2016 to 2017 and increased for 68 percent of area-EFPG combinations from 2017 to 2018; and
- Prices were typically higher in the Northeast and West regions compared with the South and Midwest. Across all EFPGs and months from 2016–18, prices were highest in the Northeast region for 55 percent of EFPG-month combinations, followed by the West with 41 percent. In contrast, prices were lowest in the South region for 54 percent of EFPG-month combinations from 2016–18, followed by the Midwest with 34 percent.

Price indexes are advantageous for tracking inflation because price measures based on unit values cannot distinguish among variation in prices of identical products, differences in the product mix, or quality differences among items. The authors constructed each price index using different methods that have distinct features, advantages, and recommended uses. Data users may select a preferred price index based on their specific needs or analytical purposes. These price measures in the F-MAP data product address a gap in existing food price data and offer an improved data resource to support diverse food price and food economics research.

How Was the Study Conducted?

The report used proprietary Circana (formerly Information Resources, Inc. (IRI)) retail scanner data for 2016–18 to construct the F-MAP price measures. Circana retail scanner data is a commercial dataset that contains dollar sales (revenue) and quantities of food items sold at FAH retail establishments. The authors mapped food products in the data to the EFPGs, a system for classifying foods based on characteristics such as ingredients, nutritional content, and convenience level. The EFPGs are structured as a tiered hierarchy of products and include 90 detailed food categories that can be aggregated into summary categories. Researchers used the retail scanner data to calculate monthly weighted average unit values, price indexes, and total sales volumes for 90 EFPGs across 15 geographic areas of the United States for all months for the 2016–18 period.

Development of the Food-at-Home Monthly Area Prices Data

Introduction

The U.S. Department of Agriculture (USDA), Economic Research Service (ERS) developed the Food-at-Home Monthly Area Prices (F-MAP) data product to provide detailed U.S. food price data to support economic research on the food environment, food choices, and diet quality. Unit prices and price indexes, which form the F-MAP, synthesize data from specific items to calculate prices of product categories. F-MAP provides measures of food prices and price changes over time, by food category and across geographic areas. Food price data are important for economic modeling of consumers' food choice and dietary patterns. An abundance of studies had examined these relationships; readers can refer to Li and Çakir (2023) and Chen and Antonelli (2020) for recent examples. Data on food prices by food category, geographic area, and time period can also be used in modeling the effects of policies that could influence food consumption, diet quality, and health outcomes (Todd et al., 2010). For example, food price data can support food assistance program analyses (Goldin et al., 2022), demand analyses for specific products (Singh et al., 2012), and studies of the industrial organization of food retail (Hermann et al., 2005).

Food prices impact consumer well-being through affordability, food security, and dietary quality. An abundance of research conducted around the world has noted the relationship between food prices on food security (Falcon & Naylor, 2005) and diet quality and health (Carlson & Frazão, 2012; Darmon & Drewnowski, 2015; Bai et al., 2021). Although food expenditures generally comprise a smaller share of overall expenditures in the United States compared with low- and middle-income countries, U.S. households often feel the impacts of food prices on their financial well-being. Affordability refers directly to prices and budget constraints, a feature of food purchasing that affects virtually all households and especially affects households with low incomes that are particularly vulnerable to food insecurity. USDA, ERS includes affordability in its survey questions to assess the food security of households in the Current Population Survey Food Security Supplement (CPS-FSS). The 2021 CPS-FSS found that of those reporting very low food security, 94 percent reported that they "could not afford to eat balanced meals," while 67 percent reported that they "had been hungry but did not eat because they could not afford enough food." These findings affirm how affordability, driven by the convergence of budgets and prices, affects both food security and dietary quality among those with very low food security (Coleman-Jensen et al., 2022).

Households also face tradeoffs between purchasing healthy foods such as produce and the overall affordability of household food baskets. Stewart et al. (2016) described how households can meet dietary recommendations for fruits and vegetables on a limited budget, but lower income households may need to forgo other less-healthy foods to purchase more produce at current prices. The effects of prices on well-being have also informed policy. For example, targeted pricing policies, such as soda taxes and subsidized produce, have been implemented with the goal of improving health and nutrition outcomes. Because consumers respond to changes in food prices, pricing policies such as food taxes have had an impact on overall purchases (Dong & Stewart, 2021).

Food prices affect consumer decisions and purchasing behavior. Demand for various food products can be shown through consumer data from sources, such as the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention's National Health and Nutrition Examination Surveys (NHANES), USDA, ERS's National Household Food Acquisition and Purchase Survey (FoodAPS), or

proprietary consumer panels. Own-price elasticities are used to measure sensitivity to price within individual product groups and cross-price elasticities are used to measure sensitivity to prices of related goods. Okrent and Alston (2012) provided a comprehensive overview of food demand, including own-price elasticities and cross-price elasticities calculated using consumer expenditure diary data, which may provide useful context for food price index analyses. Okrent and Alston (2012) noted that consumers were generally more sensitive to price changes in less-healthy foods and that cross-price elasticities were often statistically significant, which suggests the importance of considering food in the context of household baskets for all items purchased. Additional information on food price elasticities can be found in Andreyeva et al. (2010) and Cornelsen et al. (2015), as well as in the numerous articles reviewed in both of these reports' systematic reviews.

Public access to micro-level food price data remains limited. Detailed, reliable food price data, especially at the retail level, has improved, but these data often have restricted access or access fees. Retail scanner data from Circana (formerly Information Resources Inc. (IRI)) and other private companies provide information on retail food purchases at a granular level for many major retailers. Consumer-reported data such as the Circana Consumer Network household scanner data panel (see Muth et al., 2016) or USDA, ERS's FoodAPS survey provides additional information about household purchases and prices paid for food products.

USDA, ERS previously published the Quarterly Food-at-Home Price Database (QFAHPD) covering 1999–2010 to offer insights into food price dynamics across geographic areas and product groups. USDA, ERS developed the F-MAP data product to replace QFAHPD as an updated public source for detailed food price data. F-MAP classifies foods into 90 USDA, ERS Food Purchase Groups (EFPGs) and reports price measures for each of these groups, which can be aggregated into broad food categories as well. Reporting price measures at the detailed category level allows differentiation among types of foods and their healthfulness.

F-MAP includes monthly unit values (dollars per 100 grams) and a set of 6 price indexes for each EFPG across 15 geographic areas of the United States: the total United States, the metropolitan areas of Atlanta, Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, Miami, New York, and Philadelphia and the Northeast, Midwest, South, and West census regions. In addition, F-MAP provides the number of stores, total dollar sales volumes, and total sales quantities in grams by EFPG for each geographic area. This report describes the new public F-MAP data product and EFPG categorization system.

Existing Retail Food Price Data Sources

Alternative Price Databases

Existing retail food price datasets are available from both governmental and commercial sources, including the U.S. Department of Labor, Bureau of Labor Statistics' (BLS) Consumer Price Index (CPI) and monthly average price data, USDA, ERS's Fruit and Vegetable Prices and Purchase to Plate National Average Prices, and proprietary price and purchase data from Circana, NielsenIQ, and The Council for Community and Economic Research (C2ER). However, currently available datasets often lack adequate detail or comprehensive coverage of food products, do not allow comparisons across geographic areas, or are not available to the public. Each existing source has specific uses and strengths, but F-MAP contributes a valuable new source of detailed food price data to support food economics research.

The monthly CPI produced by BLS is the most widely used measure of price changes of consumer items. BLS publishes a national monthly CPI for total food at home (FAH) and for many FAH categories. Food items are just one component of the BLS price data; BLS collects and compiles prices for multiple sectors across the economy. BLS also publishes monthly or bi-monthly price indexes for six aggregate FAH categories for certain metro areas and geographic regions, but the CPI data offer limited geographic detail for detailed food

categories. BLS uses a two-step geometric mean and Laspeyres price formula to calculate most indexes within the CPI, including food. This formula allows a modest amount of consumer substitution between products in response to price changes within item categories (BLS, 2018).[1]

In addition to price indexes, the BLS CPI program publishes monthly average price data for about 70 food products at the national level and for the 4 census regions. Individual food item prices in the BLS suite are numerous and varied, but not fully comprehensive. The average price data cover specific products, which are valuable for tracking similar products over time but the data do not cover all FAH products purchased by consumers. Additionally, prices are tracked for products of a specified unit of size, such as 1 gallon of whole milk, so the average price data do not capture prices of the various sizes of products purchased by consumers. In contrast, the F-MAP data product aggregates consumer purchases of all individual products into categories (e.g., fresh whole fruit; whole milk, all sizes) to provide comprehensive coverage of FAH products.

USDA, ERS also publishes other sources of food price data. The Fruit and Vegetable Prices (FVP) data provide the average retail price per pound and per serving for over 150 commonly consumed fruits and vegetables. These data are updated periodically and are not appropriate for tracking price changes over time due to differences in the methods and products used to construct the series between years.

The Purchase to Plate National Average Prices (PP-NAP) data contain unit prices for foods reported in NHANES What We Eat in America data, linking prices with dietary intake information. PP-NAP is unique in that it provides prices for foods in the form they are consumed, whereas most food price datasets measure prices of foods in their purchased form. Each PP-NAP price series covers a 2-year period (e.g., 2017/2018) to align with NHANES and the data are updated biennially. Due to changes in both the scanner data used in the PP-NAP and the underlying nutrition data used in NHANES, PP-NAP should not be used to track changes over time. The FVP and PP-NAP data products provide prices at a more granular level of food item detail compared with the 90 aggregate food categories in F-MAP, although F-MAP tracks within-year price changes and prices across geographic areas. Table 1 shows a comparison of dimensions across available Federal food price datasets.

Table 1
Federal retail food price datasets

Data dimension	Food-at-Home Monthly Area Prices (F-MAP)	Consumer Price Index (CPI)	CPI average price data	Purchase to Plate National Average Prices	Fruit and Vegetable Prices	Quarterly Food-at-Home Price Database
Source	ERS	BLS	BLS	ERS	ERS	ERS
Years available	2016–2018	1913–2023	1890–2023	2011/12–2017/18	2013; 2016; 2020	1999–2010
Frequency	Month	Month	Month	Biennial	Annual	Quarter
Updates	Annually	Monthly	Monthly	Biennially	Periodically	Discontinued
Data type	Unit values; price indexes	Price indexes	Unit values	Unit values	Unit values	Unit values
Food-at-home item detail	90 food groups	110 food groups	70 food items	3,200–4,400 food items	150 food items	52–54 food groups
Food-at-home coverage	Comprehensive	Comprehensive	Selection	Comprehensive	Selection	Comprehensive
Food type	Purchases	Purchases	Purchases	Consumption	Purchases; consumption	Purchases

Continues on next page >

[1] BLS uses a Törnqvist formula for its chained CPI series, which allows for substitution across item categories.

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Data dimension	Food-at-Home Monthly Area Prices (F-MAP)	Consumer Price Index (CPI)	CPI average price data	Purchase to Plate National Average Prices	Fruit and Vegetable Prices	Quarterly Food-at-Home Price Database
Geography	National; census region; metro area	National; census region; census division; metro area	National; census region	National	National	National; census region; census division; metro area
Comparisons	Over time; across areas	Over time	Over time	NA	NA	Over time; across areas

ERS = USDA, Economic Research Service. BLS = U.S. Department of Labor, Bureau of Labor Statistics. NA = Not applicable.

Note: Years available denote the data availability as of 2023. Food-at-home item detail is approximate.

Source: Compiled by USDA, Economic Research Service (ERS) using USDA, ERS, Food-at-Home Monthly Area Prices, Purchase to Plate National Average Prices, Fruit and Vegetable Prices, and Quarterly Food-at-Home Price Database data; and U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index.

Food price data are also available from some private organizations and commercial data providers, such as Circana, NielsenIQ, or C2ER, but these organizations often require users to purchase data, the data have very broad scope, or the datasets lack transparency or public documentation of methods.

Quarterly Food-at-Home Price Database

USDA, ERS previously developed the QFAHPD data product to address gaps in available food price data, and QFAHPD served as the foundation for developing F-MAP. The QFAHPD data product used Nielsen household-based scanner data to calculate quarterly mean unit values and standard errors by food group and geographic area. Two versions of QFAHPD are available, covering different geographic areas and food groups. The first version covers 52 food groups for 1999–2006 using Universal Product Code (UPC) and random-weight products. The second version covers 54 food groups for 2004–2010, using only UPC products because random-weight data were no longer available. The QFAHPD data are available for 26 metro market areas and 4 nonmetro census regions for 1999–2001 and for 26 metro market areas and 9 nonmetro census divisions for 2002–2010.[2] Item-level household purchase data from Nielsen were aggregated into quarterly market-level unit values of dollars per 100 grams of food for each food group (Todd et al., 2010). The QFAHPD food groupings correspond, in part, to food groups in the U.S. Department of Health and Human Services and USDA's *Dietary Guidelines for Americans 2005* and other factors relevant for food shopping and preparation, and QFAHPD served as a foundation for developing the current EFPGs.

QFAHPD has been used to study food price variation across geographic areas and by food category, as well as to study the effects of food price variation on nutrition and health, and applications would be similar for F-MAP. For example, several studies relied on QFAHPD to examine geographic variation in food prices. Todd and Leibtag (2011) used QFAHPD to assess geographic differences in the prices of healthy foods, and Gregory and Coleman-Jensen (2013) showed that low-income households participating in USDA's Supplemental Nutritional Assistance Program (SNAP) are more likely to be food insecure in areas where food prices are higher. Other research examined the effects of food prices on food choices and health outcomes, finding that food prices have small but significant effects on children's BMI (Wendt & Todd, 2011), lower cost diets were associated with lower quality diets as measured by Healthy Eating Index 2010 scores (Rehm

[2] The four census regions are Midwest, Northeast, South, and West. The nine census divisions are East North Central, East South Central, Middle Atlantic, Mountain, New England, Pacific, South Atlantic, West North Central, and West South Central. Households in Nielsen-identified markets were assigned to a QFAHPD metro market group and households outside of Nielsen-identified market areas were assigned to a nonmetro market group.

et al., 2015), and blood sugar was higher among people with type 2 diabetes in markets with higher prices for healthy foods (Anekwe & Rahkovsky, 2018). The QFAHPD was also used to evaluate policy changes, where Basu et al. (2013; 2014) estimated the effects of changes to SNAP benefit policies such as banning sugar-sweetened beverages or subsidizing fruit and vegetable purchases.

The F-MAP data product is modeled after the QFAHPD data product but differs in several important ways. F-MAP provides price measures at a higher frequency for 15 geographic areas and provides a broader range of price measures. The geographic areas in F-MAP are defined as the top 10 metropolitan areas, 4 census regions, and the total United States. All stores, including those within the top 10 metropolitan areas, are assigned to their respective census regions with no distinction between metro and nonmetro stores within the region. The price measures in the F-MAP data product include weighted unit prices on a per 100-gram basis (mean and standard error) and a set of six weighted price indexes. F-MAP covers 90 food groups based on the EFPG definitions, which are an updated version of the food groups in QFAHPD, and F-MAP includes data from both UPC and random-weight products.

In addition, F-MAP is constructed using retail scanner data, whereas QFAHPD used household panel scanner data. When the QFAHPD data product was developed, retail scanner data did not include discount supercenters or warehouse club stores—such as Walmart and Costco (estimated at approximately 30 percent of consumer food-at-home expenditures)—and had limited random-weight foods (Todd et al., 2010). Household scanner data also included survey weights to make the data representative of the U.S. population. Survey weights were not available for the retail scanner data at that time, so household scanner data were believed to have better coverage and to better represent the marketplace. Retail scanner data, in comparison, contain substantially more price observations and more closely cover the full basket of products that consumers purchased, rather than a subset of products purchased by consumers who participated in the household panel. This advantage, coupled with subsequent improvements in retailer coverage and the development of retail store weights, motivated the shift to retail scanner data for F-MAP.

Data Description

Circana OmniMarket Core Outlets Data

The F-MAP is constructed using Circana (formerly Information Resources, Inc. (IRI)) OmniMarket Core Outlets (formerly InfoScan) retail scanner data from 2016 to 2018. The data are proprietary commercial scanner data on food sales at retail establishments that USDA, ERS purchases to support food economics research. The datasets are a nonprobability sample (i.e., not a random sample) of retail FAH sales data for approximately 55,000–65,000 stores per year across several retailer types including grocery, mass merchandisers and supercenters, club, convenience, dollar, and drug stores. The data contain weekly UPC-level (or item-level) revenue and quantity of food items sold at FAH retail establishments. About 35,000 of those stores—primarily grocery, mass merchandisers, and club stores—also report perishable product sales. Perishable products consist of fresh food items such as fruits and vegetables; fresh meat, poultry, and seafood; fresh cheese and deli meats; and fresh bakery items. The perishable data include uniform weight fresh food items, which are typically packaged products labeled with UPCs (e.g., 3-pound bag of apples), and random weight fresh food items, which are products without a UPC that are typically sold by the pound or the count (e.g., loose apples or deli meat sliced in store). Retail outlets without scanning capabilities (e.g., small retailers, farmer's markets, and other direct-to-consumer sales) are not represented in the data.[3]

[3] Direct-to-consumer food sales were about $2.9 billion in 2020 (USDA, National Agricultural Statistics Service (NASS), 2022), compared with approximately $717 billion in sales from food stores (food and nonfood products) in 2019 (USDA, Economic Research Service (ERS), 2022).

Circana also maintains a dictionary of product information for over 1 million food products. This product dictionary contains detailed information for UPC-labeled items including shelf-stable, frozen, or refrigerated packaged food products. Circana collects and codes key product information for their datasets, including a product description, manufacturer and brand, category, type, and size. Some products also include information from the Nutrition Facts label and front-of-package nutrition claims. The dataset includes a separate dictionary for perishable products, which contains about 45,000 products. Perishable products have more limited product information available, but the perishables product dictionary includes information about the category, product, variety, form, and size (for more information about the Circana (formerly IRI) datasets and their use in food economics research, see Muth et al., 2016).

To prepare the datasets for creating the F-MAP data product, the authors performed several data transformation and quality review steps. The data are reported on a weekly basis, so we grouped weekly sales into the respective months they occurred. In cases where the week straddles 2 months, we allocated the sales units and values proportionately based on the number of days in each month. We also eliminated unit value outliers using the interquartile range (IQR) method. The IQR is the difference between the 25th and 75th percentiles of the price distribution, in this case across all unit values by store and week for the UPC or random weight code. A unit value is considered an outlier if it is below the 25th percentile minus 1.5 multiplied by the IQR or above the 75th percentile plus 1.5 multiplied by the IQR. If unit values are normally distributed, the IQR method should be very close to the four-standard deviation rule used in QFAHPD (Todd et al., 2010). We used barcode-specific percentiles across all stores and weeks to detect outlying unit values.[4]

We converted the weights of each package into grams to facilitate calculating unit values on a per 100-gram basis. Following the procedures used in developing QFAHPD, we converted weights as follows:[5]

- Convert from ounces: gram weight = 28.35 * ounces per package
- Convert from pounds: gram weight = 28.35 * pounds per package * 16
- Convert from fluid ounces: gram weight = 29.57 * fluid ounces per package[6]

Note the unit value prices are "as purchased," meaning that the item weights include the inedible parts of purchased food such as seeds, skins, bones, and liquid drained from canned goods.

The authors also verified that a sufficient number of observations existed for each combination of EFPG, region, and month for the estimates to be assumed valid. In the construction of the earlier QFAHPD, a minimum of 30 households were required for each combination of food product code, region, and calendar-year quarter for an estimate to be reported. For F-MAP, the lowest number of stores per EFPG, region, and month was 114, much higher than the minimum number of price observations required in QFAHPD. Therefore, we retained estimates for all possible combinations.

Stores in the retail scanner data are not a representative sample of stores, and the datasets do not include survey weights to weight stores to be representative of the retailer population (Levin et al., 2018). Unweighted

[4] Overall, we eliminated 8 percent of records using the IQR method.

[5] In addition to the conversions listed, QFAHPD converted count data for fresh produce to weights using USDA's Food and Nutrient Database for Dietary Studies (FNDDS) data from USDA, FoodData Central. In the scanner data used for the F-MAP data product, most produce were reported in pounds so we converted counts for eggs (i.e., 1 egg = 2 ounces or 56 grams) and corn on the cob (i.e., 1 cob = 4.4 ounces or 125 grams).

[6] The 29.57-gram conversion factor for fluid ounces is based on the density of water. We used a consistent density estimate for all products labeled in fluid ounces. We recognize that the gram weight of a fluid ounce is not the same as water for products like oil and yogurt. This is not a problem for purposes of creating price indexes because products will always be compared with themselves. That is, oil will always be compared with oil. For other applications, readers may need a more precise price and should consult the PP-NAP.

estimates underrepresent total sales, so we used store-level weights developed by USDA, ERS through a contract with Research Triangle Institute (RTI International) for the retail scanner data to calculate weighted estimates (Muth et al., 2021). We applied the store-level weights and calculated weighted estimates by year for each store in the retail scanner data. For stores that are part of retailer marketing areas (RMAs),[7] sales data are aggregated for stores in each RMA. To disaggregate the sales data to individual stores, we applied the proportions of sales calculated from the per store sales values in the store-level weight files.

USDA, ERS Food Purchase Groups (EFPGs)

EFPGs are a categorization system developed by USDA, ERS to facilitate analyses of food purchase data. The groups are designed to support research on the economic determinants of food consumption, diet quality, and health outcomes. EFPGs categorize foods by ingredients, nutritional content, convenience to the consumer, and store aisle. EFPGs were created to correspond with the food groups used in both of USDA's 2015–20 and 2020–25 *Dietary Guidelines for Americans* and to capture price premiums for convenience and processing. The categories are hierarchical and flexible so that researchers can aggregate, disaggregate, and move categories around to meet individual research needs.[8] (See appendix A for the list of 90 EFPGs and their definitions and appendix B for shares of national sales by each EFPG.)

Earlier food categorization systems were developed for reporting average prices in QFAHPD (Todd et al., 2010) and for analyzing and reporting estimates from FoodAPS (Mancino et al., 2018). EFPGs further refine the FoodAPS groups for use with panel and retail scanner data, which have a broader variety of foods than reported in FoodAPS (see appendix C for a mapping between EFPGs and FoodAPS groups). EFPGs are delineated into tiers, with tier 1 representing the major food groupings used in the Dietary Guidelines for Americans healthy dietary patterns—including grains, dairy, meat and protein foods, and fruits and vegetables—and two other categories: other foods and prepared meals, sides, and salads. Tier 2 represents subcategories under the major food groups, and tier 3 represents each individual EFPG code. The tier 1 "other foods" category contains foods that do not fit into another food group (e.g., fats and oils, sweets, and beverages such as coffee, tea, and soda), are not fully prepared foods, and/or would fit into one of the food groups but contain other ingredients such as added sugars that reflect additional processing and affect the product's healthfulness.

Mappings between detailed scanner data product codes and the EFPGs provide a consistent framework for researchers to easily group products for use in policy-relevant analyses. The authors mapped UPC-labeled and random-weight products in the retail scanner data to EFPGs for each individual year from 2016 through 2018. Not all products in the scanner data product dictionary are sold each year as new products are introduced or existing products reformulated or discontinued, so we first identified products with positive sales in each year of the data. We then assigned those products to EFPGs based on information from the product dictionary, including the product description, type, style, and other product attribute fields.

Table 2 shows the total number of product codes, UPCs, and perishable codes with sales in the retail scanner data and the numbers that were successfully matched to an EFPG for the 2016–18 period. Each year of data contained approximately 600,000 product codes, and less than 0.1 percent of products did not have sufficient product information to map to an EFPG.[9] This comprehensive coverage of individual food products distin-

[7] In the retail scanner data, most retailers release data by individual store location. However, some retailers only release data by retailer marketing area, an aggregation of stores in a retailer-defined geographical area.

[8] For example, Volpe and Okrent (2012) categorized consumer food purchases into groups similar to EFPGs and compared the food budget shares with those in the budget allocation recommended by the USDA Food Plans.

[9] Unmapped product codes were assigned the EFPG code 99999 for "not coded."

guishes the F-MAP from other food price indexes because it more closely matches the full basket of products that consumers purchase, rather than a subset of products such as that used in the BLS CPI series.

Table 2
Summary table of code assignments for UPC-labeled and perishable products, 2016–18

	Products with sales	Products matched to an EFPG	Percent of products matched to an EFPG
	Number	Number	Percent
2016			
Total product codes	588,952	588,220	99.9
Universal Product Codes (UPCs)	554,375	553,815	99.9
Perishable product codes	34,577	34,405	99.5
2017			
Total product codes	588,128	587,750	99.9
Universal Product Codes (UPCs)	552,204	552,050	100.0
Perishable product codes	35,924	35,700	99.4
2018			
Total product codes	583,666	583,390	100.0
Universal Product Codes (UPCs)	546,552	546,477	100.0
Perishable product codes	37,114	36,913	99.5

UPC = Universal Product Code. EFPG = USDA, Economic Research Service, Food Purchase Groups

Note: In the Circana OmniMarket Core Outlets data, perishable products include random-weight and uniform-weight products.

Source: USDA, Economic Research Service using Circana OmniMarket Core Outlets 2016–18 data.

The number of product codes with sales is relatively constant from year-to-year, but some products exit while others enter the market between years, which accounts for 15 percent of UPCs, on average. Product categories with perishable codes include fresh and fresh-cut fruits and vegetables, fresh bread and baked goods, fresh cheese, fresh meat, fresh poultry, fresh seafood, and some ready-to-eat and ready-to-heat prepared foods. By far, the categories with the largest numbers of product codes are alcoholic beverages, baked goods, and candy (for the number of products in the retail scanner data assigned to each EFPG in 2018, see the table in appendix A).

Geographic Markets

The unit values and price indexes in the F-MAP data product were calculated for 10 metropolitan areas, 4 census regions, and nationally. The top 10 metropolitan areas were determined by the number of retail food and beverage stores in the Nielsen TDLinx database (as calculated in 2012). TDLinx is a national database of retail establishments and included about 270,000 FAH establishments in 2012 (Cho et al., 2019). The top 10 metropolitan areas were selected based on the number of stores in TDLinx for consistency with the weights (projection factors) that were developed for the Circana OmniMarket Core Outlets (formerly IRI InfoScan) data (Muth et al., 2021) and that are used in the F-MAP price calculations.[10] All stores were also grouped into their respective census region, including stores within the top 10 metropolitan areas, and unit values and price indexes are available for each of the 4 census regions. National estimates were derived using a weighted average of the census region data.

[10] The top 10 metropolitan areas by number of stores are generally similar to the top 10 metropolitan areas by population, except that the Washington, DC, metropolitan area is excluded and the Detroit area is included.

The 15 geographic areas in the F-MAP include total U.S., 4 census regions, and 10 metropolitan areas:

- National: total United States
- Northeast region: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont;
- Midwest region: Indiana, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin;
- South region: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia;
- West region: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming; and
- Top 10 metropolitan areas: Atlanta, Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, Miami, New York, Philadelphia.

Price Calculations

Overview

The F-MAP data product provides a set of mean unit values (dollars per 100 grams) and 6 price indexes for the 90 EFPGs in 15 geographic areas. The price measures in F-MAP include the following:

- Unit values on a per 100-gram basis (mean and standard error);
- Bilateral price indexes: Laspeyres (1871), Paasche (1874), Törnqvist (1936), and Fisher Ideal (Fisher, 1922); and
- Multilateral price indexes: GEKS (Gini, 1931; Eltetö & Köves, 1964; Szulc, 1964) and CCD (Caves et al., 1982).

The simplest measure of the price of a food group is the per quantity value (or unit value), which is calculated by dividing the food group sales by the food group quantity. In comparison, a price index is a unitless measure for the cost of a basket of consumption goods or services used to capture composite price changes over time. Bilateral price indexes have a fixed base period, while multilateral price indexes can be updated using a rolling window with a moving base as data for future years become available.

F-MAP contains the unit values (i.e., mean prices) and price indexes by year, month, geographic area, and EFPG. The base for the price indexes is the 2016–18 national average for each EFPG and thus allows for comparisons of values across time and geography. The total dollar amount of purchases, total purchase quantities converted to grams, and the number of stores represented in the data are also shown to provide an understanding of the size of the market for each EFPG. Unit values are provided as both weighted and unweighted estimates, whereas the price indexes were calculated using weighted data. Weights allow projections from the retail stores included in the retail scanner data to the population of stores in the United States, thus providing price measures that are more representative of the national food price environment.

Unit Value Calculations

A common measure of a food group's price is the per quantity value for which quantity can be measured by weight (e.g., grams) or volume (e.g., fluid ounce). This measure, which is also known as unit value in the consumer demand literature, is calculated by dividing the group-level expenditure by group-level quantity. To calculate unit values, we first calculated the total purchase values in dollars and in grams for each EFPG *j* in month *m* in geographic area *g* as follows:

$$purchase\_dollars\_wtd_{j,m,g} = \sum_{i \in j} \sum_{t \in m} \sum_{k \in g} W_k \cdot dollarspaid_{i,t,k}$$

$$purchase\_grams\_wtd_{j,m,g} = \sum_{i \in j} \sum_{t \in m} \sum_{k \in g} W_k \cdot units_{i,t,k} \cdot pkgweight_i$$

Where W_k represents the store weight for store *k* in each year of the data.[11] Furthermore, $dollarspaid_{i,t,k}$ represents the total revenue received (net of discounts and coupons) for all products *i* (i.e., UPCs and random weight codes) in EFPG *j* for all transactions *t* in month *m* from all stores *k* in area *g*; $units_{i,t,k}$ represents the number of units purchased. Lastly, $pkgweight_i$ represents the weight of the package for product *i* (converted to grams). The unweighted values, $purchase\_dollars\_wtd_{j,m,g}$ and $purchase\_dollars\_unwtd_{j,m,g}$ are calculated by setting $W_k = 1$.

The weighted unit value on a per 100-gram basis for EFPG *j* in month *m* for region *g* is calculated as:[12]

$$unit\_value\_wtd_{j,m,g} = \frac{purchase\_dollars\_wtd_{j,m,g}}{purchase\_grams\_wtd_{j,m,g}/100}$$

Likewise, the unweighted unit value on a per 100-gram basis is calculated as:

$$unit\_value\_unwtd_{j,m,g} = \frac{purchase\_dollars\_unwtd_{j,m,g}}{purchase\_grams\_unwtd_{j,m,g}/100}$$

To calculate the standard errors for the weighted unit values, we recalculated the weighted unit values 200 times using the replicate store weights and then used the following general formula:

$$se(X) = \sqrt{\left(\frac{1}{200}\right) \cdot \sum_{r=1}^{200} (X_r - X)^2}$$

Where $X = unit\_value\_wtd_{j,m,g}$ and X_r represents its value using each of the replicate weights (Lewis, 2017).[13]

[11] Store weights were developed by RTI International for the Circana OmniMarket Core Outlets (formerly IRI InfoScan) data and are available for use by approved users of the data (Muth et al., 2021).

[12] In the case of the QFAHPD, which used household data, the mean prices were calculated averaging over households rather than stores.

[13] A typical check on the standard error calculations is to compute relative standard errors (RSEs) by dividing the standard errors by the estimates and checking that not too many are greater than 50 percent. When we applied this check to the 2016–18 data, only 11 of the 45,360 estimates were greater than 50 percent.

Price Index Calculations

A price index is a unitless measure for the cost of a basket of consumption goods or services over time periods, across locations, or over pairs of time periods and locations. Because a basket usually consists of many items, a price index number converts a vector of item-level price comparisons into a single value that quantifies the overall price of the basket at a time and location relative to the base. In addition, the construction of price indexes does not require that all items use a single unit of measurement. This is a clear advantage in many situations. For food products, not all items have the volume-equivalent information for expressing amounts in a single unit of measurement. For example, some are measured in counts, whereas others are measured by weight or volume, and ready-to-drink beverage amounts are normally shown in fluid measures and the net quantity of a drink powder is usually shown as a weight. Denominating prices of food categories as indexes avoids the need to standardize quantity measures across a diverse line of products within the group. This property of price indexes allows statistical agencies to summarize costs of living for all facets of life into a single consumer price index.

Price indexes are often preferred to using unit values in economic analyses for several reasons. First, the mix of products within a food group is likely different across stores and over time. A higher unit value may reflect higher market prices or a greater proportion of premium-quality products in the mix. For example, a high amenity grocery store in a suburb of Dallas likely offers a different set of whole wheat bread options than a discount superstore in rural Ohio, and those differences in options are likely correlated with differences in price. Price indexes can address these types of temporal measurement concerns, including the arrival of new goods, quality adjustments, and substitutions across products and outlets (Hausman, 2003).

Second, a unit value may not be the best price statistic for tracking inflation because it is not clear how much any differences in unit values are due to differences in prices of identical products versus differences in product mix. For example, the arrival of a new brand of whole wheat bread, an improvement to an existing brand of whole wheat bread, or the arrival of a new food retailer that offers whole wheat bread at a lower price are all factors that need to be considered in tracking the price of whole wheat bread across time. Each may be of interest to policymakers and researchers, but it is important to separate them (Deaton, 1988). Another consideration with unit value-based price comparisons is their inability to quantify the effect of variety on the overall cost of living (Feenstra, 1994). However, as explained in Muth et al. (2020), variety bias accounts for a very small portion of total bias and adjusting for variety bias is computationally burdensome.

The price indexes used for the F-MAP data product adjust for heterogeneity bias, which occurs when comparing the cost of living across stores and weeks based on prices of different goods. Handbury and Weinstein (2015) found that heterogeneity in the product mix contributed 97 percent of the variance in food product prices across areas in conventional indexes. Unit values are also subject to this bias because they are based on dollar and quantity sales of food groups that are aggregates of individual food items. Insofar as there are quality differences among items, unit values reflect both quality-related cost differences and market price variations. Correcting for heterogeneity bias requires comparing prices of identical goods, which can be readily accomplished with retail scanner data for packaged foods with barcodes. For fresh produce and meats, because quality is unobservable (to the researcher), eliminating heterogeneity bias in the price measures for these food groups can be difficult. However, researchers can reduce this bias by comparing costs at the finest level of product disaggregation (e.g., at the variety level) that is possible with the retail scanner data.

The authors calculated two classes of price indexes: four bilateral price indexes (Laspeyres, Paasche, Törnqvist, and Fisher Ideal) and two multilateral price indexes (GEKS and CCD). Bilateral price indexes have a fixed base period, whereas multilateral price indexes can be updated using a rolling window with a moving base instead of a fixed base period as data for future years become available. Although bilateral price

indexes can be updated using chained indexes, studies (Ivancic et al., 2011; de Haan & van der Grient, 2011) have shown chained indexes are subject to drifting, a phenomenon in which the price index drifts lower even as barcode-level prices return to their base levels. Rolling-window GEKS and CCD indexes are free of drift and can be extended for future years without revising the index numbers that have already been published. We set the national average in 2016 through 2018 as the base for all price indexes.

Table 3 provides guidance to users on selecting a price index based on individual analytical needs. For example, statistical research might prefer the Laspeyres price index since it holds the product mix constant to track price changes of identical products, although economic research might prefer the Paasche index because it accounts for how consumers adapt to changes in prices. When considering price trends over longer periods of time, rolling-window GEKS and CCD indexes better represent the market cost of food since they allow a moving base. The bilateral indexes compare the cost of goods against a fixed basket of goods in the 2016–18 base period and become less representative of the cost of food as they move further away from the base, owing to the entry of new food products and discontinuation of older products.

Table 3
Guidance for selecting price indexes for use in analyses

Price index	Features	Recommended uses
Laspeyres	Fixed weight; tracks price variation holding product mix constant; forms the upper bound of the true cost of living	Tracking the cost of a fixed basket of goods (e.g., Consumer Price Index tracking)
Paasche	Variable weight; tracks price variation allowing product mix to fully adjust to relative price changes; forms the lower bound of the true cost of living	Tracking user-cost accounting for the impact of changes in product mix without holding the standard of living constant; for example, measures how product substitution mitigates the effect of an excise tax on users' costs
Fisher Ideal	Geometric mean of Laspeyres and Paasche; superlative by being exact for the quadratic mean of order two-unit cost function, which is a second-order approximation to an arbitrarily twice differentiable linear homogenous cost function (Diewert, 1976)	Tracking cost of living while holding the standard of living constant (e.g., as prices in demand estimation)
Törnqvist	Tracks the Fisher Ideal index closely (Zhen et al., 2019; figure 1); superlative by being exact for the translog total or unit cost function, which is a second-order approximation to an arbitrarily twice differentiable linear homogenous cost function (Diewert, 1976)	Tracking cost of living while holding the standard of living constant (e.g., as prices in demand estimation)
GEKS	A multilateral index based on the bilateral Fisher Ideal index as its elements; transitive in that a comparison of food cost between any two entities (i.e., region–month pairing) is invariant to whether they are compared directly or through a third entity; and ready for extension to the rolling-window GEKS in the future as more years are added to the series without the need to revise historical index numbers	Tracking cost of living across geographical regions at the same or different points of time and using the price index as the price variable in demand estimation
CCD	A multilateral index based on the bilateral Törnqvist index as its elements; retains the same desirable transitivity and readiness for rolling-window extension properties as the GEKS index	Tracking cost of living across geographical regions at the same or different points of time and using the price index as the price variable in demand estimation

GEKS = Gini (1931), Eltetö & Köves (1964), and Szulc (1964). CCD = Caves, Christensen, & Diewert, (1982).

Source: Compiled by USDA, Economic Research Service using Laspeyres, E. (1871). Die Berechnung einer mittleren Waarenpreissteigerung. *Jahrbücher für Nationalökonomie und Statistik, 6*, 296–314; Paasche, H. (1874). Über die Preisentwicklung der letzten Jahre nach den Hamburger Börsennotirungen. *Jahrbücher für Nationalökonomie und Statistik, 12*, 168–178; Törnqvist, L. (1936). The bank of Finland's consumption price index. *Bank of Finland Monthly Bulletin, 10*, 1–8; Fisher, I. (1922). *The making of index numbers*. Houghton Mifflin Co.; Gini, C. (1931). On the circular test of index numbers. *Metron, 9*, 3–24; Eltetö, Ö., & Köves, P. (1964). On a problem of index number computation relating to international comparisons. *Statisztikai Szemle, 42,* 507–518; Szulc, B. (1964). Indexes for multiregional comparisons. *Przeglad Statystyczny,* 239–254; Caves, D. W., Christensen, L. R., & Diewert, W. E. (1982). Multilateral comparisons of output, input, and productivity using superlative index numbers. *Economic Journal, 92*, 73–86; Diewert, W. E. (1976). Exact and superlative index numbers. *Journal of Econometrics, 4*, 115–145; and Zhen, C., Finkelstein, E. A., Karns, S. A., Leibtag, E., & Zhang, C. (2019). Scanner data-based panel price indexes. *American Journal of Agricultural Economics, 101*(1), 311–329.

Bilateral Price Indexes

To simplify notation, we defined each unique region–month pairing as an entity. For example, the same region in 2 different months was treated as two distinct entities in our index formulas. We defined base 0 as the national average in the sample period. The national average over all months is the most natural choice for the base because it includes all barcodes in the dataset. If we chose a specific region–month pair as the base, we would necessarily miss some barcodes because they were unavailable at the base. The F-MAP includes four bilateral indexes: Laspeyres, Paasche, Törnqvist, and Fisher Ideal.

The Laspeyres index that compares prices in entity *j* and base 0 is written as:

$$P_L^{0j} = \frac{\sum_{v \in v_{0j}} p_v^j q_v^0}{\sum_{v \in v_{0j}} p_v^0 q_v^0}$$

Where p_v^j is the price of barcode *v* in entity *j*; p_v^0 and q_v^0 are the base price and quantity of barcode *v*, respectively; and v_{0j} denotes the common set of barcodes available in both base 0 and entity *j*. Because the Laspeyres index uses base quantities q_v^0 as weights, it does not account for the change in the mix of barcodes that would occur as relative prices change. Therefore, P_L^{0j} is a useful statistic for tracking price changes independent of consumer response.

The Paasche price index recognizes that the purchase bundle will respond to relative price changes as consumers continue to maximize utility given the budget constraint. The Paasche index is written as:

$$P_P^{0j} = \frac{\sum_{v \in v_{0j}} p_v^j q_v^j}{\sum_{v \in v_{0j}} p_v^0 q_v^j}$$

Where q_v^j is the quantity of product *v* in entity *j*. Because the weights q_v^j are concurrent with the prices p_v^j that are compared with the base prices, the Paasche index fully reflects the change in food cost due to the consumer's utility maximization.

The Törnqvist index is written as:

$$P_T^{0j} = \exp\left\{0.5 \sum_{v \in v_{0j}} \left(s_v^0 + s_v^j\right) \ln\left(p_v^j / p_v^0\right)\right\}$$

Where s_v^0 and s_v^j are expenditure shares of barcode *v* in base 0 and entity *j*, respectively.

The Fisher Ideal index is the geometric mean of the Laspeyres and Paasche indexes:

$$P_F^{0j} = \sqrt{P_L^{0j} \times P_P^{0j}}$$

Multilateral Price Indexes

The four price indexes in the previous section are bilateral indexes in that they make bilateral price comparisons between entity *j* and the base. There is a class of multilateral price indexes specifically designed for spatial and panel price comparisons. The main advantage of multilateral indexes is that they are transitive (Hill, 2004). That is, the index ratio between entity *j* and entity *i* remains unchanged whether they are compared directly or through a third entity *k*. The bilateral indexes are not transitive. This means the index ratio between any two entities can be sensitive to the choice of base. There are two popular multilateral indexes: GEKS and CCD. The GEKS index is constructed as:

$$P_{GEKS}^{0j} = \prod_{l=0}^{M} \left(P_F^{0l} \times P_F^{lj} \right)^{1/(M+1)}$$

Where P_F^{lj} is the Fisher Ideal price index comparing entity *j* with entity *l*, and *M* is the total number of entities excluding the base. Because GEKS is transitive, the choice of base is not important. It only converts the (less useful) matrix of bilateral indexes between all possible pairs of entities *l* and *j* into a (more useful) vector of index values, one for each entity relative to the base (Deaton & Dupriez, 2011). The CCD index is similar to the GEKS index except that the CCD index uses the bilateral Törnqvist index as elements.

When we extend the multilateral price indexes to include years beyond the 2016–18 base period, we use rolling-window GEKS and CCD indexes. For details about constructing rolling-window GEKS and CCD price indexes, see appendix D.

Combining EFPGs Into Broader Food Groups

For researchers interested in the impact of retail food prices on nutrition and health, the EFPG-level price indexes can be aggregated into an overall food-at-home Stone price index (Stone, 1954), as follows:

$$\ln P_{FAH} = \sum_i w_i \ln P_i$$

Where P_{FAH} is the Stone price index for food at home, and w_i and P_i are the dollar sales share and price index or unit value of EFPG i, respectively. Alternatively, the researcher can create an index or unit values for a targeted bundle of foods by aggregating across multiple EFPGs proportionally to total sales volume. The dollar sales share can be used as weights to aggregate the tier-3 EFPGs into tier-1 or tier-2 EFPG groupings proportionally or into customizable food groupings data user chooses, such as combining whole and reduced-fat milk into a single milk grouping.

Discussion of F-MAP Data Dimensions

The Food-at-Home Monthly Area Prices (F-MAP) include monthly mean unit values and six price indexes by USDA, Economic Research Service Food Purchase Groups (EFPG) for all months in the 2016–18 period for each geographic area. The F-MAP dataset contains over 100,000 price observations per year across the 7 price measures. Using F-MAP, analysts can make comparisons across price measures, EFPGs, and geographic

areas, and track price changes for each of these dimensions over time. This section illustrates the dimensions of the price measures included in the F-MAP data product using a series of examples drawn from a variety of EFPGs that represent both packaged and fresh foods, as well as representing geographic areas around the country. It also discusses considerations for using the data.

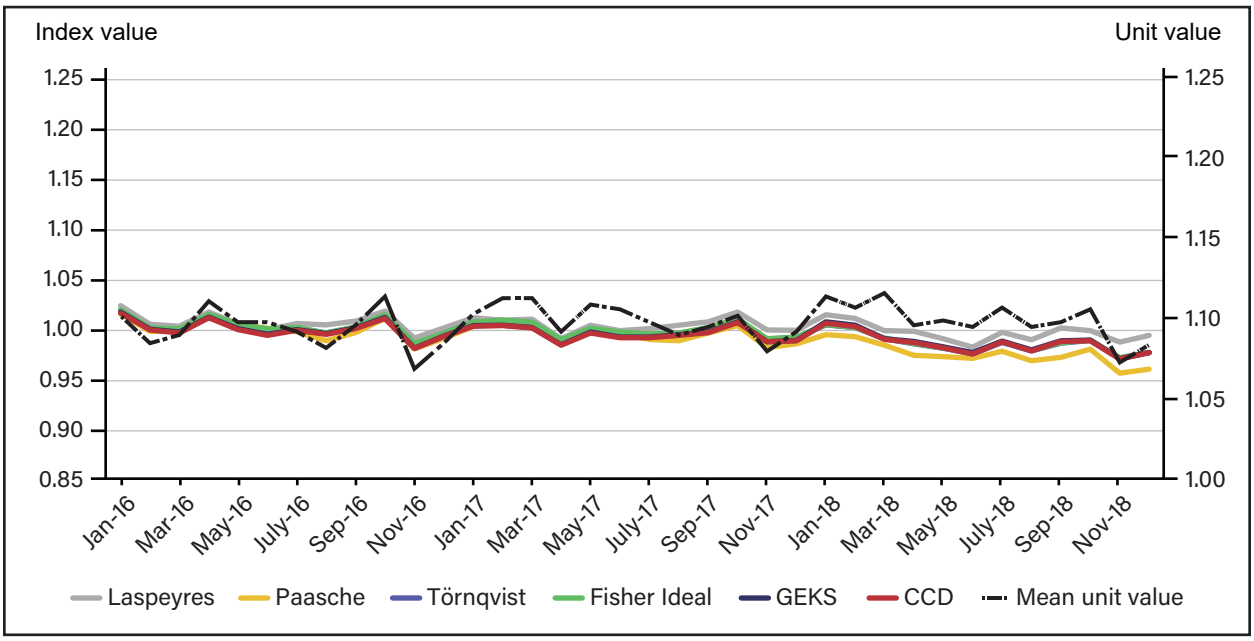
Across Price Measures

The F-MAP data product includes both a mean unit value and six price index measures for tracking food prices. Typically, the unit values and price indexes move in the same direction over time. The price indexes often track each other closely over the period shown but the price indexes may show larger differences over longer time periods. The Laspeyres price index typically represents an upper bound of price changes since it tracks a fixed basket of goods but does not measure how consumers substitute to lower cost alternatives as prices rise. The Paasche price index typically represents a lower bound of price changes since it allows the product mix to vary as consumers substitute lower cost products, but it does not account for changes in product quality.

The following figures show the unit values and price indexes for cheese (figure 1) and frozen poultry (figure 2) for the Dallas metropolitan area from 2016 to 2018. In the figures below, the price indexes and weighted unit values are shown on the same figure to allow trend comparisons over time, but the two types of price measures use different scales and correspond to different axes. The price indexes for cheese align closely, with the Laspeyres and Paasche indexes forming the upper and lower bounds, respectively, as the series slightly diverges over time. Frozen poultry offers a more dramatic example demonstrating the differences among the price indexes because this category is at least partially influenced by the seasonality and price variability of frozen turkey over the year (Dong, 2023). The Paasche index for frozen poultry, with full substitutability, is relatively stable across the year. Consumers buy large quantities of frozen turkeys around the holidays in November and December, and retailers often offer special low pricing in those months. The Laspeyres index, with a fixed basket of goods, includes a fixed share of turkey throughout the year even in seasons when prices are higher and fewer consumers purchase turkey.

Figure 1

Monthly weighted mean unit values and price indexes for cheese, Dallas metropolitan area, 2016–18



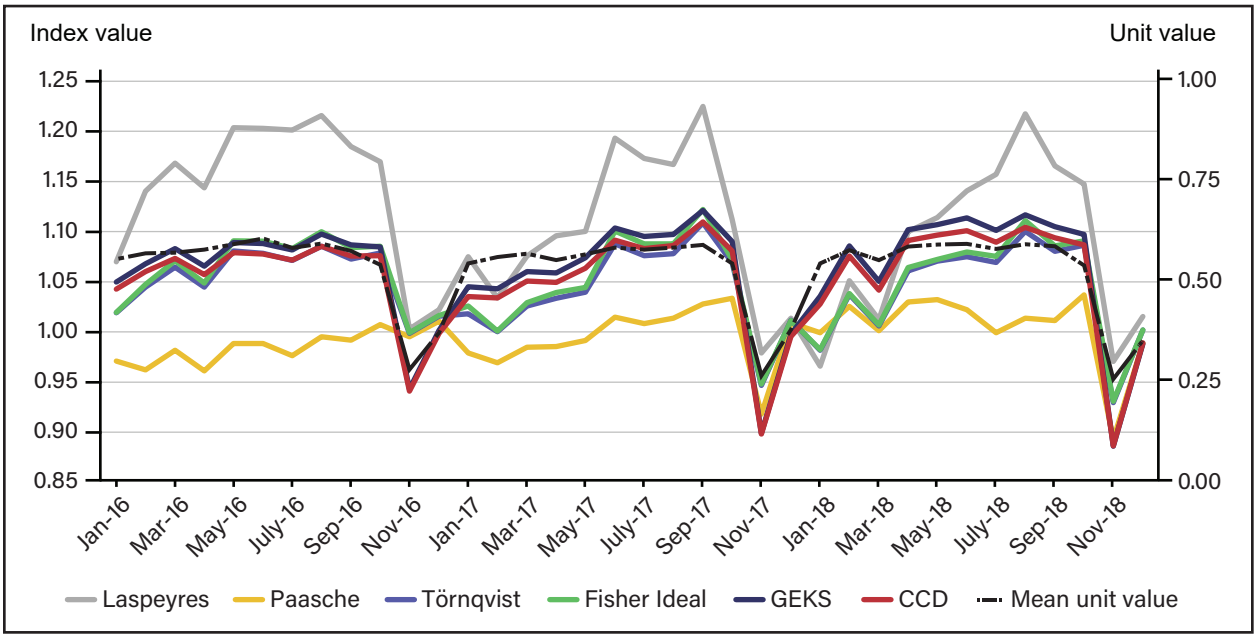
GEKS = Gini (1931), Eltetö & Köves (1964), and Szulc (1964). CCD = Caves, Christensen, & Diewert, (1982).

Note: Unit values are dollars per 100 grams. Laspeyres, Paasche, Törnqvist, Fisher Ideal, GEKS, and CCD are price indexes constructed using different formulas to measure price changes over time. Price index values are relative to a base of the national average from 2016–18.

Source: USDA, Economic Research Service, Food-at-Home Monthly Area Prices 2016–18 data.

Figure 2

Monthly weighted mean unit values and price indexes for frozen poultry, Dallas metropolitan area, 2016–18



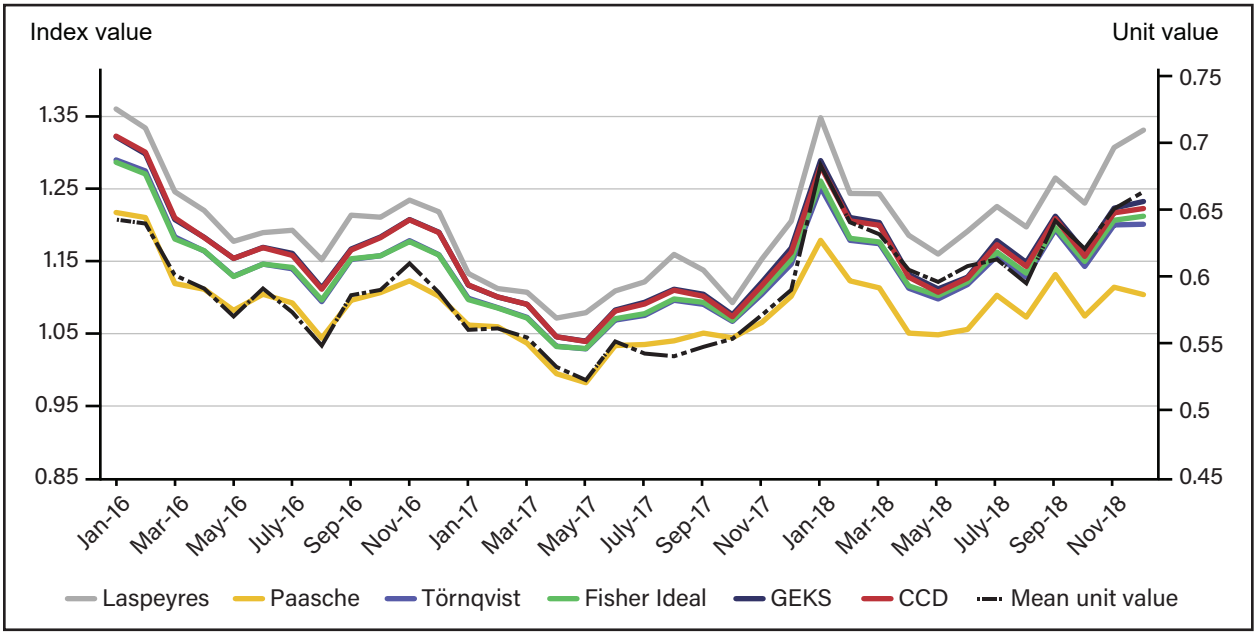
GEKS = Gini (1931), Eltetö & Köves (1964), and Szulc (1964). CCD = Caves, Christensen, & Diewert, (1982).

Note: Unit values are dollars per 100 grams. Laspeyres, Paasche, Törnqvist, Fisher Ideal, GEKS, and CCD are price indexes constructed using different formulas to measure price changes over time. Price index values are relative to a base of the national average from 2016–18.

Source: USDA, Economic Research Service, Food-at-Home Monthly Area Prices 2016–18 data.

F-MAP can be used to track long-term price trends and can show short-term effects or seasonality due to the monthly nature of the data. Figure 3 shows the weighted unit values and price indexes for fresh tomatoes for the New York metropolitan area for the 2016–18 period. The mean unit value for tomatoes follows the same general pattern of changes of the price indexes, where the values show a seasonal pattern of higher prices during the winter.

Figure 3
Monthly weighted mean unit values and price indexes for fresh tomatoes, New York metropolitan area, 2016–18



GEKS = Gini (1931), Eltetö & Köves (1964), and Szulc (1964). CCD = Caves, Christensen, & Diewert, (1982).

Note: Unit values are dollars per 100 grams. Laspeyres, Paasche, Törnqvist, Fisher Ideal, GEKS, and CCD are price indexes constructed using different formulas to measure price changes over time. Price index values are relative to a base of the national average from 2016–18.

Source: USDA, Economic Research Service, Food-at-Home Monthly Area Prices 2016–18 data.

Across Food Groupings

The EFPG categorization system used in the F-MAP data product allows for price comparisons among food categories with different levels of preparation and processing on a standardized per 100-gram basis. Across all EFPGs, infant formula had the highest national average price during the 2016–18 base period at $2.85 per 100 grams. Water had the lowest national average price per 100 grams of any EFPG at $0.05, followed by reduced-fat or skim milk, at $0.10. Prices varied considerably across tier-3 groups within the same tier-1 category, depending on the types, form, and levels of processing of products in each tier-3 group. For example, national average prices for groups within the dairy category ranged from $0.10 per 100 grams for reduced-fat and skim milk to $1.10 per 100 grams for cheese (excluding processed cheese). Similarly, national average prices for protein foods ranged from $0.31 per 100 grams for eggs and egg substitutes to $1.66 per 100 grams for fresh fish and seafood.

Table 4 shows the monthly mean unit value for select produce EFPGs for the Atlanta metropolitan area for 2018.

Table 4

Monthly weighted mean unit value (dollars per 100 grams) for EFPGs for the Atlanta metropolitan area, 2018

Product description	EFPG	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	Code	Unit value	Unit value	Unit value	Unit value	Unit value	Unit value	Unit value	Unit value	Unit value	Unit value	Unit value	Unit value
Tomatoes													
Fresh	23000	0.512	0.481	0.49	0.463	0.447	0.466	0.456	0.474	0.478	0.458	0.475	0.52
Canned	23075	0.246	0.235	0.251	0.249	0.256	0.261	0.259	0.259	0.246	0.244	0.242	0.244
Dark green vegetables													
Fresh	26000	0.508	0.522	0.527	0.526	0.519	0.524	0.528	0.536	0.53	0.535	0.571	0.58
Fresh cut	26525	0.533	0.538	0.546	0.54	0.528	0.524	0.526	0.527	0.521	0.536	0.535	0.561
Frozen	26550	0.454	0.461	0.451	0.453	0.464	0.459	0.465	0.455	0.45	0.441	0.432	0.433
Canned	26575	0.209	0.215	0.218	0.225	0.228	0.235	0.234	0.226	0.228	0.231	0.224	0.232
Beans, lentils, and peas													
Fresh/dried	27500	0.358	0.355	0.349	0.348	0.346	0.345	0.345	0.34	0.335	0.335	0.334	0.371
Frozen	27550	0.496	0.527	0.504	0.521	0.518	0.512	0.525	0.508	0.501	0.487	0.476	0.459
Canned	27575	0.228	0.227	0.229	0.232	0.228	0.23	0.229	0.23	0.227	0.226	0.229	0.232
Whole fruit													
Fresh	30000	0.337	0.334	0.325	0.325	0.297	0.291	0.287	0.301	0.324	0.327	0.329	0.333
Fresh cut	30025	0.864	0.858	0.839	0.781	0.732	0.694	0.675	0.694	0.698	0.742	0.76	0.819
Frozen	30050	0.747	0.778	0.769	0.757	0.764	0.757	0.763	0.77	0.776	0.784	0.797	0.801
Canned	30075	0.388	0.386	0.384	0.403	0.401	0.407	0.393	0.412	0.416	0.408	0.368	0.391
Dried	30090	1.163	1.209	1.149	1.256	1.292	1.264	1.269	1.277	1.292	1.264	1.139	1.109

EFPG = USDA, Economic Research Service Food Purchase Group.

Source: USDA, Economic Research Service, Food-at-Home Monthly Area Prices 2016–18 data.

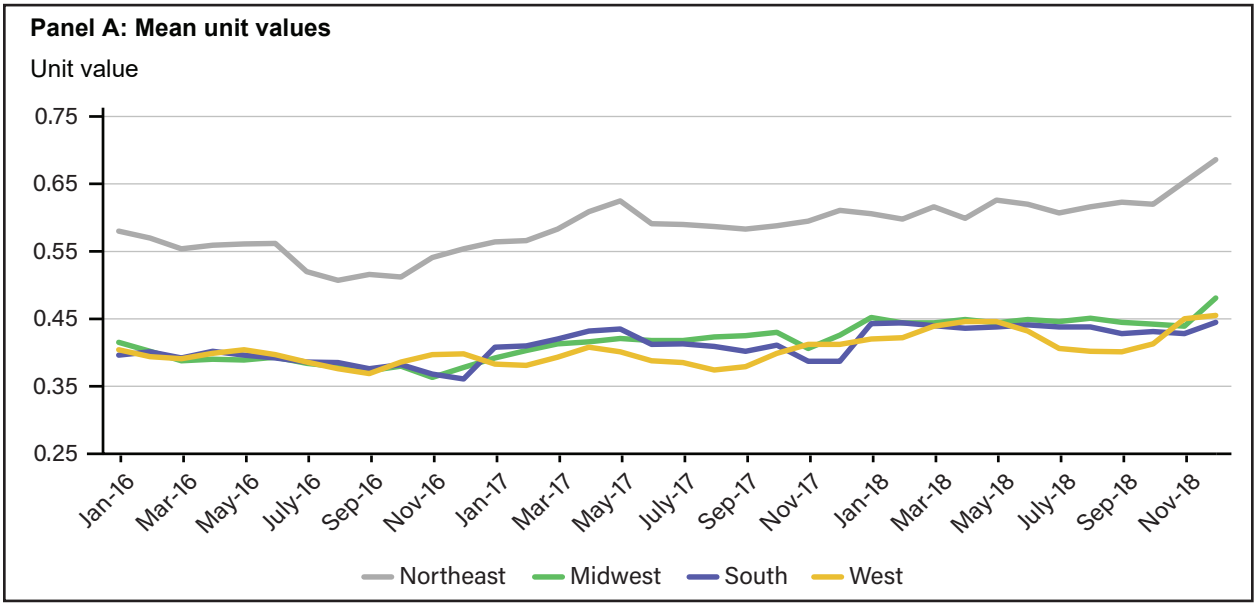
For example, across months, the mean unit value of canned tomatoes was about half that of fresh tomatoes. In contrast, fresh whole fruit had the lowest mean unit value compared with fresh cut, frozen, canned, or dried whole fruit. This is due in part to the composition of items and weighted sales within each food group. For example, some fruits that have lower unit value prices comprise a large share of fresh fruit sales, such as bananas and melons, and some fruits that have high unit values make up a large share of frozen fruit sales, such as berries. Similarly, fresh cut fruits and vegetables are processed for convenience and often have higher unit values than whole fresh fruits and vegetables. However, fresh cut items also often have inedible portions of the foods removed (e.g., rinds, stalks, and cores), while the price of whole foods includes those inedible portions.

Across Geographical Areas

The F-MAP data product also allows for price measure comparisons across geographical areas. F-MAP includes price data for the total United States, for 10 major metropolitan areas, and for the 4 census regions. Prices were typically higher in the Northeast and West regions compared with the South and Midwest. Across all EFPGs and months from 2016–18, prices were highest in the Northeast for 55 percent of EFPG-month combinations, followed by the West with 41 percent, based on the Fisher Ideal index. In contrast, prices were lowest in the South region for 54 percent of EFPG-month combinations from 2016–18, followed by the Midwest with 34 percent.

The following figures show monthly price measures for fresh dark green vegetables by census region. Across all months from 2016 to 2018, both the mean unit values (figure 4a) and the Fisher Ideal price index values (figure 4b) showed fresh dark green vegetable prices were higher in the Northeast region compared with the other three census regions. The index values for all regions showed an increase in dark green vegetable prices in early 2017, when heavy rains and flooding in California affected planting and harvesting of leafy greens.

Figure 4
Monthly weighted mean unit values and Fisher Ideal price index for fresh dark green vegetables, by census region, 2016–18

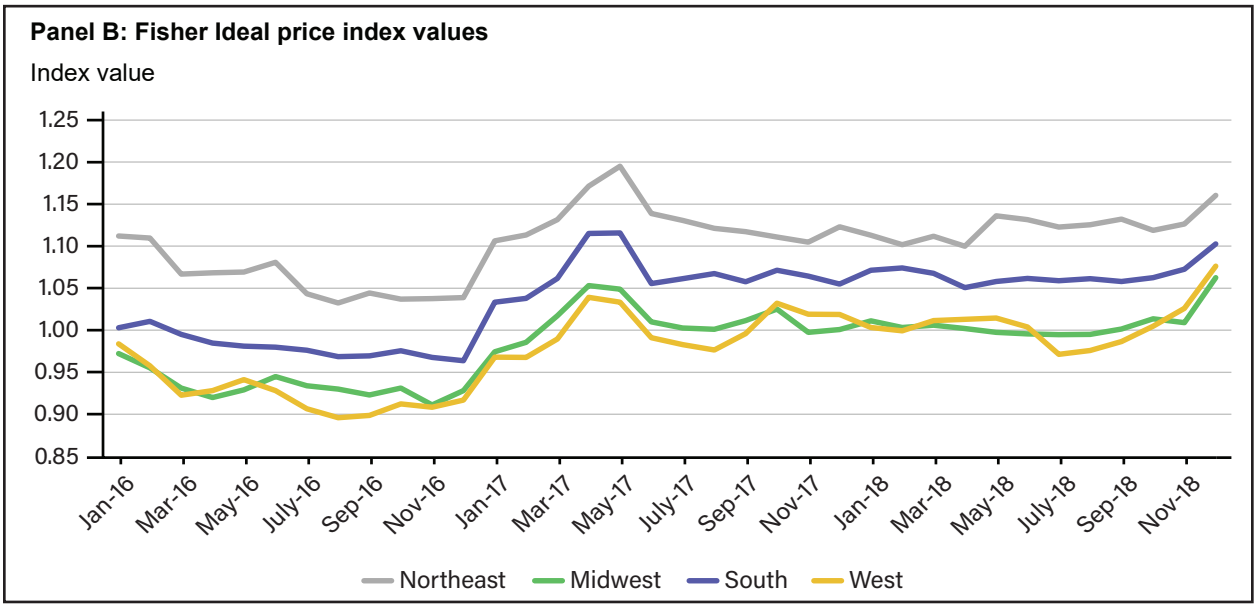


Note: Unit values are dollars per 100 grams. Price index values are relative to a base of the national average from 2016–18. Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont; Midwest: Indiana, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin; South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia; West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

Source: USDA, Economic Research Service, Food-at-Home Monthly Area Prices 2016–18 data.

Figure 4, panel B on next page >

< Figure 4, panel A on previous page



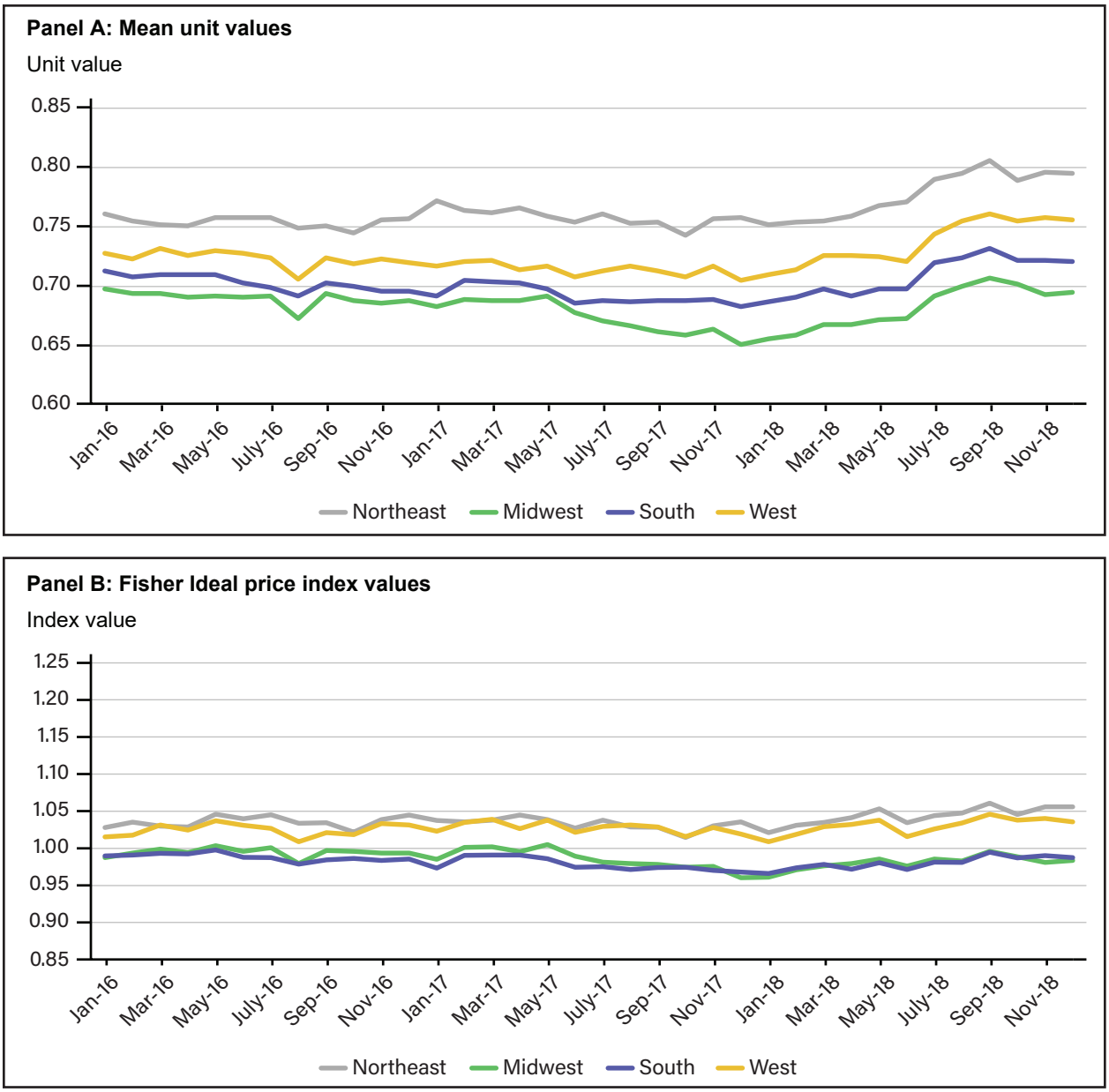
Note: Unit values are dollars per 100 grams. Price index values are relative to a base of the national average from 2016–18. Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont; Midwest: Indiana, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin; South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia; West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

Source: USDA, Economic Research Service, Food-at-Home Monthly Area Prices 2016–18 data.

Similarly, the following figures show the mean unit values (figure 5a) and the Fisher Ideal price index values (figure 5b) for whole-grain breakfast cereal across each census region. The unit values differed across each region, with the highest average prices in the Northeast and the lowest average prices in the Midwest across all months from 2016 to 2018. In contrast, the indexes tracked more closely across some regions, showing similar values over time for the Northeast and West and for the Midwest and South regions. This difference in patterns between the unit values and indexes partially reflects differences in product offerings and retailers across regions, which are not accounted for in the construction of the unit values.

Figure 5

Monthly weighted mean unit values and Fisher Ideal price index for whole grain breakfast cereal, by census region, 2016–18



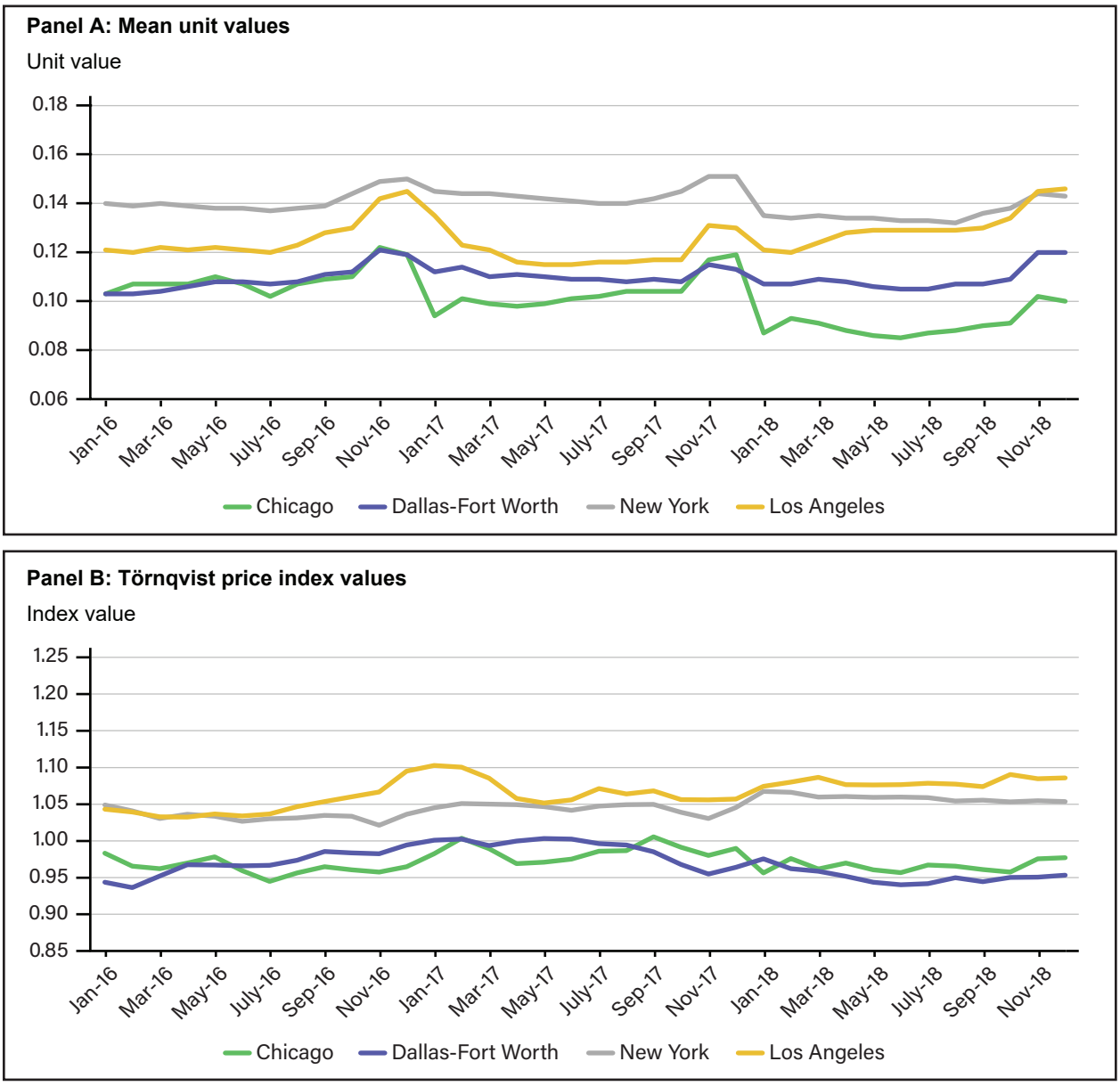
Note: Unit values are dollars per 100 grams. Price index values are relative to a base of the national average from 2016–18. Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont; Midwest: Indiana, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin; South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia; West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

Source: USDA, Economic Research Service, Food-at-Home Monthly Area Prices 2016–18 data.

In addition to regional price differences, F-MAP also shows how prices differ across metropolitan areas. Figures 6a and 6b show mean unit values and Törnqvist price index values, respectively, for whole milk in select metropolitan areas from 2016 to 2018. Törnqvist index values for whole milk in the New York and Los Angeles areas were above the base for all months from 2016 to 2018, while values for the Dallas and Chicago metropolitan areas were below the base for almost all months over the period. Comparing the unit price and

index values across areas shows that the unit value prices for whole milk were higher in New York than Los Angeles for almost all months from 2016 to 2018, but the index prices were higher in Los Angeles relative to New York over the same period.

Figure 6
Monthly weighted mean unit values and Törnqvist price index for whole milk, by metropolitan area, 2016–18



Note: Unit values are dollars per 100 grams. Price index values are relative to a base of the national average from 2016–18.

Source: USDA, Economic Research Service, Food-at-Home Monthly Area Prices 2016–18 data.

This example again reflects that while most price measures show similar trends, F-MAP users may encounter different results across the different price measures. The unit values in F-MAP provide valuable, detailed information about actual prices paid for products in each food group across geographic areas, which have many uses and are often of interest to the public. However, price indexes typically are better tools for making comparisons or tracking prices over time since assumptions about the product mix are explicitly defined in the price index construction.

In addition to the price measures, the F-MAP data product also provides the number of stores and total sales volumes in dollars and grams by EFPG for each region to help data users understand and use the data. As an example, table B.1 shows the total national shares of sales and quantities by EFPG in 2018, both weighted and unweighted. Sales volume shares can be used as weights for aggregating the 90 EFPGs into higher tiers or other food groupings data users choose. They can also be used for aggregating geographic areas into other subnational groupings or into national estimates.

The F-MAP data are well suited for linkages or for using in conjunction with other datasets covering a similar period to address food topics. The most appropriate linkages at more granular geographic levels will map to the census regions or metropolitan areas defined in F-MAP, which are aligned with census area definitions used in Federal data such as the U.S. Department of Commerce, Bureau of the Census, American Community Survey. Food product-specific linkages are best suited when F-MAP is linked to other datasets where products are identified by their EFPG or similar food groupings, such as in scanner data or FoodAPS data (see appendix C for a mapping between the EFPGs and the FoodAPS groups). However, linkages are also possible by aligning the EFPG groups with other food categorization systems such as those from the U.S. Department of Labor, Bureau of Labor Statistics' (BLS) Consumer Expenditure Survey.

Conclusion

The Food-at-Home Monthly Area Prices (F-MAP) data product is a new, publicly available data resource to support food economics research and analysis. It provides an updated version of the Quarterly Food-at-Home Price Database (QFAHPD) based on the USDA, Economic Research Service (ERS) Food Purchase Groups (EFPGs), with price measures at a higher frequency and with different geographic coverage. F-MAP provides additional price measures across these dimensions, including both unit values and price indexes, to support various uses. This data release includes monthly data for 2016–18.

The EFPG mappings documentation and F-MAP calculations described in this report provide information about the datasets' content and the methods used to create the data product from Circana retail scanner data. Users are encouraged to review the materials included in the report to determine the appropriate food category or categories, geography or geographies, and price measure included in F-MAP for their analysis. Users selecting among the price measures in F-MAP may also wish to compare multiple F-MAP price series or dimensions for sensitivity analysis. A comparison of other sources of food price data is beyond the scope of this paper, but understanding how F-MAP aligns with established sources of food price data is a valuable next step for future work in this area.

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Appendix A: ERS Food Purchase Groups (EFPGs) Descriptions

This appendix provides descriptions for each of the EFPGs, which can be used with Circana or other food data sources for a number of research topics. EFPGs are delineated into tiers with tier 1 representing the major food groupings such as grains, dairy, meat and protein foods, and vegetables; tier 2 representing subcategories under the major food groups; and tier 3 representing each individual EFPG code. Users with access to the public F-MAP data can combine groups (e.g., combine whole milk and reduced-fat milk into a single milk group), while researchers with access to the restricted scanner data are also able to manipulate and adjust the groups (e.g., separate dairy milk and plant-based milk).

Grains

The grains group contains foods where the major ingredient is wheat, rice, oats, cornmeal, barley, or other grains. There are two tier-2 groups (refined grains and whole grains). Whole-grain items have greater than 50-percent grain ounce equivalents from whole grains[14] or have a term indicating the item is "whole grain," "whole wheat," "100 percent" or other term identifying the product as a whole-grain product in the product description. All other products are placed in the refined group. Both tier-2 groups have four tier-3 groups: breads; rice and pasta; breakfast grains; and flour, bread mixes, and frozen dough.

- Breads include breads, rolls, bagels, tortillas, biscuits, prepared (plain) pizza dough, among other forms.
- Rice and pasta include dry rice, pasta of all types, barley, quinoa, farro, bulgur, and other grains.
- Breakfast grains include unprepared and unsweetened oatmeal, grits, hominy, farina, wheat germ, and other hot breakfast cereals.
- Flour, bread mixes, and frozen dough include all flour, bread mixes, pancake and biscuit mixes, and frozen doughs. This group also includes yeast, baking powder, baking soda, and cornstarch.

Note that many grain-based foods are not categorized under the grains section of the EFPGs because these foods have either distinctive nutrient profiles or levels of convenience that warrant their placement in other categories. For example, baked goods (e.g., muffins, cakes, cookies, and banana bread), which are higher in sugar and solid fats, are categorized under the desserts, sweets, and candies tier-2 category. Grain-based breakfast cereals, which usually include added sugars, are categorized under the breakfast cereal tier-2 category. Grain-based snacks, which have a higher amount of sodium, are categorized under the savory snacks tier-2 category. Lastly, prepared ready-to-eat and ready-to-heat foods with grains as the primary ingredient (e.g., prepared pasta with sauce, frozen waffles, sandwiches, etc.) are categorized under the prepared meals, sides, and salads tier-1 category. One notable exception is garlic bread, which is included under one of the two Bread groups, depending on whole grain content.

Vegetables

Foods grouped in the vegetable category are commonly consumed as vegetables, even though some foods, such as tomatoes and squash, botanically are fruits and mushrooms are fungi. USDA's *Dietary Guidelines for Americans, 2020–2025* divides vegetables into five subgroups based on their nutrient profile: dark-green, starchy, red and orange, beans and peas, and other vegetables. The seven tier-2 groups (potatoes; other starchy vegetables; tomatoes; other red and orange vegetables; dark green vegetables; beans, lentils, and peas; and

[14] See the "Grains" webpage on the MyPlate.gov website.

other/mixed vegetables), include the five subgroups and separate groups for tomatoes and potatoes, which are two of the most popularly consumed vegetables in the United States. All tier-2 vegetable groups are further divided into three to four tier-3 categories based on processing (fresh, fresh-cut, frozen, and canned). Note that 100-percent fruit and vegetable juices are categorized under the fruit tier-1 group. Dried vegetables with no added ingredients (such as fat or sodium) are included under fresh. Frozen vegetables with seasonings or flavorings but no added fat or sauce are included here, under the Vegetables tier 1 group. Vegetables with added fats or sauce are included under the prepared meals, sides, and salads tier-1 category.

- Potatoes include fresh and canned potatoes. Frozen potatoes are categorized under frozen other starchy vegetables,[15] unless prepared with added fat, when they are categorized under the prepared meals, sides, and salads tier-1 category.
- Other starchy vegetables include fresh, frozen, and canned corn, green peas, green lima beans, plantains, cassava, jicama, and other starchy vegetables. This group also includes frozen potatoes without added fat.
- Tomatoes include fresh whole and canned tomatoes. Sundried tomatoes not packed in oil are classified under fresh. Fresh-cut and frozen tomatoes are categorized under other red-orange vegetables.[16]
- Other red and orange vegetables include fresh, frozen, and canned vegetables noted as red and orange in the *Dietary Guidelines for Americans, 2015–2020* with the exception of fresh whole or canned tomatoes. Examples include acorn squash, butternut squash, carrots, Hubbard squash, pumpkin, red and orange peppers, and sweet potatoes.
- Dark green vegetables include fresh, frozen, and canned vegetables noted as dark green in the *Dietary Guidelines for Americans, 2015–2020*. Examples include bok choy, broccoli, collard greens, dark green leafy lettuce, kale, mustard greens, romaine lettuce, spinach, turnip greens, watercress, and most fresh herbs. Salad mixes comprised of dark leafy greens (e.g., romaine lettuce, kale, or broccoli) are included here unless they contain dressings or add-ins, such as other vegetables, croutons, and nuts. Salad mixes with other vegetables are included under the other/mixed vegetables tier-3 category. Salad kits with croutons, nuts, or dressing are included under the ready-to-eat prepared foods tier-2 category.
- Beans, lentils, and peas include fresh, dried, frozen, and canned black beans, black-eyed peas, edamame, garbanzo beans, kidney beans, lentils, lima beans, navy beans, pinto beans, soybeans, and split peas, including seasoned beans. Dried forms are categorized with fresh forms.
- Other/mixed vegetables include fresh, frozen, and canned asparagus, bean sprouts, celery, onions, mushrooms, beets, turnips, cucumbers, eggplant, green beans, sugar snap peas, iceberg lettuce, brussels sprouts, summer squash, chayote, Calabaza squash, nopal, packages or trays of mixed vegetables, and any other vegetable that does not fit into the other six tier-2 groups. This group also includes olives, pickles, and other fermented vegetables, such as sauerkraut and kimchi. Dried mushrooms without added ingredients are included under fresh. Salad mixes that include leafy greens not considered dark green vegetables (e.g., iceberg lettuce or cabbage) are included here unless the product contains add-ins, such as dressing, croutons, meat, and nuts. Salad kits with add-ins are included under the ready-to-eat prepared foods tier-2 category. Vegetable trays that contain only vegetables (i.e., no dips or cheeses) are also included here. Trays that contain more than just vegetables are included under the ready-to-eat prepared foods tier-2 category.

[15] Due to a limited number of items and sales.

[16] Due to a limited number of items and sales.

Fruit

This tier-1 category has two tier-2 groups: whole fruit and 100-percent fruit and vegetable juices. The five whole fruit tier-3 groups are fresh, fresh-cut, frozen, canned, and dried. Researchers who need to distinguish between the level of added sugar or solid fat added to fresh-cut, frozen, canned, or dried fruit should use the Nutrition Facts panel information to determine if the product has added sugar or solid fat.

- Fresh fruit includes all fresh, whole fruit that is not prepared, peeled, or cut.
- Fresh-cut fruit includes fresh fruit that is peeled or cut at the point of sale. This includes fresh fruit salads and fruit trays that contain only fruit (e.g., no sauces, cheese, or nuts).
- Frozen fruit includes all frozen fruit.
- Canned fruit includes single fruits (e.g., peaches), canned fruit mixtures, such as fruit cocktail or tropical mix, and canned fruit pie fillings. Note that fruit jams and jellies are categorized under the desserts, sweets, and candies tier-2 category.
- Dried fruit includes fruits that have been dried. Dried fruit may or may not be preserved with added sugar.

The 100-percent fruit and vegetable juices have three tier-3 groups: fresh, frozen, and canned. The 100-percent fruit juices and vegetable juices include only juices that do not contain added sugar. Other juice drinks are categorized under the beverages tier-2 category.

Dairy and Plant-Based Milk Products

This tier-1 category has three tier-2 groups: whole milk products; reduced-fat, low-fat, and skim milk products; and cheese products. Both tier-2 milk product groups have three tier-3 groups (milk; cream and sour cream; and yogurt) and cheese has two tier-3 categories (cheese and processed cheese). Sweetened and flavored milk-based drinks are included under the beverages tier-2 category. Ice cream and other milk-based desserts are included under the desserts, sweets, and candies tier-2 category.

- Whole milk, cream, and yogurt includes whole, unflavored fluid milk, condensed milk, evaporated whole milk, high-fat plant-based milk drinks (e.g., coconut milk), cream, and yogurt. Kefir is classified as a yogurt, not milk.
- Reduced-fat, low-fat, and skim milk, cream, and yogurt include similar products as the whole milk category but in a reduced-fat (e.g., 2-percent milk), low-fat (e.g., 1-percent milk), or fat-free form (e.g., skim milk). Unflavored plant-based milk products, such as almond milk and soy yogurt, are also included.
- Cheese includes all-natural cheeses including cream cheese and cottage cheese.
- Processed cheese includes processed cheeses as defined by the U.S. Department of Health and Human Services, Food and Drug Administration (FDA),[17] including processed cheese sauces, processed cheese spreads, and imitation cheese. Processed cheese usually contains additive ingredients (e.g., oils and emulsifiers).

[17] See Code of Federal Regulations, title 21, sec. 133.169.

Meat and Protein Foods

This tier-1 category has seven tier-2 groups: beef, pork, lamb, veal, and game; chicken, turkey, and game birds; fish and seafood; nuts, nut butters, and seeds; bacon, sausage, and lunch meats; egg and egg substitutes; and tofu and meat substitutes. The first three tier-2 groups have three tier-3 categories (fresh, frozen, and canned) and nuts, nut butters, and seeds has two tier-3 categories (nuts and seeds and nut and seed butters).

- Beef, pork, lamb, veal, and game include all types of red meat in either fresh, frozen, or canned form. This group includes marinated or seasoned raw meats. Processed meat products containing other ingredients (e.g., frozen meatballs) are placed in the prepared meals, sides, and salads tier-1 category.
- Chicken, turkey, and game birds include all poultry and game birds in either fresh, frozen, or canned form. This group includes marinated or seasoned raw poultry and game birds. Processed poultry products with additional ingredients (e.g., rotisserie chicken, frozen chicken patties, or stuffed chicken breast) are placed in the prepared meals, sides, and salads tier-1 category.
- Fish and seafood include fish or other seafood in either fresh, smoked, frozen, or canned form. This group includes marinated or seasoned raw fish and seafood and frozen uncoated, cooked shrimp. Processed fish and seafood products with additional ingredients (e.g., frozen fish sticks) are placed in the prepared meals, sides, and salads tier-1 category.
- Nuts, nut butters, and seeds include all raw, roasted, and flavored nuts (e.g., peanuts, cashews, almonds), seeds (e.g., sunflower seeds, pumpkin seeds, sesame seeds), and nut butters.
- Bacon, sausage, and lunchmeats include bacon, sausage, prepacked and deli lunchmeat, hot dogs, meat and poultry jerky, meat spreads, etc.
- Egg and egg substitutes include eggs and egg substitutes.
- Tofu and meat substitutes include tofu, plant-based hot dogs and burgers, seitan, and other meat substitutes.

Prepared Meals, Sides, and Salads

This tier-1 category has four tier-2 groups: ready-to-eat foods; frozen and refrigerated ready-to-heat foods; shelf-stable, ready-to-heat foods and soups; and shelf-stable meal kits. Although these groups are very general, the intention of the groupings is to allow users enough categorization to make sorting prepared foods simple, but with enough flexibility to further refine and group foods based on individual research needs. For example, researchers can further separate these groups based on the nutrient content.

- Ready-to-eat foods include prepared foods that are ready to eat. Examples include packaged salad kits with dressing and/or add-ins, prepared other salads, sandwiches, rotisserie chickens, items from a salad or hot bar, prepared items like hummus, and other prepared items often sold at the deli. However, the group does not include beverages, deli sliced meats and cheese, baked goods (e.g., grain-based desserts or breads), and fresh-cut fruits and vegetables without dips, sauces, or added sugar.
- Frozen and refrigerated ready-to-heat foods include frozen and refrigerated prepared foods that are ready to heat. Examples include chicken patties, fish sticks, frozen vegetables with sauce, microwave dinners, and pizza.
- Shelf-stable, ready-to-heat foods and soups include canned soups (including condensed soups), canned chili, and canned pasta. This category also includes prepared, shelf-stable, ready-to-heat foods sold in

cartons and microwavable containers, such as soups packaged in cartons and pasta packaged in microwavable containers.

- Shelf-stable meal kits are shelf-stable kits that contain most of the ingredients necessary to make a side dish or entrée. Limited preparation, such as adding water, oil, or meat, and cooking is required. Examples include dry soups, macaroni and cheese kits, taco seasonings and kits, ramen, and rice-pilaf kits.

Other Foods

This tier-1 category has nine tier-2 groups: fats, oils, and salad dressings; gravies, sauces, condiments, and spices; beverages; desserts, sweets, and candies; breakfast cereals; savory snacks; vitamins and meal supplements; baby food; and infant formula. Fats, oils, and salad dressings have two tier-3 categories (fats and oils; and salad dressing). Gravies, sauces, condiments, and spices have two tier-3 categories (condiments, gravies, and sauces; and dry spices). Beverages have seven tier-3 categories (sweetened coffee and tea; unsweetened coffee and tea; flavored milk and other sweetened milk beverages; low-calorie beverages; all other caloric beverages; alcohol; and water). Desserts, sweets, and candies have seven tier-3 categories (sweeteners; jellies and jams; candy; baked goods; cake and cookie mixes; ice cream and other milk-based desserts; and all other desserts). Both breakfast cereal and savory snacks each have two tier-3 categories (whole grain and all other).

Fats, Oils, and Salad Dressings

- Fats and oils include butter, margarine, olive oil, peanut oil, other oils, and lard.
- Salad dressing includes salad dressings and mayonnaise.

Gravies, Sauces, Condiments, and Spices

- Condiments, gravies, and sauces include ketchup, barbecue sauce, mustard, gravies, relish, chutney, dip, pasta sauce, Worcestershire sauce, and soy sauce.
- Dry spices include dry parsley, oregano, garlic, onion, salt, pepper, thyme, and spice mixtures, such as Italian spice, curry powder, and poultry seasoning. This category also includes vanilla and other flavor extracts. When appropriate, fresh herbs are included in the dark green vegetable tier-2 category and otherwise are in the other/mixed vegetables tier-2 category.

Beverages

- Sweetened coffee and tea include coffee and tea drinks that have added sugars, such as cappuccino, latte, and sweetened iced tea beverages, and dry powders used to make these beverages.
- Unsweetened coffee and tea include coffee and tea drinks that have no added sugars, such as coffee grounds, tea bags, unsweetened prepared tea, and iced tea dry mix.
- Flavored milk and other sweetened milk beverages include flavored milk (chocolate, strawberry, etc.), flavored plant-based milk drinks (chocolate almond milk, vanilla rice milk, etc.), and milkshakes. Sweetened condensed milk is included in the whole milk tier-3 category. This group includes dry powders to make these beverages only when the mix includes dry milk. Dry beverage powders for flavored milk that do not include dry milk are in all other caloric beverages tier-3 category.

- Low-calorie beverages include drinks not included in sweetened or unsweetened coffee and tea, alcohol, or water categories that have less than 5 calories per 8 ounces. Examples include low- or no-calorie sodas and sweetened water.
- All other caloric beverages include drinks not included in sweetened or unsweetened coffee and tea, flavored and sweetened milk beverages, alcohol, or water categories that have at least 5 calories per 8 ounces. Examples include sports drinks, energy drinks, regular sodas, tomato cocktail mix, and juice drinks. This group also includes dry powders to make these beverages as well as dry powders for flavored milk without dry milk in the mix. 100-percent fruit or vegetable juice is included under the fruit tier-1 category.
- Alcohol includes all alcoholic drinks, such as beer, wine, liquor, and premixed alcoholic beverages.
- Water includes all unsweetened water, whether it is still or carbonated.

Desserts, Sweets, and Candies

- Sweeteners include all types of sugars, no-calorie sweeteners, syrups, honey, chocolate and caramel sauce, nondairy whipped topping, and icings. This group does not include dry beverage powders.
- Jellies and jams include all types of jellies, jams, marmalades, and preserves.
- Candy includes all types of candy, both chocolate and nonchocolate, and chewing gum. Both sugar-free and regular candies are included in this group.
- Baked goods include cakes, cookies, pies, pastries, doughnuts, granola bars, banana and other sweet breads, and muffins that are both fresh (from an in-store bakery) and pre-packaged. This includes snack bars that are fortified (FiberOne™, Clif bars®, etc.). There is no distinction between refined and whole-grain content.
- Cake and cookie mixes include all dry cake, muffin, cookie, sweet bread (e.g., banana bread) and brownie mixes, and refrigerated cookie dough.
- Ice cream and other milk-based desserts include ice cream, frozen yogurt, ice cream cakes, ambrosia, cheesecake, and puddings.
- All other desserts include any other sweet desserts that are not in the other categories, such as gelatins and nondairy popsicles.

Breakfast Cereal

- Whole-grain breakfast cereals include ready-to-eat breakfast cereals with greater than 50 percent of grain ounce equivalents from whole grains. Flavored oatmeal and other flavored whole-grain cereal grains are also included in this group.
- All other breakfast cereals include ready-to-eat breakfast cereals with less than or equal to 50 percent of grain ounce equivalents from whole grains. Flavored non-whole-grain cereal grains, such as most grits and hominy, are also included.

Savory Snacks

- Whole-grain snacks include snacks with greater than 50 percent of grain ounce equivalents from whole grains. Examples include popcorn, whole-wheat crackers, some corn chips, and some multigrain snacks.
- All other snacks include savory snacks with less than or equal to 50 percent of grain ounce equivalents from whole grains. Examples include potato chips, trail mixes, pork rinds, most crackers, and some corn chips.

Vitamins and Meal Supplements

- Vitamins and meal supplements include all vitamins, protein shakes, diet bars, etc.

Baby Food

- Baby food includes all baby food except infant formula.

Infant Formula

- Infant formula includes all infant formula.

Table A.1
Number of product codes (UPC and perishable) assigned to each EFPG, 2018

Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
All items		583,390	546,477	36,913	
Grains	1	35,253	35,125	128	The grains group contains foods where the major ingredient is wheat, rice, oats, cornmeal, barley, or other grains. Baked goods, ready-to-eat breakfast cereals, and other prepared grain-based foods are classified elsewhere
Whole-grain breads, cereal, rice, pasta, and flours	100	3,596	3,596	0	All products with whole wheat, whole grain, 100 percent whole grain, or equivalent in the description Greater than 50 percent of grain ounce equivalents from whole grains[1]
Breads	10000	1,436	1,436	0	Whole-grain breads, rolls, bagels, tortillas, biscuits, etc. Includes whole-grain garlic bread, prepared (plain) pizza dough, frozen bread, and soft breadsticks
Rice and pasta	10025	1,179	1,179	0	Whole-grain rice and pasta Includes whole barley, quinoa, farro, and bulgur
Breakfast grains	10050	770	770	0	Unprepared and unsweetened whole-grain oatmeal, grits, hominy, and wheat germ Includes quinoa and other hot breakfast cereals

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Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
Flour, bread mixes, and frozen dough	10075	211	211	0	Whole-grain flour, bread mixes, pancake and biscuit mixes, and frozen doughs
Non-whole-grain breads, cereal, rice, pasta, and flours	150	31,657	31,529	128	All products without whole grain or equivalent in the description Less than 50 percent of grain ounce equivalents from whole grains[1]
Breads	15000	17,868	17,741	127	Non-whole-grain breads, rolls, bagels, tortillas, biscuits, etc. Includes non-whole-grain garlic bread, rice spring roll wrappers, corn bread, corn tortillas, soft breadsticks, gluten-free bread, and taco shells
Rice and pasta	15025	9,049	9,049	0	Non-whole-grain dry rice and pasta Includes pearled or hulled barley and polenta
Breakfast grains	15050	159	159	0	Unprepared and unsweetened non-whole-grain grits, farina, and other hot breakfast cereals Includes oat bran hot cereal
Flour, bread mixes, and frozen dough	15075	4,581	4,580	1	Non-whole-grain flour, bread mixes, pancake and biscuit mixes, and frozen doughs Includes all-purpose baking mix, fish fry batter mix, corn flour, and corn meal Includes yeast, baking powder, baking soda, and cornstarch
Vegetables	2	44,279	27,071	17,208	The vegetables group includes all forms of potatoes (without added fats); other starchy vegetables; tomatoes; other red and orange vegetables; dark green vegetables; beans, lentils, peas, and legumes; and other/mixed vegetables
Potatoes	200	1,843	209	1,634	Fresh and canned potatoes Potatoes prepared with added fat are categorized under prepared meals, sides, and salads Frozen potatoes are categorized under frozen other starchy vegetables (21550)
Fresh	20000	1,641	7	1634	Fresh potatoes Includes dried potatoes with no added ingredients (e.g., dehydrated potato flakes)
Canned	20075	202	202	0	Canned potatoes
Other starchy vegetables	215	3110	2753	357	Fresh, frozen, and canned starchy vegetables, including corn, green peas, green lima beans, plantains, cassava, jicama, and parsnips

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Product description	EFPG	Total product codes	UPCs	Perish-able codes	EFPG description
Fresh	21500	467	296	171	Fresh other starchy vegetables Includes dried other starchy vegetables with no added ingredients (such as fat and seasoning)
Fresh cut	21525	186	0	186	Fresh-cut other starchy vegetables
Frozen	21550	1,069	1,069	0	Frozen other starchy vegetables, including with seasoning or flavoring (but no added fat) Includes vegetable mixtures with at least one starchy vegetable Includes frozen potatoes without added fat
Canned	21575	1,388	1,388	0	Canned other starchy vegetables
Tomatoes	230	3,994	2,550	1,444	Fresh whole and canned tomatoes Fresh-cut tomatoes are categorized under fresh-cut other red and orange vegetables (24525) Frozen tomatoes are categorized under frozen other red and orange vegetables (24550)
Fresh	23000	1,574	130	1444	Fresh whole tomatoes Includes dried tomatoes with no added ingredients and not packed in oil
Canned	23075	2,420	2,420	0	Canned tomatoes Includes sundried tomatoes in oil and canned tomatoes with oil
Other red and orange vegetables	245	2,713	700	2,013	Fresh, frozen, and canned vegetables noted as red and orange in the *Dietary Guidelines for Americans, 2015–2020* Includes acorn squash, butternut squash, carrots, Hubbard squash, pumpkin, sweet potatoes, and red and orange peppers
Fresh	24500	1,289	11	1278	Fresh other red and orange vegetables Includes dried other red and orange vegetables with no added ingredients
Fresh cut	24525	736	1	735	Fresh-cut other red and orange vegetables Includes fresh-cut tomatoes
Frozen	24550	207	207	0	Frozen other red and orange vegetables Includes frozen tomatoes
Canned	24575	481	481	0	Canned other red and orange vegetables

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Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
Dark green vegetables	260	4,038	1,417	2,621	Fresh, frozen, and canned vegetables noted as dark green in the *Dietary Guidelines for Americans, 2015–2020* Includes bok choy, broccoli, collard greens, dark green leafy lettuce, kale, mustard greens, romaine lettuce, spinach, turnip greens, and watercress Includes salad mixes comprised of dark leafy greens (e.g., romaine lettuce, kale, broccoli) Includes dark green fresh herbs such as basil, dill, parsley, and cilantro Includes spring mix, mesclun, and mixed greens without dressings or add-ins such as other greens, vegetables, croutons, and nuts
Fresh	26000	2,285	1	2284	Fresh whole or unprepared dark green vegetables Includes dried dark green vegetables with no added ingredients
Fresh cut	26525	775	438	337	Fresh-cut dark green vegetables Includes salads with herbs, mixed baby greens, lettuce with other greens, spring mixes, lettuce blends, baby lettuce, butter lettuce, romaine, green leaf, and mesclun
Frozen	26550	784	784	0	Frozen dark green vegetables
Canned	26575	194	194	0	Canned dark green vegetables
Beans, lentils, and peas	275	5,110	5,005	105	Fresh, dried, frozen, and canned black beans, black-eyed peas, edamame, garbanzo beans, kidney beans, lentils, lima beans, navy beans, pinto beans, soybeans, and split peas, including seasoned beans Includes baked beans with no added meat Dried forms are categorized with fresh forms
Fresh/dried	27500	2,193	2,088	105	Fresh or dried beans, lentils, and peas
Frozen	27550	235	235	0	Frozen beans, lentils, and peas
Canned	27575	2,682	2,682	0	Canned beans, lentils, and peas Includes seasoned or flavored beans

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Product description	EFPG	Total product codes	UPCs	Perish-able codes	EFPG description
Other/mixed vegetables	290	23,471	14,437	9,034	Fresh, frozen, and canned other/mixed vegetables, including asparagus, bean sprouts, celery, onions, mushrooms, beets, turnips, cucumbers, eggplant, green beans, sugar snap peas, iceberg lettuce, Brussels sprouts, summer squash (all kinds), chayote, nopal, and mixed vegetables Includes olives, pickles, and fermented vegetables, such as sauerkraut and kimchi Includes salad mixes with leafy greens not considered dark green vegetables (e.g., iceberg lettuce, cabbage) unless the product contains add-ins, such as dressing, croutons, meat, and nuts Includes vegetable trays that contain only vegetables (i.e., no dips or cheeses) Salad kits and vegetable trays with add-ins are included in the ready-to-eat prepared foods tier-2 category
Fresh	29000	6,807	426	6,381	Fresh other/mixed vegetables Includes dried other/mixed vegetables and mushrooms without added ingredients
Fresh cut	29025	2,807	154	2653	Fresh-cut other/mixed vegetables Includes vegetable trays that contain only vegetables (i.e., no dips or cheeses) Includes fresh-cut coleslaw without dressing Includes salad mixes with other vegetables Includes salad mixes that include leafy greens not considered to be dark green vegetables (e.g., iceberg lettuce and cabbage)
Frozen	29050	2,136	2,136	0	Frozen other/mixed vegetables
Canned	29075	11,721	11,721	0	Canned other/mixed vegetables Includes olives, pickles, fermented vegetables, pickled vegetables, kimchi, and sauerkraut
Fruit	3	30,771	16,364	14,407	The fruit group includes all forms of whole and cut fruit and 100-percent fruit and vegetable juices
Whole fruit	300	25,910	11,530	14,380	Fresh, fresh-cut, frozen, canned, and dried whole fruit
Fresh	30000	11,475	0	11,475	Fresh whole fruit not prepared, peeled, or cut
Fresh cut	30025	2,901	0	2901	Fresh peeled or cut fruit, fresh fruit salads, and fruit trays that contain only fruit (i.e., no sauces, cheeses, or nuts)
Frozen	30050	1,621	1,621	0	Frozen whole and cut fruit

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Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
Canned	30075	5,255	5,251	4	Canned single fruits (e.g., peaches), canned fruit mixtures such as fruit cocktail or tropical mix, and canned fruit pie fillings Includes Circana items described as "prepared refrigerated fruit salad"
Dried	30090	4,658	4,658	0	Dried whole fruits, preserved with or without added sugar
100-percent fruit and vegetable juices	350	4,861	4,834	27	100-percent fruit and vegetable juices Excludes cocktail mixes, cocktail drinks, and non-100-percent juice drinks
Fresh	35000	1,538	1,511	27	Refrigerated fresh 100-percent fruit and vegetable juices
Frozen	35050	260	260	0	Frozen 100-percent fruit and vegetable juices and juice concentrates
Canned/shelf stable	35075	3,063	3,063	0	Canned and shelf-stable 100-percent fruit and vegetable juices
Dairy and plant-based milk products	4	29,304	29,078	226	The dairy and plant-based milk products group includes unflavored fluid milk (whole, reduced-fat, low-fat, and skim milk), yogurt, and cheese products
Whole milk, yogurt, and cream	400	4,202	4,202	0	Whole, unflavored fluid milk, condensed milk, evaporated milk, high-fat plant-based milk drinks (e.g., coconut milk), cream, and yogurt
Milk	40000	1,769	1,769	0	Whole, unflavored fluid milk, condensed milk, and high-fat plant-based milk drinks (e.g., coconut milk) Includes sweetened condensed milk and evaporated whole milk Excludes flavored plant-based milk drinks
Cream and sour cream	40030	1,729	1,729	0	Whole-fat cream and sour cream Includes plant-based sour cream replacements Cream cheese is included under 46000
Yogurt	40060	704	704	0	Whole-fat yogurt Includes coconut milk yogurt Includes kefir (all flavors) Includes yogurt packaged with toppings Excludes refrigerated yogurt drinks
Reduced-fat, low-fat, and skim milk, cream, and yogurt	430	8,467	8,467	0	Similar products as the whole milk category, but in a reduced-fat (e.g., 2-percent milk), low-fat (e.g., 1-percent milk), or fat-free form (e.g., skim milk) Includes unflavored milk replacement products such as almond milk and soy yogurt Excludes milk-substitute coffee creamers

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Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
Milk	43000	3,645	3,645	0	Reduced-fat, low-fat, or skim milk Includes unflavored, plant-based milk drinks (e.g., almond milk, soy milk, and oat milk)
Cream and sour cream	43030	782	782	0	Reduced-fat and low-fat cream and sour cream Cream cheese is included under 46000
Yogurt	43060	4,040	4,040	0	Reduced-fat and low-fat yogurt Includes almond- and soy-based yogurt Includes reduced-fat and low-fat kefir (all flavors) Includes yogurt packaged with toppings Excludes refrigerated yogurt drinks
Cheese	460	16,635	16,409	226	All-natural and processed cheeses, including cream cheese and cottage cheese Includes cheese sauces
Cheese and cream cheese	46000	14,509	14,304	205	All-natural cheeses, cottage cheese, and cream cheese
Processed	46050	2,126	2,105	21	Processed cheese that usually contains added ingredients (e.g., oils and emulsifiers) Processed cheese sauces, processed cheese spreads, and imitation cheese and cream cheese
Meat and protein foods	5	48,668	45,160	3,508	The meat and protein foods group includes beef, pork, lamb, veal, and game; chicken, turkey, and game birds; fish and seafood; nuts, nut butters, and seeds; bacon, sausage, and lunch meats; egg and egg substitutes; and tofu and meat substitutes
Beef, pork, lamb, veal, and game	500	4,138	2,616	1,522	All types of red meat in either fresh, frozen, or canned forms Includes marinated or seasoned raw meats Includes venison, alligator, and boar Processed meat products with additional ingredients (e.g., frozen meatballs) are placed in the prepared meals, sides, and salads tier-1 category
Fresh	50000	3,197	1,684	1513	Fresh beef, pork, lamb, veal, and game
Frozen	50050	767	758	9	Frozen beef, pork, lamb, veal, and game Includes frozen patties, burgers, and filets, without added ingredients such as breadcrumbs and cheese, but may include seasoning
Canned	50075	174	174	0	Canned beef, pork, lamb, veal, and game Includes pickled beef or pork

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Product description	EFPG	Total product codes	UPCs	Perish-able codes	EFPG description
Chicken, turkey, and game birds	515	2,170	1,750	420	All poultry and game birds in either fresh, frozen, or canned forms Includes ostrich and duck Includes marinated or seasoned raw poultry Processed poultry products with additional ingredients (e.g., rotisserie chicken or stuffed chicken breast) are placed in the prepared meals, sides, and salads tier-1 category
Fresh	51500	1,066	715	351	Fresh poultry and game birds
Frozen	51550	813	744	69	Frozen poultry and game birds Includes chicken or turkey tenderloin, ground, filet, patty, breast, burger with or without seasoning
Canned	51575	291	291	0	Canned poultry and game birds
Fish and seafood	530	7,768	7,319	449	Fish and other seafood in either fresh, smoked, frozen, or canned forms Includes marinated or seasoned raw fish and seafood Processed fish and seafood products with additional ingredients (e.g., frozen fish sticks) are placed in the prepared meals, sides, and salads tier-1 category
Fresh	53000	1,705	1,287	418	Fresh fish and other seafood Includes smoked seafood
Frozen	53050	3,248	3,217	31	Frozen fish and other seafood Includes frozen uncoated seafood and frozen uncoated, cooked shrimp
Canned	53075	2,815	2,815	0	Canned fish and other seafood Includes pickled fish and seafood (e.g., herring in wine sauce)
Nuts, nut butters, and seeds	545	12,925	12,925	0	All raw, roasted, and flavored nuts (e.g., peanuts, cashews, and almonds), seeds (e.g., sunflower seeds, pumpkin seeds, and sesame seeds), and nut butters
Nuts and seeds	54500	11,223	11,223	0	Raw, roasted, and flavored nuts and seeds Includes nut salad topping
Nut and seed butters and spreads	54550	1,702	1,702	0	Nut and seed butters and spreads
Bacon, sausage, and lunch meats	56000	18,430	17,488	942	Bacon, sausage, pre-packed and deli lunch-meat, hot dogs, meat and poultry jerky Includes salt pork; pizza toppings: pepperoni and Italian sausage; shelf-stable country ham; fat back; bacon bits (real); and meat sticks

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Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
Egg and egg substitutes	57500	2,214	2,214	0	Eggs and egg substitutes Includes pickled eggs Refrigerated hard-boiled eggs are included in the prepared meals, sides, and salads tier-1 category
Tofu and meat substitutes	59000	1,023	848	175	Tofu, vegetarian hot dogs and burgers, seitan, and other meat and poultry substitutes (including cooked versions) Includes imitation bacon bits
Prepared meals, sides, and salads	6	50,117	49,210	907	The prepared meals, sides, and salads group includes ready-to-eat foods; frozen and refrigerated ready-to-heat foods; shelf-stable ready-to-heat foods and soups; and shelf-stable meal kits
Ready-to-eat foods	60000	11,966	11,575	391	Prepared foods that are ready to eat Includes prepared salads, salad kits, sandwiches, rotisserie chickens, and items from a salad or hot bar Includes vegetable trays that contain more than just vegetables Includes fruit trays that contain more than just fruit Includes packaged lunch kits Includes tuna and chicken salad Includes hard-boiled eggs Includes hummus and baba ghanoush (eggplant dip)

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Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
Frozen and refrigerated ready-to-heat foods	62500	26,002	25,486	516	Frozen and refrigerated prepared foods that are ready to heat Includes chicken patties and nuggets, fish sticks, frozen waffles, frozen sandwiches, pastry stuffed with meat or vegetables, frozen vegetables with sauce, microwave dinners, and pizza Includes meatloaf, meatballs, and breaded meats Includes cooked and processed seafood that is frozen (except uncoated, cooked shrimp) Includes prepared potatoes with added fat (e.g., fries and hash browns) Includes prepared (ready-to-heat) rice Includes refrigerated and frozen prepared pasta with sauce Includes frozen or refrigerated tortellini with filling, ravioli with filling, dumplings with filling, and pierogi with filling Excludes frozen bread; frozen dough; uncooked raw uncoated meat; and poultry, seafood, and meat substitutes
Shelf-stable, ready-to-heat foods and soups	65000	6,316	6,316	0	Shelf-stable, ready-to-heat foods and soups sold in cans, cartons, and microwavable containers Includes canned soups (including condensed soups), canned chili, and canned pasta
Shelf-stable meal kits	67500	5,833	5,833	0	Shelf-stable kits that contain most of the ingredients necessary to make a side dish or entrée for which limited preparation, such as adding water, oil, or meat, and cooking is required Includes dry soups, macaroni and cheese kits, taco kits, and rice-pilaf kits Includes shelf-stable box mixes: rice-vermicelli, rice and beans, and pasta salads Includes ramen and Asian noodle soup
Other foods	7	344,998	344,469	529	The other foods group includes fats, oils, and salad dressings; gravies, sauces, condiments, and spices; beverages; desserts, sweets, and candies; breakfast cereals; savory snacks; vitamins and meal supplements; baby food; and infant formula
Fats, oils, and salad dressings	700	10,729	10,728	1	Fats, oils, and salad dressings
Fats and oils	70000	5,753	5,753	0	Fats and oils Includes butter, margarine, salad and cooking oils, and lard

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Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
Salad dressing	70050	4,976	4,975	1	Salad dressings and mayonnaise
Gravies, sauces, condiments, and spices	710	47,367	47,342	25	Condiments, gravies, sauces, and dry spices
Condiments, gravies, and sauces	71000	26,709	26,684	25	Ketchup, barbecue sauce, mustard, gravy, pasta sauce, Worcestershire sauce, and soy sauce Includes relish and chutney Includes meat sandwich mixes (e.g., sloppy joe) Includes dips excluding hummus and baba ghanoush Includes miso paste Excludes cheese sauces
Dry spices	71050	20,658	20,658	0	Dry spices and baking extracts Includes dry parsley; oregano; garlic powder, onion powder; salt; pepper; thyme; and spice mixtures, such as Italian spice, curry powder, and poultry seasoning Includes vanilla and other baking extracts and flavorings
Beverages	720	132,057	132,057	0	All liquid beverages and beverage mixes excluding unflavored milk products and 100-percent fruit and vegetable juices
Sweetened coffee and tea	72000	4,803	4,803	0	Coffee and tea drinks that have added sugars, such as cappuccino, latte, and sweetened iced tea beverages Includes dry powders to make coffee or tea beverages with any type of sweetener (e.g., low-calorie, agave, honey, artificial, and sugar)
Unsweetened coffee and tea	72010	15,190	15,190	0	Coffee and tea drinks that have no added sweeteners, such as unsweetened prepared tea and coffee and components to make these drinks such as ground coffee, loose tea, and tea bags Includes dry powders to make these beverages without added sweeteners

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Product description	EFPG	Total product codes	UPCs	Perishable codes	EFPG description
Flavored milk and other sweetened milk-based beverages	72020	3,549	3,549	0	Flavored milk (e.g., chocolate and strawberry), flavored plant-based milk drinks (e.g., chocolate almond milk and vanilla rice milk), and milkshakes Includes dry powders to make these beverages if the powder contains dry milk Includes refrigerated and frozen yogurt drinks Sweetened condensed milk is included in the whole milk tier-3 category Dry beverage powders for flavored milk that do not contain dry milk are included in the all other caloric beverages tier-3 category
Low-calorie beverages	72030	5,264	5,264	0	Drinks not included in sweetened or unsweetened coffee and tea, alcohol, or water categories that have less than 5 calories per 8 ounces Includes low- or no-calorie sodas and sweetened water Includes low-calorie dry powder and concentrated liquid beverage enhancers
All other caloric beverages	72040	19,797	19,797	0	Drinks not included in sweetened or unsweetened coffee and tea, flavored and sweetened milk-based beverages, alcohol, or water categories that have at least 5 calories per 8 ounces Includes sports drinks, energy drinks, regular sodas, tomato cocktail mix, cranberry cocktail drink, grape cocktail drink, and juice drinks Includes dry powders to make these beverages and dry powders for flavored milk that do not contain dry milk Includes frozen smoothie kits, bottled smoothies, and fruit nectar drinks 100-percent fruit or vegetable juice is included under the fruit tier-1 category
Alcohol	72050	77,874	77,874	0	Alcoholic drinks such as beer, wine, liquor, and premixed alcoholic beverages
Water	72060	5,580	5,580	0	All unsweetened water, whether still or carbonated
Desserts, sweets, and candies	730	117,066	116,576	490	Sweeteners, jellies and jams, candies, baked goods, baking mixes, ice cream and other milk-based desserts, and all other desserts

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Product description	EFPG	Total product codes	UPCs	Perish-able codes	EFPG description
Sweeteners	73000	8,078	8,077	1	All types of sugars; no-calorie sweeteners; syrups; honey; chocolate, butterscotch, caramel, and other sauces; and icings Includes coffee syrups and flavorings Includes non-dairy whipped topping Excludes drink powders
Jellies and jams	73010	4,836	4,836	0	All types of jellies, jams, marmalades, and preserves
Candy	73020	39,981	39,970	11	All types of candy, both chocolate and non-chocolate Includes sugar-free and regular candies Includes sugar-free and regular chewing gum Includes sugar sprinkles
Baked goods	73030	44,198	43,781	417	Cakes, cookies, pies, pastries, doughnuts, granola bars, banana and other sweet breads, and muffins that are both fresh (from an in-store bakery) and prepackaged Includes fortified snack bars Includes toaster strudel, sweetened rolls, piecrust, and puff pastry No distinction between refined and whole-grain content
Cake and cookie mixes	73040	2,521	2,520	1	Dry cake, muffin, cookie, sweet bread (e.g., banana bread), and brownie mixes Includes refrigerated cookie dough
Ice cream and other milk-based desserts	73050	13,904	13,856	48	Ice cream, frozen yogurt, ice cream cakes, ambrosia, cheesecake, and puddings
All other desserts	73060	3,548	3,536	12	Any other sweet desserts that are not in the other categories, such as gelatins and nondairy popsicles
Breakfast cereals	740	5,947	5,947	0	Ready-to-eat breakfast cereals including flavored oatmeal and other cereal grains
Whole-grain breakfast cereal	74000	4,396	4,396	0	Ready-to-eat, whole-grain breakfast cereals Includes flavored oatmeal and other flavored whole-grain cereal grains Greater than 50 percent of grain ounce equivalents from whole grains[1]
All other breakfast cereal	74050	1,551	1,551	0	Ready-to-eat, non-whole-grain breakfast cereals Includes flavored, non-whole-grain cereal grains, such as most grits and hominy Less than or equal to 50 percent of grain ounce equivalents from whole grains[1]
Savory snacks	750	28,415	28,402	13	Savory whole-grain and other snacks

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Product description	EFPG	Total product codes	UPCs	Perish-able codes	EFPG description
Whole-grain snacks	75000	5,622	5,622	0	Savory whole-grain snacks Includes ready-to-eat and microwave popcorn, whole-wheat crackers, some corn chips, and multigrain snacks Includes granola snack mix Greater than 50 percent of grain ounce equivalents from whole grains[1]
All other snacks	75050	22,793	22,780	13	Savory non-whole-grain snacks Includes potato chips, trail mixes, pork rinds, most crackers, snacks made from vegetables and beans, wonton salad toppings, hard breadsticks, and some corn chips Less than or equal to 50 percent of grain ounce equivalents from whole grains[1]
Vitamins and meal supplements	76000	233	233	0	All vitamins, protein shakes, diet bars, and similar products Includes instant breakfast drinks, protein powders, and meal replacement bars Excludes fortified snack bars
Baby food	77000	2,336	2,336	0	All baby food except infant formula Includes baby fruit puree
Infant formula	78000	848	848	0	All infant formula
Not Coded	99999	276	75	201	Foods with insufficient descriptions to allow assignment to an EFPG

UPC = Universal Product Code. EFPG = USDA, Economic Research Service (ERS) Food Purchase Group.

[1]This qualifier was not used to assign Circana product codes to EFPGs due to data limitations.

Source: USDA, Economic Research Service using 2018 Circana OmniMarket Core Outlets data.

Appendix B: Share of Weighted and Unweighted National Sales by EFPG

The Food-at-Home Monthly Area Price (F-MAP) includes measures of sales volumes in total dollars and in grams for each month, region, and USDA, Economic Research Service (ERS) Food Purchase Group (EFPG). Table B.1 shows the share of weighted and unweighted sales calculated using data in the F-MAP in both dollars and grams at the national level by EFPG in 2018. The sales shares can be used to aggregate price measures across categories.[18]

Table B.1
Share of weighted and unweighted national sales by EFPG, 2018

EFPG	Tier	EFPG description	Category share, dollars, weighted	Category share, grams, weighted	Category share, dollars, unweighted	Category share, grams, unweighted
			Percent	Percent	Percent	Percent
0	0	All foods	100.00	100.00	100.00	100.00
1	1	Grains	4.30	3.49	4.62	3.81
100	2	Whole-grain breads, cereal, rice, pasta, and flours	0.50	0.33	0.56	0.38
10000	3	Whole-grain breads	0.34	0.21	0.38	0.24
10025	3	Whole-grain rice and pasta	0.06	0.03	0.07	0.04
10050	3	Whole-grain breakfast grains	0.10	0.07	0.11	0.09
10075	3	Whole-grain flour, bread mixes, and frozen dough	0.01	0.01	0.01	0.01
150	2	Non-whole-grain breads, cereal, rice, pasta, and flours	3.80	3.16	4.06	3.43
15000	3	Non-whole-grain breads	2.78	2.00	2.97	2.18
15025	3	Non-whole-grain rice and pasta	0.51	0.56	0.56	0.61
15050	3	Non-whole-grain breakfast grains	0.02	0.02	0.02	0.02
15075	3	Non-whole-grain flour, bread mixes, and frozen dough	0.49	0.58	0.51	0.62
2	1	Vegetables	5.47	5.72	6.15	6.48
200	2	Potatoes	0.46	0.96	0.51	1.07
20000	3	Potatoes, fresh	0.46	0.95	0.50	1.06
20075	3	Potatoes, canned	0.01	0.01	0.01	0.01
215	2	Other starchy vegetables	0.33	0.48	0.35	0.52
21500	3	Other starchy vegetables, fresh	0.08	0.16	0.09	0.20
21525	3	Other starchy vegetables, fresh cut	0.04	0.03	0.04	0.03
21550	3	Other starchy vegetables, frozen	0.10	0.10	0.11	0.10
21575	3	Other starchy vegetables, canned	0.12	0.19	0.12	0.19
230	2	Tomatoes	0.69	0.59	0.79	0.68
23000	3	Tomatoes, fresh	0.53	0.39	0.62	0.45

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[18] Weighted category shares are recommended for aggregating data across categories, and researchers may select dollars or grams depending on their research focus.

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EFPG	Tier	EFPG description	Category share, dollars, weighted	Category share, grams, weighted	Category share, dollars, unweighted	Category share, grams, unweighted
23075	3	Tomatoes, canned	0.16	0.20	0.17	0.23
245	2	Other red and orange vegetables	0.47	0.59	0.56	0.71
24500	3	Other red and orange vegetables, fresh	0.28	0.40	0.33	0.48
24525	3	Other red and orange vegetables, fresh cut	0.15	0.13	0.17	0.17
24550	3	Other red and orange vegetables, frozen	0.01	0.01	0.01	0.01
24575	3	Other red and orange vegetables, canned	0.04	0.05	0.04	0.05
260	2	Dark green vegetables	0.64	0.41	0.73	0.49
26000	3	Dark green vegetables, fresh	0.26	0.19	0.32	0.23
26525	3	Dark green vegetables, fresh cut	0.29	0.14	0.31	0.17
26550	3	Dark green vegetables, frozen	0.08	0.06	0.09	0.07
26575	3	Dark green vegetables, canned	0.01	0.02	0.01	0.02
275	2	Beans, lentils, and peas	0.27	0.36	0.28	0.39
27500	3	Beans, lentils, and peas, fresh/dried	0.05	0.05	0.05	0.05
27550	3	Beans, lentils, and peas, frozen	0.01	0.01	0.02	0.01
27575	3	Beans, lentils, and peas, canned	0.21	0.31	0.22	0.33
290	2	Other/mixed vegetables	2.61	2.33	2.92	2.63
29000	3	Other/mixed vegetables, fresh	1.51	1.56	1.75	1.80
29025	3	Other/mixed vegetables, fresh cut	0.37	0.17	0.40	0.18
29050	3	Other/mixed vegetables, frozen	0.17	0.13	0.19	0.15
29075	3	Other/mixed vegetables, canned	0.55	0.47	0.58	0.50
3	1	Fruit	6.67	7.57	7.70	8.86
300	2	Whole fruit	5.52	5.76	6.54	6.91
30000	3	Whole fruit, fresh	4.37	5.11	5.24	6.16
30025	3	Whole fruit, fresh cut	0.43	0.18	0.51	0.22
30050	3	Whole fruit, frozen	0.12	0.05	0.14	0.06
30075	3	Whole fruit, canned	0.44	0.38	0.47	0.42
30090	3	Whole fruit, dried	0.15	0.04	0.18	0.05
350	2	100-percent fruit and vegetable juices	1.16	1.81	1.16	1.95
35000	3	100-percent fruit and vegetable juices, fresh	0.59	0.91	0.61	1.00
35050	3	100-percent fruit and vegetable juices, frozen	0.02	0.04	0.02	0.04
35075	3	100-percent fruit and vegetable juices, canned and shelf-stable	0.55	0.86	0.54	0.92
4	1	Dairy and plant-based milk products	6.64	7.88	7.07	7.81
400	2	Whole milk, yogurt, and cream	1.30	2.49	1.29	2.30
40000	3	Whole milk	0.72	2.13	0.64	1.89
40030	3	Whole cream and sour cream	0.49	0.30	0.52	0.34
40060	3	Whole yogurt	0.10	0.05	0.13	0.07
430	2	Reduced-fat, low-fat, and skim milk, cream, and yogurt	2.18	4.41	2.32	4.42
43000	3	Reduced-fat, low-fat, and skim milk	1.13	3.65	1.09	3.52

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EFPG	Tier	EFPG description	Category share, dollars, weighted	Category share, grams, weighted	Category share, dollars, unweighted	Category share, grams, unweighted
43030	3	Reduced-fat, low-fat, and skim cream and sour cream	0.18	0.18	0.20	0.21
43060	3	Reduced-fat, low-fat, and skim yogurt	0.87	0.57	1.03	0.70
460	2	Cheese	3.16	0.98	3.46	1.09
46000	3	Cheese and cream cheese	2.60	0.80	2.86	0.89
46050	3	Processed cheese	0.56	0.18	0.60	0.20
5	1	Meat and protein foods	15.84	6.66	17.02	7.20
500	2	Beef, pork, lamb, veal and game	5.02	1.83	5.23	1.88
50000	3	Beef, pork, lamb, veal and game, fresh	4.92	1.79	5.12	1.83
50050	3	Beef, pork, lamb, veal and game, frozen	0.10	0.04	0.11	0.05
50075	3	Beef, pork, lamb, veal and game, canned	0.01	0.00	0.00	0.00
515	2	Chicken, turkey, and game birds	2.51	1.72	2.89	1.95
51500	3	Chicken, turkey, and game birds, fresh	2.15	1.43	2.47	1.61
51550	3	Chicken, turkey, and game birds, frozen	0.32	0.28	0.37	0.32
51575	3	Chicken, turkey, and game birds, canned	0.04	0.02	0.04	0.02
530	2	Fish and seafood	1.28	0.30	1.48	0.35
53000	3	Fish and seafood, fresh	0.57	0.11	0.69	0.13
53050	3	Fish and seafood, frozen	0.37	0.08	0.41	0.08
53075	3	Fish and seafood, canned	0.35	0.12	0.38	0.13
545	2	Nuts, nut butters, and seeds	1.24	0.41	1.31	0.45
54500	3	Nuts and seeds	0.91	0.21	0.93	0.22
54550	3	Nut and seed butters and spreads	0.33	0.19	0.38	0.23
560	2	Bacon, sausage, and lunch meats	4.91	1.61	5.18	1.74
56000	3	Bacon, sausage, and lunch meats	4.91	1.61	5.18	1.74
575	2	Egg and egg substitutes	0.74	0.76	0.78	0.79
57500	3	Egg and egg substitutes	0.74	0.76	0.78	0.79
590	2	Tofu and meat substitutes	0.12	0.03	0.16	0.04
59000	3	Tofu and meat substitutes	0.12	0.03	0.16	0.04
6	1	Prepared meals, sides, and salads	10.57	6.77	11.29	7.37
600	2	Ready-to-eat foods	3.04	0.85	3.22	0.90
60000	3	Ready-to-eat foods	3.04	0.85	3.22	0.90
625	2	Frozen and refrigerated ready-to-heat foods	5.51	2.46	5.92	2.69
62500	3	Frozen and refrigerated ready-to-heat foods	5.51	2.46	5.92	2.69
650	2	Shelf-stable, ready-to-heat foods and soups	1.14	1.14	1.22	1.25
65000	3	Shelf-stable, ready-to-heat foods and soups	1.14	1.14	1.22	1.25
675	2	Shelf-stable meal kits	0.88	2.32	0.93	2.53
67500	3	Shelf-stable meal kits	0.88	2.32	0.93	2.53
7	1	Other foods	50.51	61.91	46.14	58.47
700	2	Fats, oils, and salad dressings	1.83	1.21	1.97	1.30
70000	3	Fats and oils	1.15	0.75	1.23	0.80

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EFPG	Tier	EFPG description	Category share, dollars, weighted	Category share, grams, weighted	Category share, dollars, unweighted	Category share, grams, unweighted
70050	3	Salad dressing	0.68	0.46	0.74	0.51
710	2	Gravies, sauces, condiments, and spices	2.74	1.71	2.91	1.86
71000	3	Condiments, gravies, and sauces	2.05	1.56	2.18	1.70
71050	3	Dry spices	0.69	0.15	0.73	0.16
720	2	Beverages	25.12	50.55	20.55	46.34
72000	3	Sweetened coffee and tea	1.58	2.98	1.16	2.76
72010	3	Unsweetened coffee and tea	1.74	0.41	2.00	0.46
72020	3	Flavored milk and other sweetened milk-based beverages	0.99	1.19	1.01	1.28
72030	3	Low-calorie beverages	2.44	6.42	2.04	6.44
72040	3	All other caloric beverages	7.34	17.39	5.51	15.46
72050	3	Alcohol	9.16	8.57	7.10	5.82
72060	3	Water	1.88	13.58	1.74	14.11
730	2	Desserts, sweets, and candies	12.58	5.74	12.47	6.04
73000	3	Sweeteners	0.69	0.69	0.75	0.71
73010	3	Jellies and jams	0.16	0.10	0.18	0.11
73020	3	Candy	4.24	1.14	4.05	1.21
73030	3	Baked goods	4.95	1.81	4.92	1.88
73040	3	Cake and cookie mixes	0.29	0.22	0.32	0.25
73050	3	Ice cream and other milk-based desserts	1.92	1.52	1.89	1.58
73060	3	All other desserts	0.33	0.27	0.37	0.30
740	2	Breakfast cereals	1.52	0.73	1.72	0.86
74000	3	Whole-grain breakfast cereal	1.05	0.49	1.19	0.58
74050	3	All other breakfast cereal	0.47	0.24	0.53	0.28
750	2	Savory snacks	5.60	1.77	5.27	1.82
75000	3	Savory snacks, whole-grain snacks	0.77	0.25	0.78	0.27
75050	3	Savory snacks, all other snacks	4.83	1.52	4.49	1.55
760	2	Vitamins and meal supplements	0.07	0.02	0.08	0.02
76000	3	Vitamins and meal supplements	0.07	0.02	0.08	0.02
770	2	Baby food	0.25	0.09	0.31	0.11
77000	3	Baby food	0.25	0.09	0.31	0.11
780	2	Infant formula	0.79	0.09	0.86	0.11
78000	3	Infant formula	0.79	0.09	0.86	0.11

EFPG = USDA, Economic Research Service (ERS) Food Purchase Group.

Note: Category shares represent the share of total sales volume (in both dollars and grams) for each EFPG. This table includes the 90 category-level EFPGs, as well as tier 1 and tier 2 aggregations. The category shares in each tier sum to 100 percent (though may differ slightly due to rounding). Weighted shares were calculated using the weighted sales volume fields in the Food-at-Home Monthly Area Price, which are sales volume totals produced with the store weights applied. Unweighted shares were calculated using unweighted Circana OmniMarket Core Outlets data.

Source: USDA, Economic Research Service (ERS) calculations using USDA, ERS, Food-at-Home Monthly Area Price data.

Appendix C: Mapping of EFPGs to FoodAPS-1 groups

The USDA, Economic Research Service (ERS) Food Purchase Groups (EFPG) were developed from the groups used in USDA, ERS's National Household Food Acquisition and Purchase Survey (FoodAPS).19 For users who wish to compare other data with FoodAPS, this table explains how to map the EFPG to the FoodAPS-1 category.

Table C.1
Mapping of EFPG groups to FoodAPS-1 groups

Tier 1	Tier 2	Tier 3	EFPG Code	FoodAPS-1 Code	Crosswalk notes
Grains			1	1	
	Whole-grain breads, cereal, rice, pasta, and flours		100	101	
		Breads	10000	10101	Combine EFPG 10050 and 74000 to form FoodAPS-1 10103.
		Rice and pasta	10025	10102	
		Breakfast grains	10050	10103	
		Flour, bread mixes, and frozen dough	10075	10104	
	Non-whole-grain breads, cereal, rice, pasta, and flours		150	102	
		Breads	15000	10201	Combine EFPG 15050 and 74050 to form FoodAPS-1 10203.
		Rice and pasta	15025	10202	
		Breakfast grains	15050	10203	
		Flour, bread mixes, and frozen dough	15075	10204	
Vegetables			2	2	
	Potatoes		200		
		Fresh	20000		Combine EFPG 20000, 21500, and 21525 to form FoodAPS-1 20101.
		Canned	20075		Combine EFPG 20075 and 21575 to form FoodAPS-1 20103.

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[19] For more information on FoodAPS, please see the page "FoodAPS National Household Food Acquisition and Purchase Survey" page on the USDA, ERS website.

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Tier 1	Tier 2	Tier 3	EFPG Code	FoodAPS-1 Code	Crosswalk notes
	Other starchy vegetables		215	201	
		Fresh	21500	20101	Combine EFPG 20000, 21500, and 21525 to form FoodAPS-1 20101.
		Fresh cut	21525		Combine EFPG 20000, 21500, and 21525 to form FoodAPS-1 20101.
		Frozen	21550	20102	
		Canned	21575	20103	Combine EFPG 20075 and 21575 to form FoodAPS-1 20103.
	Tomatoes		230	202	FoodAPS-1 included a code for frozen tomatoes (20202) that no longer exists in the EFPGs.
		Fresh	23000	20201	
		Canned	23075	20203	
	Other red and orange vegetables		245	204	
		Fresh	24500	20401	Combine EFPG 24500 and 24525 to form FoodAPS-1 20401.
		Fresh cut	24525		Combine EFPG 24500 and 24525 to form FoodAPS-1 20401.
		Frozen	24550	20402	
		Canned	24575	20403	
	Dark green vegetables		260	203	
		Fresh	26000	20301	Combine EFPG 26000 and 26525 to form FoodAPS-1 20301.
		Fresh cut	26525		Combine EFPG 26000 and 26525 to form FoodAPS-1 20301.
		Frozen	26550	20302	
		Canned	26575	20303	
	Beans, lentils, and peas		275	205	
		Fresh/dried	27500	20501	
		Frozen	27550	20502	
		Canned	27575	20503	
	Other/mixed vegetables		290	206	
		Fresh	29000	20601	Combine EFPG 29000 and 29025 to form FoodAPS-1 20601.
		Fresh cut	29025		Combine EFPG 29000 and 29025 to form FoodAPS-1 20601.
		Frozen	29050	20602	
		Canned	29075	20603	

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Tier 1	Tier 2	Tier 3	EFPG Code	FoodAPS-1 Code	Crosswalk notes
Fruit			3	3	
	Whole fruit		300	301	
		Fresh	30000	30101	Combine EFPG 30000 and 30025 to form FoodAPS-1 30101.
		Fresh cut	30025		Combine EFPG 30000 and 30025 to form FoodAPS-1 30101.
		Frozen	30050	30102	
		Canned	30075	30103	
		Dried	30090	30104	
	100-percent fruit and vegetable juices		350	302	
		Fresh	35000	30201	Combine EFPG 35000, 35050, and 35075 to form FoodAPS-1 30201.
		Frozen	35050	30201	Combine EFPG 35000, 35050, and 35075 to form FoodAPS-1 30201.
		Canned/ shelf-stable	35075	30201	Combine EFPG 35000, 35050, and 35075 to form FoodAPS-1 30201.
Dairy and plant-based milk products			4	4	
	Whole milk, yogurt, and cream		400	401	
		Milk	40000	40101	
		Cream and sour cream	40030	40102	
		Yogurt	40060	40103	
	Reduced-fat, low-fat, and skim milk, cream, and yogurt		430	402	
		Milk	43000	40201	
		Cream and sour cream	43030	40202	
		Yogurt	43060	40203	
	Cheese		460	403	
		Cheese and cream cheese	46000	40301	
		Processed	46050	40302	
Meat and protein foods			5	5	
	Beef, pork, lamb, veal and game		500	501	
		Fresh	50000	50101	
		Frozen	50050	50102	
		Canned	50075	50103	

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Tier 1	Tier 2	Tier 3	EFPG Code	FoodAPS-1 Code	Crosswalk notes
	Chicken, turkey, and game birds		515	502	
		Fresh	51500	50201	
		Frozen	51550	50202	
		Canned	51575	50203	
	Fish and seafood		530	503	
		Fresh	53000	50301	
		Frozen	53050	50302	
		Canned	53075	50303	
	Nuts, nut butters, and seeds		545	504	
		Nuts and seeds	54500	50401	
		Nut and seed butters and spreads	54550	50402	
	Bacon, sausage, and lunch meats		560	505	
			56000	50501	
	Egg and egg substitutes		575	506	
			57500	50601	
	Tofu and meat substitutes		590	507	
			59000	50701	
Prepared meals, sides, and salads			6	6	
	Ready-to-eat foods		600	601	
			60000	60101	
	Frozen/refrigerated ready-to-heat foods		625	602	
			62500	60201	
	Shelf-stable, ready-to-heat foods and soups		650	603	
			65000	60301	
	Shelf-stable meal kits		675	604	
			67500	60401	
Other foods			7	7	
	Fats, oils, and salad dressings		700	701	
		Fats and oils	70000	70101	
		Salad dressing	70050	70102	

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Tier 1	Tier 2	Tier 3	EFPG Code	FoodAPS-1 Code	Crosswalk notes
	Gravies, sauces, condiments, and spices		710	702	
		Condiments, gravies, and sauces	71000	70201	
		Dry spices	71050	70202	
	Beverages		720	703	
		Sweetened coffee and tea	72000	70301	
		Unsweetened coffee and tea	72010	70302	
		Flavored milk and other sweetened milk-based beverages	72020	70406	Combine EFPG 72020 and 73050 to form FoodAPS-1 70406.
		Low-calorie beverages	72030	70303	
		All other caloric beverages	72040	70304	
		Alcohol	72050	70305	
		Water	72060	70306	
	Desserts, sweets, and candies		730	704	
		Sweeteners	73000	70401	
		Jellies and jams	73010	70402	
		Candy	73020	70403	
		Baked goods	73030	70404	
		Cake and cookie mixes	73040	70405	
		Ice cream and other milk-based desserts	73050	70406	Combine EFPG 72020 and 73050 to form FoodAPS-1 70406.
		All other desserts	73060	70407	
	Breakfast cereals		740		
		Whole-grain breakfast cereal	74000	10103	Combine EFPG 10050 and 74000 to form FoodAPS-1 10103.
		All other breakfast cereal	74050	10203	Combine EFPG 15050 and 74050 to form FoodAPS-1 10203.

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Tier 1	Tier 2	Tier 3	EFPG Code	FoodAPS-1 Code	Crosswalk notes
	Savory snacks		750	705	
		Whole-grain snacks	75000	70501	
		All other snacks	75050	70502	
	Vitamins and meal supplements		760	706	
			76000	70601	
	Baby food		770	707	
			77000	70701	
	Infant formula		780	708	
			78000	70801	
Not coded			9	9	
	Not coded		999	999	
			99999	99999	

EFPG = USDA, Economic Research Service (ERS) Food Purchase Groups. FoodAPS-1 = USDA, ERS National Household Food Acquisition and Purchase Survey.

Source: USDA, Economic Research Service using USDA, ERS Food Purchase Groups and FoodAPS-1.

Appendix D: Rolling-Window Multilateral Price Indexes

This report covers the initial development of the Food-at-Home Monthly Area Prices (F-MAP) data for 2016–18. However, the F-MAP data product will be extended to include additional years of data beyond this initial base period. When extending the series, the multilateral price indexes are updated using a rolling window with a moving base.

The multilateral GEKS (named for Gini, 1931; Eltetö & Köves, 1964; Szulc 1964) and CCD (named for Caves et al., 1982) indexes used in the F-MAP are fully transitive and free of chain drift. However, as new data become available beyond the initial base period, the index numbers for existing entities must be recalculated because the multilateral index compares product prices in an entity with prices in all other entities. For statistical agencies, it is not practical to revise all historical index numbers every time new data are published. One way to maintain the published indexes is to compare product prices in a new entity with prices of entities within a rolling window. If a wide window length (e.g., 1 year) is chosen, the rolling-window index will be largely free of chain drift despite not being fully transitive.

The rolling-window version of the GEKS index (RWGEKS) is calculated as follows. Let T be the last period of the base time frame, and T+1 be the first time period post base. The RWGEKS for entity k in T+1 is constructed as

$$P^{0k}_{RWGEKS} = P^{0j}_{GEKS} \prod_{l \in I_{T+1-\kappa,T+1}} \left(P^{jl}_F \times P^{lk}_F\right)^{\frac{1}{N_{T+1-\kappa,T+1}}}.$$

In the above, P^{0j}_{GEKS} is the GEKS index for entity j in period T, K is window length, $I_{T+1-\kappa,T+1}$ represents the set of $N_{T+1-\kappa,T+1}$ entities between period T+1-K and T+1, to which entity l belongs. With monthly data, a rolling-year GEKS index has K=12. Entity j is known as the link entity. Although the RWGEKS is not fully transitive, the technical appendix of Zhen et al. (2019) shows that it can be made transitive among all ks in T+1 by using the same link entity j from T. The same study also found that a year-long rolling window was sufficient to remove chain drift caused by high-frequency data and seasonal variation in variety. We chose the entity representing the national mean as the link entity and set K=12.

As data for new time periods become available, the window rolls forward. For entities in T+2 and beyond, the index for the link entity is also a RWGEKS. For example, the RWGEKS for entity k in T+2 is calculated as

$$P^{0k}_{RWGEKS} = P^{0j}_{RWGEKS} \prod_{l \in I_{T+2-\kappa,T+2}} \left(P^{jl}_F \times P^{lk}_F\right)^{\frac{1}{N_{T+2-\kappa,T+2}}}$$

where P^{0j}_{RWGEKS} is the RWGEKS index number for the national mean entity j in T+1.

We can also calculate RWGEKS for entities before the base time frame 1:T by rolling the window backward. For entity k in period -1, the first period preceding the beginning of the base period, the RWGEKS is built as

$$P^{0k}_{RWGEKS} = P^{0j}_{GEKS} \prod_{l \in I_{-1,\kappa}} \left(P^{jl}_F \times P^{lk}_F\right)^{\frac{1}{N_{-1,\kappa}}}$$

Where P^{0j}_{GEKS} is the GEKS for national mean entity j in period 1. The RWGEKS for entity k in period -2 is calculated as

$$P^{0k}_{RWGEKS} = P^{0j}_{RWGEKS} \prod_{l \in I_{-2,\kappa-1}} \left(P^{jl}_F \times P^{lk}_F\right)^{\frac{1}{N_{-2,\kappa-1}}}$$

Where P^{0j}_{RWGEKS} is the RWGEKS for national mean entity j in period -1.

Replacing the Fisher Ideal index with the Törnqvist index in all the above equations would give us the rolling-window CCD (RWCCD) index.